School of Computer Science, Engineering & Applications

Bharathidasan University

Tiruchirappalli - 620 023

Master of Technology in Computer Science

(6 year Integrated Course Structure under CBCS)

(Applicable to the candidates admitted from the academic year 2024-2025 onwards)

BHARATHIDASN UNIVERSITY
SCHOOL OF COMPUTER SCIENCE, ENGINEERING & APPLICATIONS
MASTER OF TECHNOLOGY IN COMPUTER SCIENCE(6 YEAR INTEGRATED COURSE)
CHOICE BASED CREDIT SYSTEMREGULATIONS
(w.e.f. 2024 - 2025)

1. **Aim of the Course** The course strives to inculcate job-oriented and value based quality education in Information Technology and Commercial Application Development. At the end of the course, the students will be well-versed, particularly in core subjects with quality in inter-personal and professional skills.

2. **Eligibility for Admission** A Candidates who has passed 12TH standard with (Maths, physics and Chemistry).

3. **Duration of the Course** The Course duration shall be for six years consisting of twelve semesters. In order to be eligible for the award of the degree the candidate shall successfully complete the course in a maximum period of eight years from the date of enrolment for the first semester of the course.

4. **Choice Based Credit System** The University follows the 'Choice Based Credit System (CBCS)' for all its programmes. Each credit is worth 12 hours of student study time, comprising all learning activities. Thus a four-credit course involves 48 study hours. This helps the student to understand the academic effort and to successfully complete a course.

5. Structure of the Course and Evaluation Pattern

Internal Marks:**25** External Marks: **75**

The duration of University examination for both theory and practical subjects shall be 3 hours. The maximum marks for each theory and practical course is 100. Continues Internal Assessment (CIA) will be 25. The university theory examination will be conducted for 75 marks, which will be add withcontinues internal assessment to make 100 marks for the course. For the conduct of University examinations in theory, the question paper for the theory examination will be set by the external examiner and for practical examination, the question paper will be set by both internal and external examiners appointed by the Department.

6. Procedures for Awarding Marks for Internal Assessment

THEORY COURSES

For regularity and discipline - 5 Marks

For two assignment (Equal weightage) - 5 Marks

For two tests to be conducted (Equal weightage) -

5MarksModel examination - 10 Marks

Total - 25 Marks

PRACTICAL COURSES

For regularity and discipline - 5 Marks

Completion of all Experiments prescribed for the course - 5

MarksObservation Note - 10 Marks

For model Examination at the end of the Semester - 20 Marks

Total – 40 Marks

In the case of CIA, a candidate who secures not less than 40% of total marks prescribed for any course shall be declared to have passed for that course, failing which the candidatehas toredo the academic activities prescribed for the continuous internal assessment (CIA)..

7. Pattern of Question Paper (Theory)

Time 3 hours Max Marks 75

Section - A: (10 X 2 = 20 Marks)

All questions are to be answered. Two questions from each Unit

Section - B: (5X 5 = 25 Marks)

Five Questions are to be answered, Two questions from each UNIT In the either or pattern

Section - C : (3 x 10 = 30 Marks)

Three Questions are to be answered out of five questions – one question from each Unit

Programme OUTCOMES

S.No	Programme Outcome
PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering Problems
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Development of Solutions: Design and evaluate solutions for complex computing problems with appropriate consideration.
PO4	Modern Tool Usage: Create, identify and apply appropriate techniques, resources, and modern computing tools to complex computing activities
PO5	The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevantto the professional engineering practice

Program Specific Outcome

S.No	Programme Specific Outcome
PSO1	Apply the knowledge of computer engineering to find solutions for real-life application
PSO2	Ability to analyze, design, develop and maintain the software application with latest Technologies
PSO3	Utilize skills and knowledge for computing practice with commitment on social, ethical, cyber and legal values.
PSO4	Inculcate employability and entrepreneur skills among students who can develop customized solutions for small to large Enterprises
PSO5	Develop techniques to enhance ability for lifelong learning.
PSO6	Develop class environment congenial and competitive for generation of ideas, innovation and sharing.
PSO7	To make graduates understand cross cultural, societal, professional, legal and ethical issues prevailing in industry
PSO8	Ability to research, analyze and investigate complex computing problems through design of experiments, analysis and interpretation of data and synthesis of the information to arrive atvalid conclusions.

Master of Technology in Computer Science (6 year Integrated Course Structure and Syllabus under CBCS)

(Applicable to the candidates admitted from the academic year 2024-2025 onwards)

Course Number	Course Code	Course Name	L	P	C	Int.	Ext.	Total
Semester III								
24MTCS031	CC-I	Data Structures	5	0	4	25	75	100
24MTCS032	CC-II	Digital Principles and Computer Organization	5	0	4	25	75	100
24MTCS033	CC-III	Probability and Statistics	5	0	4	25	75	100
24MTCS034	CC-IV	Java Programming	5	0	4	25	75	100
24MTCS035	CC-V	Foundations of Data Science	4	0	3	25	75	100
24MTCS036P	CC-VI	Lab I - Data Structure	0	3	2	40	60	100
24MTCS037P	CC-VII	Lab II - Java Programming	0	3	2	40	60	100
24VAC01	VAC-I	Hardware and Network Essential	0	0	0	25	75	100
		Total	24	6	23	700		
Semester IV								
24MTCS041	CC-VIII	Computer Networks	4	0	3	25	75	100
24MTCS042	CC-IX	Design and Analysis of Algorithms	5	0	4	25	75	100
24MTCS043	CC-X	Mathematical Foundations of Computer Science	5	0	3	25	75	100
24MTCS044	CC-XI	Operating System	4	0	4	25	75	100
24MTCS045	CC-XII	Object Oriented Analysis and Design	4	0	3	25	75	100
24MTCS046	EEC	Soft Skills**	2	0	2	-	-	100
24MTCS047P	CC-XIII	Lab-III Operating System	0	3	2	40	60	100
24MTCS048P	CC-XIV	Lab-IV Object Oriented Analysis and Design	0	3	2	40	60	100
		Total	24	6	23	800		

Course Number	Course Code	Course Name	L	P	C	Int.	Ext.	Total
Semester V								
24MTCS051	CC-XV	Microprocessor and MicroController	4	0	4	25	75	100
24MTCS052	CC-XVI	Operation Research	4	0	4	25	75	100
24MTCS053	CC-XVII	Problem Solving using Python	4	0	4	25	75	100
24MTCS054	CC-XVIII	Database Management System	4	0	4	25	75	100
24MTCS055	EC-I	Elective-I (G)	4	0	3	25	75	100
24MTCS056	EC-II	Elective-II (G)	4	0	3	25	75	100
24MTCS057P	CC-XIX	Lab-V Problem Solving using Python	0	3	2	40	60	100
24MTCS058P	CC-XX	Lab-VI Database Management System	0	3	2	40	60	100
24VAC02	VAC-II	Augmented Reality and Virtual Reality	0	0	0	25	75	100
		Total	24	6	26	800		
Semester VI								
24MTCS061	CC-XXI	Computer Graphics	4	0	4	25	75	100
24MTCS062	CC-XXII	Software Engineering	4	0	4	25	75	100
24MTCS063	CC-XXIII	Cryptography and Cyber Security	4	0	4	25	75	100
24MTCS064	CC-XXIV	Web Technology	4	0	3	25	75	100
24MTCS065	EC-III	Elective-III (G)	4	0	3	25	75	100
24MTCS066	EC-IV	Elective-IV (G)	4	0	3	25	75	100
24MTCS067P	CC-XXV	Lab VII - Cryptography and Cyber Security	0	3	2	40	60	100
24MTCS068P	CC-XXVI	Lab VIII - Web Technology	0	3	2	40	60	100
		Total	24	6	25	800		

Course Number	Course Code	Course Name	L	P	C	Int.	Ext.	Total
Semester VII								
24MTCS071	CC-XXVII	Artificial Intelligence	4	0	4	25	75	100
24MTCS072	CC-XXVIII	Open Source Technologies	4	0	3	25	75	100
24MTCS073	CC-XXIX	Mobile Application Development	4	0	3	25	75	100
24MTCS074	CC-XXX	Compiler Design	4	0	4	25	75	100
24MTCS075	EC-V	Elective-V (G)	4	0	3	25	75	100
24MTCS076	EC-VI	Elective-VI (G)	4	0	3	25	75	100
24MTCS077P	CC-XXXI	Lab-IX Open Source Technologies	0	3	2	40	60	100
24MTCS078P	CC-XXXII	Lab-X Mobile Application Development	0	3	2	40	60	100
24VAC03	VAC-III	Ethical Hacking	0	0	0	25	75	100
		Total	24	6	24	800		
Semester VIII								
24MTCS081	CC-XXXIII	Project	6	20	6	40	60	100
24MTCS082	CC-XXXIV	Professional Ethics	4	0	3	25	75	100
24MTCS083	EC-VII	Elective-VII (S)	4	0	3	25	75	100
Total			14	20	12	300		
Grand Total (III to VIII semester)			133					

Credits from 1st semester to 8th semester: 51+133=184

Course Number	Course Code	Course Name	L	P	C	Int.	Ext.	Total
Semester IX								
24MTCS091	CC-XXXV	Advanced Data Structure and Algorithms	5	0	4	25	75	100
24MTCS092	CC-XXXVI	Social Network Security	5	0	4	25	75	100
24MTCS093	CC-XXXVII	VLSI Technology	5	0	4	25	75	100
24MTCS094	CC-XXXVIII	Internet of Things	5	0	4	25	75	100
24MTCS095	CC-XXXIX	AGILE Technologies	4	0	5	25	75	100
24MTCS096	CC-XL	Research Study ***	3	0	2	40	60	100
24MTCS097P	CC-XLI	Lab-XI Advanced Data Structure and Algorithms	0	3	2	40	60	100
24VAC04	VAC-IV	DevOps	0	0	0	25	75	100
		Total	27	3	25	700		
Semester X								
24MTCS101	CC-XLII	Parallel Distributed Systems	4	0	4	25	75	100
24MTCS102	CC-XLIII	Big Data Analytics	5	0	4	25	75	100
24MTCS103	CC-XLIV	Digital Forensics & Cyber Security	5	0	4	25	75	100
24MTCS104	CC-XLV	Machine Learning Techniques	5	0	3	25	75	100
24MTCS105	EC-VIII	Elective-VIII (S)	5	0	4	25	75	100
24MTCS106P	CC-XLVI	Lab-XII Big Data Analytics	0	3	2	40	60	100
24MTCS107P	CC-XLVII	Lab-XIII Machine Learning	0	3	2	40	60	100
		Total	24	6	23	700		

Course Number	Course Code	Course Name	L	P	C	Int.	Ext.	Total
Semester XI								
24MTCS111	CC-XLVIII	Cloud Computing	5	0	4	25	75	100
24MTCS112	CC-XLIX	System Modeling and Simulation	5	0	4	25	75	100
24MTCS113	CC-L	Block Chain Technology	5	0	3	25	75	100
24MTCS114	EC-IX	Elective-IX (S)	5	0	4	25	75	100
24MTCS115	EC–X	Elective-X (S)	5	0	4	25	75	100
24MTCS116	CC-LI	Project Phase –I	0	5	3	40	60	100
24VAC05	VAC-V	Full Stack Development	0	0	0	25	75	100
		Total	25	5	22	600		
Semester XII								
24MTCS121	CC-LII	Project Phase –II	10	20	12	40	60	100
		Total	10	20	12	100		
Grand Total (IX to XII semester)			**82**					

Credits from 1st sem to 8th sem: 51+133=184

Credits from 9th sem to 12th sem =82

Total Credits: 184+82=266

Credit Summary

Semester	Credit Secured
I to II Semester	**51**
III to VIII Semester	**133**
IX to XII Semester	**82**
Total	**266**

Soft Skill: EEC (Employability Enhancement Course)

** This course is offered with 2 credits an hour/week basis. This course has demonstrations/ GD and other communication skills. However the evaluation pattern for this course will be based on oral examination. Maximum marks will be 100 (external only).

Research Study:

*** This course is offered with 3 credits an hour/week basis. This course has written assignmenton specific topic selected from a journal under the guidance of a supervisor.

40 marks - Internal evaluation 60

marks - External evaluation.

List of Elective Courses:

Elective General(G)

Elective (**General-G**)
1. Network Management and Protocols
2. Business Analytics
3. Design Thinking
4. Virtualization
5. Software testing and Automation
6. Real Time Operating System
7. Principles of Programming Languages
8. Information Storage and Management
9. Advance Database Management Systems
10. Data Mining for Business Intelligence
11. Web Application Security
12. Digital Signal Processing
13. Multimedia Technology
14. Organizational Behavior

List of Elective Courses:

Elective Specialization(S)

Elective(Specialization-S)
Intelligent Systems
1. Knowledge Engineering
2. Neural Networks and Deep Learning
3. Computer Vision
4. Natural Language Processing
5. Bio Informatics
6. Human Computer Interaction
7. Robotic Process Automation
8. High Performance Computing
9.Text and Speech Analysis

List of Value Added Courses

S.No	Course Number	Course Code	Course Name
1	24VAC01	VAC-I	Hardware and Network Essential
2	24VAC02	VAC-II	Augmented Reality and Virtual Reality
3	24VAC03	VAC-III	Ethical Hacking
4	24VAC04	VAC-IV	DevOps
5	24VAC05	VAC-V	Full Stack Development

Credit Distributions

Course Nature	Total Credits
Core – Theory	**135**
Core – Practical	**26**
Project	**21**
Elective	**33**
Employability Enhancement Course (EEC)	**2**
Total	**217**

III SEMESTER

Course Code: 24MTCS031 **CC-I**

Credits: 4 **L-P-C: 5-0-4**

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

OBJECTIVES:

- Formulate simple definitions, examples and proofs in discrete mathematics
- Understand the concepts of formal languages, automata and grammars, and the relation between them Describe concrete examples of computationally or inherently infeasible problems from different fields
- Describe precisely what it means for a problem to be in the classes P,NP, and PSPACE, and what it means to be complete for a class
- Explain the theoretical limits on computational solutions and inherently complex problems
- Understand the syntax and semantics of propositional logic

UNIT I – LOGIC

Statements – Connectives – Truth tables – Normal forms – Predicate calculus – Inference Theory for Statement calculus and predicate calculus.

UNIT II - ELEMENTARY COMBINATORICS

Mathematical Induction – Pigeonhole principle – Principle of inclusion and exclusion.

UNIT III – RECURSIVE FUNCTIONS

Recurrence relation- Solution of recurrence relation using characteristic polynomial and using generating function – Recursive functions – Primitive recursive functions, Computable and non computable functions.

UNIT IV – ALGEBRAIC STRUCTURES

Groups – Definition and examples only – Cyclic groups – Permutation group (Sn and Dn) – Subgroups – Homomorphism and Isomorphism – Cosets – Lagrange's Theorem – Normal subgroups – Cayley's representation theorem.

UNIT V – LATTICES

Partial order relations, poset – Lattices, Hasse diagram – Boolean algebra

Primary Books:

1. Tremblay J. P. and Manohar R., "Discrete Mathematical Structures with applications to Computer Science", McGraw Hill International Edition, 1987.(reprint 2005)
2. Kenneth H. Rosen, Discrete Mathematics and its Applications, 4th Edition, Tata McGraw Hill, 2002. (Unit II – Chapter 3: Sections 3.1, 3.2, Chapter 4: Section 4.2).

3. Venkataraman M.K. etal., “Discrete Mathematics”, National Publishing Co., 2000, (Unit III Ch. 5.1 – 5.7)
4. Prof. V. Sundaresan, K.S. Ganapathy Subramanian and K. Ganesan, “Discrete Mathematics”, New Revised Edition, 2001. (Unit IV – Chapter 4: Section 4.3)
5. Alan Doerr and Kenneth Levasseur, “Applied Discrete Structures for Computer Science”, Galgotia publications (P) Ltd., 1992. (Unit – V Chapter:13.1, 13.2,13.3)

Reference books:

1. C. L. Liu, Elements of Discrete Mathematics, 2nd Edition, McGraw Hill Publications, 1985
2. Gersting. J. L. Mathematical Structures for Computer Science, 3rd Edition, W. H. Freeman and Co., 1993.
3. Lidl and Pitz, Applied abstract Algebra, Springer – Verlag, New York, 1984.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define logic statements and truth tables	K1, K2
CO2	Explain combinatorics principles and induction	K3, K4
CO3	Apply recurrence relations and recursive functions	K5
CO4	Analyze algebraic structures and group theory	K3, K4
CO5	Evaluate lattices, posets, and Boolean algebra	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS032 **CC-II**

Credits: 4 **L-P-C: 5-0-4**

DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION

OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I COMBINATIONAL LOGIC

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards. 67

UNIT V MEMORY AND I/O

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary Book:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

Reference books:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

2. William Stallings, "Computer Organization and Architecture – Designing for Performance", Tenth Edition, Pearson Education, 2016.

3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define combinational logic and design procedures	K1, K2
CO2	Explain synchronous sequential logic and flip-flops	K3, K4
CO3	Apply computer fundamentals and instruction sets	K5
CO4	Analyze processor design and pipelining	K3, K4
CO5	Evaluate memory concepts and I/O interfaces	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS033 **CC-III**

Credits: 4 **L-P-C: 5-0-4**

DATA STRUCTURES

OBJECTIVES:

- Understand the concept of data storage and its representation.
- Introduce various techniques for representing of the data in the real world.
- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Discuss the hash function and concepts of collision and its resolution methods
- Develop knowledge of data structures for storage and retrieval of ordered or unordered data.
- Develop the ability to implement algorithms for the creation, insertion, deletion, searching and sorting of each data structure.

UNIT I BASIC OPERATIONS

Introduction to Data Structures - Arithmetic operations and Expressions-Strings and string operations-Relations and relational operators-Logical operations and Expressions-Information and its storage representation-Primitive data structures

UNIT II VARIOUS STORAGE REPRESENTATION

Linear data structures and their sequential storage representation-storage structures for arrays-stacks-applications of stacks-polish expressions and their compilation-queues-linear data structures and their linked storage representation-linked linear lists-applications of lined linear lists.

UNIT III TREES AND GRAPHS

Nonlinear data structures-trees-storage representation and manipulation of binary trees- conversion of general trees to binary trees-applications of trees-multilinked structures-graphs and their representations-spanning trees-applications of graphs-dynamic storage management.

UNIT IV SORTING METHODS

Sorting and searching: Sorting-selection sort-bubble sort-merge sort-tree sorts-partition- exchange sort-radix sort-address-calculation sort-searching-binary searching-search trees-hash table methods.

UNIT V FILE STRUCTURE

File structures-sequential files-external sorting-indexed sequential files-class record retrieval system-direct files-external searching-other methods of file organization-multiple-key access.

UNIT V

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

Primary Books:

An introduction to Data structures with Applications, Jean-Paul Tremblay & Paul G. Sorenson 2nd Edition 2006.

Reference books:

1. Seymour Lipschitz, " Data Structures", Tata McGraw Hill Publications.
2. Ellis Horowitz and S. Sahni, " Fundamentals of Data Structures", Galgotia Pub.
3. "Introduction to Algorithms, fourth edition", by Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein
4. "Algorithms Illuminated part (1-4) ", by Tim Rough garden
5. "Data Structures and Algorithm Analysis in C" by Mark Allen Weiss

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define basic operations and data structures	K1, K2
CO2	Explain storage representation and linked lists	K3, K4
CO3	Apply tree and graph structures	K5
CO4	Analyze sorting and searching methods	K3, K4
CO5	Evaluate file structures and organization	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS034 **CC-IV**

Credits: 4 **L-P-C: 5-0-4**

JAVA PROGRAMMING

OBJECTIVES:

- Acquire knowledge of object-oriented paradigm in the Java programming language
- Design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and iterative structures, and functions.
- Describe and use the mechanics of parameter passing.
- Learns to design, implement, test, debug, and document in object-oriented programming language.
- Discuss and use primitive data types and built-in data structures.

UNIT I - OBJECT ORIENTED CONCEPTS

Java Basics History of Java, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and costing, simple java program, classes and objects - concepts of classes, objects, constructors, and methods.

UNIT II - INHERITENCE AND POLYMORPISM

Access control, this keyword, garbage collection, overloading methods and constructors, parameter passing, recursion, string handling. Inheritance –Inheritance basics, using super, creating a multilevel hierarchy, dynamic method dispatch, using final with inheritance, Polymorphism- method overriding, abstract classes.

UNIT III - PACKAGES AND INTERFACES

Defining, Creating and Accessing a Package, Understanding CLASSPATH, Access protection, importing packages. Interface – difference between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

UNIT IV - EXCEPTION HANDLING AND MULTI-THREADING

Concepts of exception handling, Exception types, uncaught exceptions, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes. Multithreading – Java thread model, thread priorities, synchronization, creating threads, creating multiple threads, inter-thread communication.

UNIT V- EVENT HANDLING

Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes, inner classes. Applets - Concepts of Applets, Applet architecture, Applet skeleton, Applet initialization and termination, simple applet display methods, simple banner applet, creating applets, passing parameters to applets.

Primary books:

1. "Java; The complete reference", Herbert Schildt, 7th Editon, TMH, 2007.

Reference books:

1. "The Java Programming Language", Ken Arnold, James Gosling and David Holmes, Pearson Education, Seventh Indian Reprint, 2005

2. "Programming with JAVA", C. Muthu, Thomson, 2004

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define Java basics and object concepts	K1, K2
CO2	Explain inheritance and polymorphism	K3, K4
CO3	Apply packages and interfaces	K5
CO4	Analyze exception handling and multithreading	K3, K4
CO5	Evaluate event handling and applets	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS035 **CC-V**

Credits: 4 **L-P-C: 4-0-4**

COMPUTER NETWORKS

OBJECTIVES:

- To appreciate the top-down and bottom-up view of computer network architecture,
- To know the functionality of each layer in computer networks,
- To get introduced to various protocols at every layer,
- To learn concepts related to network addressing and
- To learn the use of hardware in data communication.

UNIT-I:

Introduction: Data Communication – Networks – Network Types - Internet History – Standards and Administration – Network Models : Protocol Layering - TCP/IP Protocol Suite – The OSI Model

UNIT-II:

Bandwidth Utilization: Multiplexing and Spectrum Spreading : Multiplexing - Spread Spectrum - Transmission Media: Guided Media - Unguided Media: Wireless – Switching : Introduction - Circuit-Switched Networks - Packet Switching

UNIT-III:

Error Detection And Correction : Introduction - Block Coding - Cyclic Codes - Data Link Control (DLC) : DLC Services - Data-Link Layer Protocols – HDLC - Point-To-Point Protocol (PPP)

UNIT-IV:

Introduction to Network Layer: Network-Layer Services - Network-Layer Performance – IPV4 Addresses - Network-Layer Protocols: Internet Protocol (IP) - Mobile IP - Unicast Routing: Introduction - Routing Algorithms - Unicast Routing Protocols - Multicast Routing: Introduction - Multicasting Basics - Next Generation IP - IPV6 Addressing

UNIT-V:

Introduction to Transport Layer: Introduction - Transport-Layer Protocols - Introduction To Application Layer: Introduction - Standard Client-Server Protocols: World Wide Web And Http – FTP – Electronic Mail – Telnet – Secure Shell (SSH) – Domain Name System (DNS).

UNIT VI:

CurrentContours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned

Primary Book :

1. Behrouz A. Forouzan, "Data Communications and Networking", McGraw-Hill Publication, New York, 5th Edition, 2017.

Reference Books:

1. Andrew S Tanenbaum, "Computer Networks", Prentice Hall of India, New Delhi, 6th Edition,2021
2. William Stallings "Data and computer communications", Prentice Hall of India, 7th Edition,2003
3. "Computer Networks: A Systems Approach", Larry Peterson and Bruce Davie, 3rd Edition
4. "DATA AND COMPUTER COMMUNICATIONS ", William Stallings, 8th Edition , 2007
5. Computer Networking: A Top-Down Approach" (8th Edition) by James Kurose and Keith Ross

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define data communication and network models	K1, K2
CO2	Explain bandwidth utilization and switching	K3, K4
CO3	Apply error detection and data link control	K5
CO4	Analyze network-layer protocols and routing	K3, K4
CO5	Evaluate transport layer and application protocols	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS036P **CC-VI**

Credits: 2 **L-P-C: 0-3-2**

LAB I - DATA STRUCTURES

OBJECTIVES:

- Understand the concept of data storage and its representation.
- Introduce various techniques for representing of the data in the real world.
- Understand basic data structures such as arrays, linked lists, stacks and queues.
- Discuss the hash function and concepts of collision and its resolution methods
- Develop knowledge of data structures for storage and retrieval of ordered or unordered data.
- Develop the ability to implement algorithms for the creation, insertion, deletion, searching and sorting of each data structure.

LIST OF PROGRAMS:

1. Implementation of Singly, Doubly and Circular linked list .
2. Implementation of Multi stack in a Single Array.
3. Implementation of Circular Queue.
4. Implementation of Binary Search Trees.
5. Implementation of Hash table.
6. Implementation of Heaps.
7. Implementation of AVL Rotations.
8. Implementation of Breadth First Search Techniques.
9. Implementation of Depth First Search Techniques
10. Implementation of Prim’s Algorithm.
11. Implementation of Dijkstra’s Algorithm.
12. Implementation of Kruskal’s Algorithm
13. Implementation of Searching Techniques
14. Implementation of Sorting Techniques

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	1. Implement linked lists: singly, doubly, circular	K1, K2
CO2	2. Apply multi stack in a single array	K3, K4
CO3	3. Design binary search trees and hash tables	K4, K5
CO4	4. Analyze heap, AVL, and search techniques	K3, K4
CO5	5. Execute Prim's, Dijkstra's, Kruskal's algorithms	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS037P **CC-VII**

Credits: 2 **L-P-C: 0-3-2**

LAB II - JAVA PROGRAMMING

OBJECTIVES:

The course aims to,

- Demonstrate the fundamental programming constructs and concepts.
- Explaining the process of object instantiation using variables and methods.
- Discuss about the Boolean operations, comparison, arithmetic and object (instance of) operators in their programs.
- Distinguishing between inheritance of implementation (extends) and inheritance of design (implements).
- Explaining the properties of a variable such as its name, value, scope, persistence, and size.
- Identify and use the overloaded methods and constructors.
- Explaining the restrictions imposed when using inheritance.
- Distinguishing between Overriding and overloading parent class functions within a child class.

LIST OF PROGRAMS:

1. Implement a Java program that uses both recursive and non recursive functions to print the nth value in the Fibonacci sequence

2. a. Develop a Java program that prompts the user for an integer and then prints out all prime numbers up to that integer

b. Design a Java program to multiply two given matrices.

c. Develop a Java Program Using String Tokenizer class of java .util.

3. a. Design java program to apply the concept of inheritance

b. Implement a Java program to use all the methods in String class and String Buffer class

4. Develop Java program using Vector class and Stack class

5. a. Develop an Applet program to display simple message

b. Use text field and label to develop an Applet program

6. Develop program using all the types of Exception

7. a. Implement the concept of Muti threading and b. Inter-thread communication using a Java program

8. Develop a program to use package and interface concept.

9. Develop a Java program to incorporate the abstract class.

10. Design a Java program that implements a simple client/server application.

11. Develop a java program to read and write the file.

12. Design a java program that allows the user to draw lines, rectangles and ovals.

OUTCOMES:

The students will be able to,

- Use and create packages and interfaces in a Java program
- Create Applets, Implement exception handling in Java
- Implement Multithreading, Input/Output Streams
- Using appropriate data types for programming assignments.
- Distinguishing between expressions and statements.
- Parsing a string and using other string manipulation techniques using arrays.
- Developing a recursive algorithm for solving a problem.
- Creating programs using inner classes and describing their effects on generated class files
- Explaining the benefits of inheritance.
- Creating a class which extends a parent class and a class which implements an interface.
- Creating a class which extends an abstract class Using visibility modifiers (public, private, protected) to implement appropriate abstraction and encapsulation.

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M

On the completion of the course the student will be able to

CO6	Course Outcome	Knowledge Level
CO1	1. Implement Fibonacci sequence (recursive and non-recursive)	K1, K2
CO2	2. Develop programs for prime numbers and matrix multiplication	K3, K4
CO3	3. Apply inheritance and string handling in Java	K3, K4
CO4	4. Implement Java programs using Vector and Stack classes	K5
CO5	5. Create Java applets for simple messages and text fields	K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24VAC01 **VAC-I**

HARDWARE AND NETWORK ESSENTIAL

Objectives:

- To introduce the importance of computer Hardware and its need.To create awareness on Hardware and Network devices.
- Networking is used to develop the future Business and Industry.
- To know about Communication Networks and their Applications.
- To know about Operating System and Storage devices

UNIT I Introduction to Computer hardware

Definition of a Computer-History and Generations of Computers-Functions and Characteristics of a Computer-Operating a Computer.-Parts of a Computer - Different parts of a Computer and their Functions-Peripheral devices-Definition of Hardware- Input/output devices -Central Processing Unit (CPU)-Memory and Storage - Types of Memory: Internal and External, Storage Devices, Portable Storage, Hard Disk.

UNIT II Computer Memory

Memory and Storage Devices - Primary (Cache, RAM and ROM) and Secondary memory, Storage Devices- Portable Storage- Hard Disk-Memory Units- bit-byte,-MB, GB, TB, and PB.

UNIT III

Operating Systems

Introduction to Operating Systems -Different types of OS-Need and Function of OS- Commonly used OS-Mobile OS-User Interface- Basics Computer Operations-Language Processors: Assemblers, Interpreters, and Compilers.

Computer Software

Introduction to Computer Software - Definition of Software, Types of Software: System and Application Software, Utility Software, Graphics- System Software.

UNIT IV Introduction to Network

Types of networks-LAN-WAN-MAN- Network Topologies: bus topology-ring topology-star topology-tree topology-mesh topology and hybrid topology.-Network Models: Peer-to-Peer-protocol-client / server network and hybrid network. Servers: Different types of servers-Types of Network protocols.

UNIT V Introduction to network standards

OSI reference model, TCP/IP Model- Difference between OSI reference model & TCP/IPmodel-Transmission Media: Types-Guided Media: twisted pair cable-coaxial cable-fibre optics- Unguided Media: radio wave-microwave-light wave- infrared and satellite.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

Reference books:

1. V. Rajaraman, Fundamentals of Computers, PHI Publication.
2. Dr. Ajit Mittal, Dr. Ajay Rana, Mastering PC Hardware & Network.
3. Tannenbaum, A.S.: Computer Networks, Prentice Hall.
4. Networking: The Complete Reference, Mcgraw Hill Education.

E-Resources:

1. https://www.tutorialspoint.com/computer_fundamentals/computer_hardware.htm
2. https://www.geeksforgeeks.org/computer-network-tutorials/

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Describe computer hardware components and functions	K1, K2
CO2	Differentiate between primary and secondary memory	K3, K4
CO3	Explain operating systems and software types	K1, K2
CO4	Analyze network types, topologies, and protocols	K3, K4
CO5	Compare OSI and TCP/IP models	K4, K5
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M

CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

IV SEMESTER

Course Code: 24MTCS041 **CC-VIII**

Credits: 3 **L-P-C: 4-0-3**

PROBABILITY AND STATISTICS

OBJECTIVES:

- Identify Objectives of Statistical Analysis.
- Apply Methods of Data collection & Analysis.

Unit I – Introduction to Statistical Methods

Statistics & managerial decisions - statistical data - operation research technique.

Unit II - Data Collection and Analysis

Collection and presentation of data in terms of tables- graphs- raw data-frequency distributions-histogram-Cumulative frequency curve-Measures of central tendency and location-Partition value-Comparison of various measures of central tendencies - Measures of dispersion- skewness &Kurtosis - comparison of various measures of dispersion-Moments as measures of Statistical propertie-measures of skewness & kurtosis based on moments.

Unit III - Probability Distribution & Statistics

Introduction of Probability- sample, space & events- Basic rules of probability - permutation & combinations- conditional probability- Baye's theorem, - distributions: Binomial, Poisson, Exponential and Normal distribution with their properties and application- Random variables - discrete and continuous probability distribution functions- probability density functions- mean medium, moment and moment generating functions of Binomial- Poisson- geometric & hyper geometric- Concept of joint probability distribution.

Unit – IV Correlation and Regression Analysis

Curve fitting - correlation and regression analysis- Autocorrelation- Multiple regression- statistical Inference & estimation applied to Industrial problems.

Unit – V Statistical Tests and Testing of Hypothesis

Elementary theory and practice of sampling - standard error or means and variance - tests of significance - T test - F test - Z test and chi-square test along with their applications - Goodness of fit - testing of hypotheses and decision making, analysis of variance (ANOVA).

Primary Books:

1. Quantitative Techniques for Managerial Decision by Srivastava, New Age
2. Statistics for Management by Lewis, Pearson
3. Quantitative Techniques in Management by Vohra, TMH
4. Applied Statistics & Probability for Engineers by Sharma, Willey
5. Introduction to Probability & Statistical Application by P.A. Meyer

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Implement Fibonacci sequence (recursive and non-recursive)	K1, K2
CO2	Develop programs for prime numbers and matrix multiplication	K3, K4
CO3	Apply inheritance and string handling in Java	K3, K4
CO4	Implement Java programs using Vector and Stack classes	K5
CO5	Create Java applets for simple messages and text fields	K6

K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS042 **CC-IX**

Credits: 4 **L-P-C: 5-0-4**

DESIGN AND ANALYSIS OF ALGORITHMS

OBJECTIVES:

- Learn good principles of algorithm design
- Describe the methodologies of how to analyze an algorithm
- Explain the space and time complexity of problems
- Learn how to analyze algorithms and estimate their worst-case and average-case behavior
- Discuss various algorithm design techniques for developing algorithms.

UNIT I: BASIC CONCEPTS OF ALGORITHMS

Introduction - Notion of Algorithm - Fundamentals of Algorithmic Solving - Important Problem types - Fundamentals of the Analysis Framework - Asymptotic Notations and Basic Efficiency Classes.

UNIT II: MATHEMATICAL ASPECTS & ANALYSIS OF ALGORITHMS

Mathematical Analysis of Non-recursive Algorithm - Mathematical Analysis of Recursive Algorithm - Example: Fibonacci Numbers - Empirical Analysis of Algorithms - Algorithm Visualization.

UNIT III: ANALYSIS OF SORTING & SEARCHING ALGORITHMS

Brute Force - Selection Sort and Bubble Sort - Sequential Search and Brute - force string matching - Divide and conquer - Merge sort - Quick Sort - Decrease and Conquer - Insertion Sort - Depth first Search and Breadth First Search.

UNIT IV: ALGORITHMIC TECHNIQUES

Dynamic Programming - Warshall's and Floyd's Algorithm - Optimal Binary Search trees - Greedy Techniques - Prim's Algorithm - Kruskal's Algorithm - Dijkstra's Algorithm - Huffman trees.

UNIT V: ALGORITHM DESIGN METHODS

Backtracking - n-Queen's Problem - Hamiltonian Circuit problem - Subset-Sum problem - Branch and bound - Assignment problem - Knapsack problem - Traveling salesman problem.

Primary books:

1. "Introduction to the Design and Analysis of Algorithm", Anany Levitin, Pearson Education Asia, Third Edition

Reference Books :

1. "Introduction to Algorithms", T.H. Cormen, C.E. Leiserson, R.L. Rivest and C. Stein, PHI Pvt. Ltd., 2001

2. "Computer Algorithms: Introduction to Design and Analysis", Sara Baase and Allen Van Gelder, Pearson Education Asia, 2003.

3. "The Design and Analysis of Computer Algorithms", A.V.Aho, J.E. Hopcroft and J.D.Ullman, Pearson Education Asia, 2003.

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Understand fundamental algorithm concepts and problem-solving	K1, K2
CO2	Perform mathematical analysis of algorithms (recursive/non-recursive)	K3, K4
CO3	Analyze sorting and searching algorithms (brute force, divide/conquer)	K3, K4
CO4	Apply dynamic programming and greedy algorithms	K5
CO5	Evaluate backtracking and branch-bound techniques for optimization	K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes

COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS043 **CC-X**

Credits: 3 **L-P-C: 5-0-3**

PYTHON PROGRAMMING

Objectives:

- To acquire programming skills in core Python.
- To study data structures in Python.
- To get familiar in modules and packages.
- To develop the skill of designing web applications in Python.
- To develop the ability to write database applications in Python.

UNIT I:

Introduction To Python Programming: Python interpreter and interactive mode; values and types variables, expressions, statements, Order of operations, comments, debugging; modules and functions: function Calls, adding new functions, Definitions and Uses, flow of execution, parameters and arguments, Fruitful functions. Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, range, break, continue, pass; recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as

arrays.

UNIT II:

Lists, Tuples, Dictionaries: Lists: Traversing a List, list operations, list slices, list methods, Map, Filter and Reduce, list loop, mutability, aliasing, cloning lists, list parameters; Dictionaries: operations and methods; advanced list processing - list comprehension; Tuples: tuple assignment, tuple as return value

UNIT III:

Files, Modules, Packages: Files and Input/output; text files, reading and writing files, format operator; command line arguments, Errors and Exception; detecting and handling exception, raising exception and Assertions, Modules; importing modules, Features, Packages: PANDAS and NUMPY

UNIT IV

Network And Web Programming: Network programming; Socket communication, socket server module, Internet client programming, Transferring files, Electronic mail and related modules, Web Programming: Creating simple web client, Process client data and building CGI applications

UNIT V:

Database And Gui Programming : Introduction to tkinter, Top Level Windows, Dialogs, Message and Entry, Event Handling, Menus, List boxes and Scrollbars, Text, SQL Database interfaces with sqlite: Basic operations and table load scripts

Text Books:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‖, 2nd edition, Updated for Python 3, Shroff/OReilly Publishers,2016
2. WesleyJ. Chun,–CorePython Programming|2ndEdition, Pearson Education, 2007

References:

1. Guido van Rossum and Fred L. Drake Jr, ―An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd.,2011.
2. Mark Lutz ,Learning Python, O Reily, 4th Edition,2009,
3. Magnus Lie Hetland, –Beginning Python: From Novice To Professional‖, Second Edition, 2005
4. Mark Summerfield –Programmingin Python 3|, Pearson Education, 2010

E-Resources:

1. http://www.network-theory.co.uk/docs/pytut
2. http://docs.python.org/tutorial/

http://index-of.es/Python/Core.Python.Programming.2nd.Edition.Wesley.Chun.2006.pdf

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Understand Python basics, variables, and control flow	K1, K2
CO2	Apply lists, tuples, dictionaries, and list comprehension	K3, K4
CO3	Work with files, modules, and packages (Pandas, NumPy)	K5
CO4	Develop network and web programming using sockets	K6
CO5	Implement database and GUI programming (tkinter, SQLite)	K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M

CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS044 **CC-XI**
Credits: 4 **L-P-C: 4-0-4**

OPERATING SYSTEM

OBJECTIVES:

- Demonstrate the operating system design and its impact on application design
- Describe how computing resources (such as CPU and memory) are managed by the operating system, describe the basic principles used in the design of modern operating systems
- Understand the process concept and concurrency as the heart of modern operating systems.
- Describe the various CPU scheduling algorithms and remove deadlocks.
- Explain various memory management techniques and concept of thrashing
- Introduce and explain the various features of distributed operating system
- Learn how the file, mass storage, and I/O are handled in a modern computer system

UNIT I- INTRODUCTION

Main frame Systems, Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time systems – Hand held Systems, Operating Systems Structures: System Components – Operating System Services - System calls – System Programs – System Design and Implementation - CPU scheduling: Basic Concepts – Scheduling Algorithms**.**

UNIT II - PROCESS MANAGEMENT

Process Concepts - Process Scheduling - Operation on Process - Co-Operating process - Inter Process Communication - Threads: Multithreading Models – Process Synchronization: The Critical Section Problem –

Synchronization Hardware - Semaphores – classical problem of Synchronization – Monitors - Deadlock: Deadlock Characterization - Methods for handling Deadlocks - Deadlock Prevention – Deadlock Avoidance - Deadlock Detection – Recovery from Deadlock.

UNIT III - MEMORY MANAGEMENT

Background – Swapping - Contiguous Memory Allocation - Paging - Segmentation – Segmentation with paging - Virtual Memory: Demand paging - Page Replacement - Thrashing.

UNIT IV - FILE SYSTEMS

File Concepts - Access methods - Directory Structure - File Protection - File System Implementation: File System Structure and Implementation – Directory Implementation – Allocation methods Free Space Management – Recovery - Disk Structure – Disk Scheduling.

UNIT V - DISTRIBUTED OPERATING SYSTEM

Design issues in distributed operating system-Distributed file systems - Naming and Transparency-Remote File Access- Stateful versus Stateless service – Distributed Coordination- Event Ordering-Mutual Exclusion-Atomicity- Concurrency Control- Deadlock Handling-Election Algorithms-Case Study-Linux**.**

Primary books:

1. "Operating System Concepts", Silberschatz, Galvin, Gagne , Ninth Edition , 2012.

Reference Books :

1. Andrew S. Tanenbaum , "Modern Operating Systems", PHI , 2nd Edition 2001

2. Achut S. Godbole and Kahate Atul , "Operating Systems & Systems Programming ", Tata Mcgraw Hill, 2003.

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Understand OS structures, system services, and CPU scheduling	K1, K2
CO2	Explain process management, synchronization, and deadlock handling	K3, K4
CO3	Analyze memory management techniques like paging and segmentation	K5
CO4	Discuss file systems, directory structures, and disk scheduling	K6
CO5	Explore distributed OS design, coordination, and case study of Linux	K7
K1 – Knowledge; K2 – Understanding; K3 – Practice; K4 – Analysis; K5 – Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS045 **CC-XII**

Credits: 3 **L-P-C: 4-0-3**

DATABASE MANAGEMENT SYSTEMS

OBJECTIVES:

- To expose the students to the fundamentals of Database Management System.
- To make the students understand the rational model.
- To make the students to understand the storages structures.

UNIT I – RELATIONAL DATABASES:

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II – DATABASE DESIGN:

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III – TRANSACTIONS:

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion –Validation and Snapshot

isolation–Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm

UNIT IV – IMPLEMENTATION TECHNIQUES:

RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics – Cost Estimation.

UNIT V – ADVANCED TOPICS:

Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges **TEXT BOOKS:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", SeventhEdition, McGraw Hill, 2020.

2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2017

REFERENCES:

C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006

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Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Explain relational databases and SQL features	K1, K2
CO2	Analyze ER models and normalization techniques	K3, K4
CO3	Apply transaction concepts and concurrency control	K5
CO4	Implement indexing, hashing, and query optimization	K6
CO5	Explore distributed databases, NoSQL, and security	K7
K1 – Knowledge; K2 – Understanding; K3 – Practice; K4 – Analysis; K5 – Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes

COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS046 **EEC**

Credits: 2 **L-P-C: 2-0-2**

SOFT SKILLS

OBJECTIVES

- The conformity of the Institute' purpose and educational goal with academic professional development programs.
- The purpose and goal of the Institute is set in accordance with the "The Institute Educational Program of National Defense Medical College".
- As a military college shouldering the duty of military education, the purpose of the Institute is set as ""To cultivate outstanding talents of biomedical research" and "To upgrade academic standards and the quality of medical care", whereas the educational objective is: "To foster outstanding research talents and reserve professional teachers in the fields of Microbiology and Immunology."

UNIT1:

Behavioral Skills

UNIT2:
Business Communication

UNIT3:
Spoken English

UNIT4:
Text Writing

UNIT5:
Group Dynamics

TextBook:

1. G. Ravindran, S.P. Benjamin Elango and L. Arockiam, " Success Through Soft Skills", ICT, 2007.

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Explain the importance of behavioral skills	K1, K2
CO2	Apply business communication techniques effectively	K3
CO3	Improve spoken English proficiency	K4
CO4	Develop skills in writing formal texts K5	K5
CO5	Analyze the principles of group dynamics K6	K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS047P **CC-XIII**

Credits: 2 **L-P-C: 0-3-2**

PYTHON PROGRAMMING LAB

Objectives:

- To acquire programming skills in core Python.
- To understand the data structures in Python.
- To develop the skill on files and modules.
- To develop the skill of designing Graphical user Interfaces in Python.
- To develop the ability to write database applications in Python.

List of Exercises

1. Exercise programs on basic control structures &loops.
2. Exercise programs on Python Script.
3. Exercise programs on Lists.
4. Exercise programs on Strings.
5. Exercise programs on functions.
6. Exercise programs on recursion & parameter passing techniques.
7. Exercise programs on searching & sorting Techniques.
8. Exercise programs on Files

9. Exercise Program on Modules
10. Exercise Program on Exception handling
11. Exercise programs on Networking
12. Exercise programs on GUI, Graphics
13. Exercise Programs on Data base Connection

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Implement basic control structures & loops	K3
CO2	Develop Python scripts for various tasks	K4
CO3	Manipulate lists with Python functions	K3
CO4	Perform string operations in Python	K4
CO5	Apply recursion & parameter passing techniques	K5
K1 – Knowledge; K2 – Understanding; K3 – Practice; K4 – Analysis; K5 – Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes		
COS	Programme Outcomes	Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS048P **CC-XIV**

Credits: 2 **L-P-C: 0-3-2**

DATABASE MANAGEMENT SYSTEM LAB

OBJECTIVES:

- To learn and implement important commands in SQL.
- To learn the usage of nested and joint queries.
- To understand functions, procedures and procedural extensions of databases.
- To understand design and implementation of typical database applications.
- To be familiar with the use of a front end tool for GUI based application development.

LIST OF EXPERIMENTS:

1.Create a database table, add constraints (primary key, unique, check, Not null), insert rows, update and delete rows using SQL DDL and DML commands.
2. Create a set of tables, add foreign key constraints and incorporate referential integrity.
3. Query the database tables using different ‘where’ clause conditions and also implement aggregate functions.
4. Query the database tables and explore sub queries and simple join operations.

5. Query the database tables and explore natural, equi and outer joins.
6. Write user defined functions and stored procedures in SQL.
7. Execute complex transactions and realize DCL and TCL commands.
8. Write SQL Triggers for insert, delete, and update operations in a database table.
9. Create View and index for database tables with a large number of records.
10. Create an XML database and validate it using XML schema.
11. Create Document, column and graph based data using NOSQL database tools.
12. Develop a simple GUI based database application and incorporate all the abovementioned features
13. Case Study using any of the real life database applications from the following list
a) Inventory Management for a EMart Grocery Shop
b) Society Financial Management
c) Cop Friendly App – Eseva
d) Property Management – eMall
e) Star Small and Medium Banking and Finance

- Build Entity Model diagram. The diagram should align with the business and functional goals stated in the application.
- Apply Normalization rules in designing the tables in scope.
- Prepared applicable views, triggers (for auditing purposes), functions for enabling enterprise grade features.
- Build PL SQL / Stored Procedures for Complex Functionalities, ex EOD Batch Processing for calculating the EMI for Gold Loan for each eligible Customer.
- Ability to showcase ACID Properties with sample queries with appropriate settings

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Create and manage database tables with constraints (primary key, unique, check, not null)	K3
CO2	Incorporate foreign keys and ensure referential integrity in tables	K4
CO3	Perform SQL queries with where clauses and aggregate functions	K3
CO4	Explore subqueries and simple join operations in SQL	K4
CO5	Implement views, triggers, and stored procedures in a database	K5
K1 – Knowledge; K2 – Understanding; K3 – Practice; K4 – Analysis; K5 – Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

V SEMESTER

CourseCode:24MTCS051 **CC-XV**

Credits:4 **L-P-C:4-0-4**

OPERATION RESEARCH

OBJECTIVES:

- Toprovideknowledgeandtraininginusingoptimizationtechniquesunderlimitedresourcesforthee ngineeringandbusiness problems.
- Solvelinearprogrammingproblemsusingappropriatetechniquesandoptimizationsolvers, interpret the results obtained.
- Optimize the allocation of resources to Demand points in the best possible way using various techniques and minimize the cost or time of completion of number of jobs by number of persons.

- Model competitive real-world phenomena using concepts from game theory. Analyse pure and mixed strategy games
- Formulate Network models for service and manufacturing systems, and apply operations research techniques and algorithms to solve these Network problems

UNITI – FUNDAMENTAL OF OPERATIONAL RESEARCH

Definition of OR- Types of OR Models - Applications of OR – Linear Programming Problem: Mathematical Formulation - Graphical Solution of LP Models - Simplex Method – Artificial Variable Techniques -Dual Simplex Method- Special cases in Simplex Method- Duality Principle-Economic Interpretation of the Dual Problem

UNITII – TRANSPORTATION MODEL

Definition and Applications of the Transportation Model: Mathematical Formulation- Solution of the Transportation Problem: North - West Corner Rule Vogel's Approximation Method - LeastCostMethod-DeterminationofOptimalSolution-DegeneracyinTP-Unbalanced TPAssignment Problem: Mathematical Formulation-Assignment Method-Unbalanced Assignment Problem -The Traveling Salesman Problem

UNITIII – NETWORK SCHEDULING

Network Scheduling by PERT/CPM: Basic components- Rules of Network Construction-Critical Path Calculation-Determination of Floats–Probability Considerations in Project Scheduling-Cost Considerations in Project Scheduling

UNITIV - GAME THEORY

Two-Person Zero-Sum Games: Maximin-Minimax Principle – Dominance Property – Graphic Solution of 2 X n and m X 2 games. Decision Analysis: Basic definitions - Decision Making under Uncertainty - Decision Making under Risk Decision Tree Analysis. Markov Analysis –Simulation

UNITV - QUEUING THEORY

Inventory Control: Costs associated with Inventories - EOQ Models – ABC Analysis. Queuing Theory: Queuing System - Classification of Queuing Models Transient and Steady States-M/M/1&M/M/N Models

UNITVI

Current Contours(for Continous Internal Assessment only):Contemporary Development Related to the Course during the Semester Concerned.

Primarybooks:

1. “Operations Research An Introduction”, Hamdy A Taha Macmillan Publishing Company ,April 2006, 8th Edition ISBN: 9780131889231

2. “OperationsResearch', Kanti Swarup, P.K.Gupta and ManMohan, SultanChandandSons, Ninth Edition, 2008.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define OR models and applications	K1,K2
CO2	Solve transportation problems and assignments	K3,K4
CO3	Apply PERT/CPM for network scheduling	K5,K6
CO4	Analyze game theory and decision analysis	K7
CO5	Apply queuing theory and inventory control	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

CourseCode:24MTCS052 **CC-XVI**

Credits:3 **L-P-C:4-0-3**

WEB TECHNOLOGY

OBJECTIVES:

- TobuildwebapplicationsusingASPandclientsidescripttechnologiesusewithMicrosoft'sIIS,
- To build XML applications with DTD and stylesheets that span multiple mains ranging from finance to vector graphics to genealogy for use with legacy browsers.
- To analyze web page and identify its elements and attributes.
- To create web pages using HTML and Cascading Style Sheets.
- To build dynamic web pages using Java Script(Client side programming).
- To create XML documents and Schemas.

UNITI – BASIC WEB TECHNOLOGY PROTOCOL

History of the Internet and World Wide Web – HTML 4 protocols – HTTP, SMTP, POP3,MIME, IMAP. Introduction to JAVA Scripts – Object Based Scripting for the web. Structures –Functions– Arrays – Objects.

UNITII – DYNAMIC WEB TECHNOLOGY

Introduction – Object refers, Collectors all and Children. Dynamic style, Dynamic position,frames, navigator, Event Model – On check – On load – One or – Mouse rel – Form process –Event Bubblers – Filters – Transport with the Filter – Creating Images – Adding shadows –Creating Gradients–Creating Motion with Blur–Data Binding–Simple Data Binding–Moving with a record set – Sorting table data–Binding of an Image and table.

UNITIII - SPEECH RECOGNITION

Audio and video speech synthesis and recognition - Electronic Commerce – Business Model – E-Marketing – Online Payments and Security – Web Servers – HTTP request types – System Architecture – Client Side Scripting and Server side Scripting – Accessing Web servers – IIS – Apache web server.

UNITIV - SQL ANDASP

Database, Relational Database model – Overview, SQL – ASP – Working of ASP – Objects –File System Objects – Session tracking and cookies – ADO – Access a Database from ASP – ServersideActive-XComponents–WebResources–XML–StructureinData–Namespaces – DTD–Vocabularies–DOMmethods.

UNITV - SERVLET

Introduction–ServletOverviewArchitecture–HandlingHTTPRequest–Getandpostrequest–redirectingrequest–multi-tierapplications–JSP–Overview–Objects–scripting–StandardActions– Directives.

UNITVI

Current Contours(for Continous Internal Assessment only):Contemporary Development Related to the Course during the Semester Concerned.

Primarybooks:

1. Deitel & Deitel, Goldberg, "Internet and world wide web – How to Program",Pearson Education Asia, 2001.

Referencebooks:

1. EricLadd,JimO'Donnel,"UsingHTML4,XML andJAVA",Prentice HallofIndia–QUE,1999.
2. Aferganatel,"WebProgramming:DesktopManagement",PHI,2004.
3. Rajkamal,"WebTechnology",TataMcGraw-Hill,2001.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain web technologies and protocols	K1,K2
CO2	Apply dynamic web styling and event handling	K3,K4
CO3	Implement speech recognition and e-commerce	K5,K6
CO4	Use SQL and ASP for database management	K7
CO5	Develop servlets and JSP applications	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS053 **CC-XVII**

Credits: 4 **L-P-C: 4-0-4**

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

OBJECTIVES

- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand supervised and unsupervised learning.
- To know the various applications of AI.

UNIT I:

Introduction –Foundation of Artificial Intelligence –Intelligent Agents– structure of agents – Definitions of a rational agent, reflex, model-based, goal-based, and utility-based agents, the environment in which a particular agent operates.

UNIT II:

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning – Stochastic Games

UNIT III:

Knowledge Representation: First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV:

Machine Learning: Supervised learning- learning decision trees- Linear Regression and Classification- Nonparametric Models - Unsupervised learning – Reinforcement learning- Passive Reinforcement Learning - Active Reinforcement Learning

UNIT V:

Applications of Artificial Intelligence- Deep learning for Natural Language Processing, Computer vision-classifying images, Robotics.

UNIT VI:

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. 1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach, Prentice Hall,Third Edition,2010.
2. I.Bratko,―Prolog:Programming for Artificial Intelligence‖ ,Fourth edition ,Addison-Wesley Educational Publishers Inc.,2011.

References:

1. M. Tim Jones, ―Artificial Intelligence: A Systems Approach (Computer Science),Jonesand Bartlett Publishers, Inc.; First Edition,2008
2. Nils J. Nilsson, ―The Quest for Artificial Intelligence, Cambridge University Press,2009.
3. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using theISOStandard, Fifth Edition, Springer,2003.
4. Gerhard Weiss, ―Multi Agent Systems, Second Edition, MIT Press,2013.
5. David L. Poole and Alan K. Mackworth, ―Artificial Intelligence: Foundations ofComputational Agents, Cambridge University Press,2010.

E-Resources :

1. http://nptel.ac.in/.
2. https://epgp.inflibnet.ac.in/

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define intelligent agents and their structures	K1,K2
CO2	Apply search strategies and game theory	K3,K4
CO3	Utilize knowledge representation techniques	K5,K6
CO4	Implement machine learning algorithms	K7
CO5	Explore AI applications in deep learning	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS054 **CC-XVIII**

Credits: 3 **L-P-C: 4-0-3**

CLOUD COMPUTING

Objective

- To introduce the broad perceptive of cloud architecture and model.
- To be familiar with the lead players in cloud.
- To understand the concept of Virtualization.
- To understand the CRM in cloud computing.
- To know the use of cloud computing in day-to-day life.

UNIT I: Computing Paradigms

High-performance computing, parallel computing, distributed computing, cluster computing, grid computing, cloud computing, bio-computing, mobile computing quantum computing, optical computing. Nano-computing.

UNIT II: Cloud Computing Fundamentals

Motivation for Cloud Computing, The Need for Cloud Computing, Defining Cloud Computing, Definition of Cloud computing, Cloud Computing Is a Service, Cloud Computing Is a Platform, Principles of Cloud computing, Five Essential Characteristics, Four Cloud Deployment Models.

UNIT III: Cloud Computing Architecture and Management

Cloud architecture, Layer, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Managing the Cloud Infrastructure, Managing the Cloud application, Migrating, Application to Cloud, Phases of Cloud Migration Approaches for Cloud Migration.

UNIT IV: Cloud Service Models

Infrastructure as a Service, Characteristics of IaaS, Suitability of IaaS, Pros and Cons of IaaS, Summary of IaaS Providers, Platform as a Service, Characteristics of PaaS, Suitability of PaaS, Pros and Cons of PaaS, Summary of PaaS Providers, Software as a Service, Characteristics of SaaS, Suitability of SaaS, Pros and Cons of SaaS, Summary of SaaS Providers. Other Cloud Service Models

UNIT V: Cloud Service Providers

EMC, EMC IT, Captiva Cloud Toolkit, Google Cloud Platform, Cloud Storage, Google Cloud Connect, Google Cloud Print, Google App Engine, Amazon Web Services, Amazon Elastic Compute Cloud, Amazon Simple Storage Service, Amazon Simple Queue ,Service, Microsoft Windows Azure, Microsoft Assessment and Planning Toolkit, SharePoint, IBM Cloud Models, IBM Smart Cloud, SAP Labs, SAP HANA Cloud Platform, Virtualization Services Provided by SAP, Sales force, Sales Cloud, Service Cloud: Knowledge as a Service, Rack space, VMware, Manjra soft Aneka Platform

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

Primary Book:

1. Essentials of Cloud Computing :K.Chandrasekhran , CRC press, 2014

Reference Book:

1. Cloud Computing: Principles and Paradigms by RajkumarBuyya, James Broberg andAndrzej M. Goscinski, Wiley, 2011.
2. Distributed and Cloud Computing , Kai Hwang, GeofferyC.Fox, Jack J.Dongarra, Elsevier, 2012.
3. Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance, TimMather, SubraKumaraswamy, ShahedLatif, O'Reilly, SPD, rp2011.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define computing paradigms and their types	K1,K2
CO2	Explain cloud computing fundamentals and models	K3,K4
CO3	Describe cloud architecture and management	K5,K6
CO4	Analyze cloud service models and providers	K7
CO5	Evaluate major cloud service providers	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS057P **CC- XIX**

Credits: 2 **L-P-C: 0-3-2**

LAB V - WEB TECHNOLOGY

OBJECTIVES:

- The objective of this lab is to develop an ability to design and implement static and dynamic website
- Analyze a web page and identify its elements and attributes.
- Create web pages using XHTML and Cascading Style Sheets.
- Build dynamic web pages using JavaScript (Client side programming).
- Create XML documents and Schemas. • Build interactive web applications using AJAX.

PROGRAM 1. Create a HTML table with rows & columns and split them using Rowspan and Colspan.

PROGRAM 2. Create a web page in the format of front page of a news paper using Text links. Align the text with colors.

PROGRAM 3. Write an XML document to display your bio-data. Write an XSL style sheet and attach that to the XML document. Validate the document using DTD or XSD.

PROGRAM 4. Write an ASP program to prepare Employee pay bill using Java Script.

PROGRAM 5. Write an ASP program to prepare student performance evaluation document using Java Script.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Create HTML table with rowspan and colspan	K1
CO2	Design newspaper-style webpage with text links	K2
CO3	Write and validate XML with XSL	K3
CO4	Develop employee paybill using ASP and JavaScript	K4
CO5	Create student performance evaluation document with ASP	K5
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS058P **CC- XX**

Credits: 2 **L-P-C: 0-3-2**

LAB VI - ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

OBJECTIVES:

- To introduce students to the basic concepts and techniques of Machine Learning.
- To develop skills of using recent machine learning software for solving practical problems.
- To gain experience of doing independent study and research.
- To understand students how computers to perform intellectual tasks as decision making, problem solving, perception, understanding human communication
- To apply k-Nearest Neighbour algorithm for clustering

Write java/Python programmes to implement the following:

1. Write a Program to Implement Breadth First Search using Python.
2. Write a Program to Implement Depth First Search using Python
3. Write a Program to Implement a Star Search Algorithm using Python
4. Write a Program to Implement Tic-Tac-Toe game.
5. Write a Program to Implement N-Queens Problem using Python.
6. Write a Program to Implement Support Vector Machine Algorithm
7. Write a Program to Implement K-Nearest Neighbor Algorithm
8. Write a Program to Implement Natural Language Processing Toolkit
9. Write a Program to Implement Naïve Bayesian Classifier
10. Write a Program to Implement Back propagation Algorithm

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Implement breadth-first search in Python	K1
CO2	Implement depth-first search in Python	K2
CO3	Apply A* search algorithm in Python	K3
CO4	Create Tic-Tac-Toe game in Python	K4
CO5	Solve N-Queens problem using Python	K5
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M

S-Strong; M-Medium; L-Low

VI SEMESTER

CourseCode:24MTCS061 **CC-XXI**

Credits:4 **L-P-C:4-0-4**

FOUNDATIONS OF DATA SCIENCE

OBJECTIVES:

Thestudent should bemadeto

- To understand the data science fundamentals and process.
- To learn to describe the data for the data science process.
- To learn to describe the relationship between data.

- To utilize the Python libraries for Data Wrangling.
- To present and interpret data using visualization libraries in Python

UNIT I INTRODUCTION

Data Science: Benefits and uses – facets of data - Data Science Process: Overview – Defining research goals – Retrieving data – Data preparation - Exploratory Data analysis – build the model– presenting findings and building applications - Data Mining - Data Warehousing – Basic Statistical descriptions of Data

UNIT II DESCRIBING DATA

Types of Data - Types of Variables -Describing Data with Tables and Graphs –Describing Data with Averages - Describing Variability - Normal Distributions and Standard (z) Scores

UNIT III DESCRIBING RELATIONSHIPS 9

Correlation –Scatter plots –correlation coefficient for quantitative data –computational formula for correlation coefficient – Regression –regression line –least squares regression line – Standard error of estimate – interpretation of r2 –multiple regression equations –regression towards the mean

UNIT IV PYTHON LIBRARIES FOR DATA WRANGLING 9

Basics of Numpy arrays –aggregations –computations on arrays –comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – Hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT V DATA VISUALIZATION 9

Importing Matplotlib – Line plots – Scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT VI

CurrentContours(forContinuousInternalAssessmentOnly):Contemporary DevelopmentsRelatedto theCourseduringthe Semester Concerned.

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (Unit I)

2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Units II and III)

REFERENCES:

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press,2014

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	**Describe data types and variables**	K1,K2
CO2	**Use tables and graphs for data description**	K3,K4
CO3	**Analyze variability and normal distributions**	K5,K6
CO4	**Interpret correlation and regression**	K3,K4
CO5	**Utilize Python libraries for data manipulation**	K6,K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8

CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS062 **CC-XXII**

Credits: 4 **L-P-C: 4-0-4**

COMPILER DESIGN

OBJECTIVES:

The student should be made

- To Learn the design principles of a Compiler,

- To Learn the various parsing techniques and different levels of translation and
- To learn how to optimize and effectively generate machine codes
- To understand relations between computer architecture and how it sunderstanding is useful in design of a compiler.
- To construct efficient algorithms for compilers.

UNIT I - COMPILERS: GRAMMARS & AUTOMATA

Languages – Grammars – Types of grammars – Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression of NDFA – Thompson's construction- minimization of NDFA –Derivation - parse tree – ambiguity

UNIT II- LEXICAL ANALYSIS

Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexical analyzers - implementation of lexical analyzer

UNIT III - SYNTAX ANALYSIS – PARSING

Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING- Predictive parsing - recursive descent parsing. LR parsing –LR (0) items - SLR parsing – Canonical LR - LALR parsing - generation of LALR - Ambiguous grammars - error recovery

UNIT IV - SYNTAX DIRECTED TRANSLATION

Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes –

Conversion of Assignment statements- Boolean expressions –Backpatching - Declaration - CASE statements.

UNIT V -CODE OPTIMIZATION

Local optimization- Loop Optimization techniques – DAG – Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

Primary books:

1. AlfredAho, Ravi Sethi, Jeffrey D Ullman, "Compilers Principles, Techniques and Tools", Pearson Education Asia, 2003.

Reference books:

1 .HenkAlblas and Albert Nymeyer, "Practice and Principles of Compiler Building with C", PHI, 2001.

2. Kenneth C. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

3. Alfred V Aho , Jeffery D Ullman , Ravi Sethi, " Compilers , Principles techniques and tools ", Pearson Education 2011

4. Raghavan V., "Principles of Compiler Design", Tata McGraw Hill Education Pvt. Ltd., 2010.

5. David Galles, "Modern Compiler Design", Pearson Education, Reprint 2012.

Dasaradh Ramaiah. K., "Introduction to Automata and Compiler Design", PHI, 2011.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Define grammars and finite automata	K1,k2
CO2	Implement lexical analysis and token specification	K3,K4
CO3	Analyze parsing techniques and error recovery	K5,K6
CO4	Apply syntax-directed translation methods	K7
CO5	Optimize code with various techniques	K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

CourseCode:24MTCS063 **CC-XXIII**

Credits:4 **L-P-C:4-0-4**

CRYPTOGRAPHY AND CYBER SECURITY

OBJECTIVES:

- To understand the basics of Cryptography and Network Security.
- To be able to secure a message over the in secure channel by various means.
- Tolearn about how to maintain the Confidentiality, Integrity, and availability of data.
- To understand various protocols for network security to protect against the threats in

UNIT IINTRODUCTION TO CRYPTOGRAPHY AND BLOCK CIPHERS

Introduction to cryptography-Conventional Encryption: Conventional encryption model - classical encryption techniques -substitution ciphers and transposition ciphers –cryptanalysis– steganography - stream and block ciphers - Block ciphers principals - - data encryption standard(DES) - DES Encryption and Decryption-DES example–Strength of DES– AES Structure and Transformation functions

UNIT II MODULAR ARITHMETIC

Random number generation - Introduction to Groups - ring and field - prime and relative prime numbers - modular arithmetic - Fermat's and Euler's theorem - primality testing - Euclid's Algorithm –Chinese Remainder theorem-discrete algorithms.

UNIT IIIPUBLIC KEY CRYPTOGRAPHY AND AUTHENTICATION REQUIREMENTS

Principles of public key cryptosystems - RSA algorithm - security of RSA - key management –Diffle-Hellman key exchange algorithm –the introductory idea of Elliptic curve cryptography –Elgamel encryption - Message Authentication and Hash Function: Authentication requirements -authentication functions - message authentication code - hash functions - birthday attacks –security of hash functions and MACS.

UNIT IV INTEGRITY CHECKS AND AUTHENTICATION ALGORITHMS

Secure hash Algorithm (SHA) Digital Signatures: Digital Signatures-authentication protocols-digital signature standards (DSS)- Authentication Applications: X.509 - directory authentication service-electronic mail security-pretty good privacy(PGP) -S/MIME.

UNIT VIP SECURITY AND WIRELESS NETWORK SECURITY

IP Security: Architecture - Authentication header - Encapsulating security payloads – combining security associations –Wireless Network Security: Wireless Security - Mobile Device Security

UNIT VI

Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Primarybooks:

1. William Stallings, “Cryptography and Network security Principles and Practices”, Pearson/PHI.
2. AtulKahate, “ Cryptography and Network security”, TMCH, Second Edition.

Reference Books:

1. W.Mao,“ModernCryptography–TheoryandPractice”,PearsonEducation.
2. Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing –Prentice Hall of India.

E-Resources:

1. http://nptel.ac.in/courses/106105031/lecturebyDr.DebdeepMukhopadhyayIITKharagpur
2. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-033-computer-system-engineering-spring-2009/video-lectures/lecturebyProf.Robert Morrisand Prof.SamuelMaddenMIT.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain cryptographic models and block ciphers	K1,K2
CO2	Apply modular arithmetic and number theory	K3,K4
CO3	Implement public key cryptography and RSA	K5,K6
CO4	Analyze digital signatures and authentication methods	K7
CO5	Evaluate network and wireless security protocols	K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS064 **CC-XXIV**

Credits: 3 **L-P-C: 4-0-3**

COMPUTER GRAPHICS

OBJECTIVES:

- To build web applications using ASP and client side script technologies use with Microsoft's IIS,
- To build XML applications with DTD and style sheets that span multiple domainsranging from finance to vector graphics to genealogy for use with legacy browsers.
- To analyze a web page and identify its elements and attributes.
- To create web pages using XHTML and Cascading Style Sheets.
- To build dynamic web pages using JavaScript (Client side programming).
- To create XML documents and Schemas.

UNIT I INTRODUCTION TO GRAPHIC TOOLS

Applications of Computer Animation-Creating Interactive scene using OpenGL- Blender Game Engine-Blender: Interface-Navigation-Creating and Editing Objects-Materials-Textures-World Setting-Lighting and Cameras-Raytracing and Rendering-Animation Basics-Modifiers-Particle Systems-Relationship Constraints-Armatures-Shape Key and Action Editors-Fluid Simulation-Nodes-Audio and Video Sequence Editing

UNIT II RASTERIZATION

Lines-Filled Triangles-Shaded Triangles-Perspective Projection-Describing and Rendering a Scene-Clipping-Hidden Surface Removal-Shading-Textures-Extending the Rasterizer.

UNIT III RAYTRACING

Introductory Concepts-Basic Raytracing- Light-Shadows and Reflections- Extending the Ray tracer-shading and surface characteristics.

UNIT IV PRINCIPLE OF ANIMATION

Introduction-Human Development-Developing Characters-Writing structure-Story Board-Gag Writing-Dialogue-Script-Editing and rewriting-Types of Animation

UNIT V ANIMATION TECHNIQUES

Introduction-Technical Background-Interpolation-Based Animation-Kinematic Linkage-Motion Capture-Physically Based Animation-Fluids: Liquids and Gases, Modelling and Animating Human Figures-Facial

Animation - Behavioural Animation-Crowd Animation- interactive Animation-Visual Effects

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

Primary books:

1. Deitel & Deitel, Goldberg, "Internet and world wide web – How to Program",

Pearson Education Asia, 2001.

Reference books:

1. Gabriel Gambetta, "Computer Graphics from Scratch" , Np Starch press,2021.
2. Ann Wright, "Animation Writing and Devlopment", Routledge, 2013.
3. Rick Parent "Computer Animation" Third Edition, Morgan Kaufmann, 2012.
4. Isaac V.Kerlow, The Art of 3D Computer Animation and Effects", Fourth Edition,Wiley,2009 4.John M.Blain, "The Complete Guide to Blender Graphice", CRC Press, 2012.
5. Donald D. Hearn, M. Pauline Baker, Warren Carithers, "Computer Graphics with Open GL", Fourth Edition, Prentice Hall, 2011.

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Describe computer animation and OpenGL	K1,K2
CO2	Implement rasterization and scene rendering	K3,K4
CO3	Apply raytracing techniques and shading	K5,K6
CO4	Develop animation principles and storyboards	K7
CO5	Utilize various animation techniques and effects	K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

CourseCode:24MTCS067P **CC-XXV**

Credits:2 **L-P-C:0-3-2**

LABVII -CRYPTOGRAPHY AND NETWORK SECURITY LAB

OBJECTIVES:

- To Know the Concepts Behind the Network Security Algorithms
- To Understand the Logic of Network Security Algorithms
- To Know the Implementation of Network Security Algorithms
- To apply Present Compatible Programming Language for Network Security Algorithms
- To Test Whether the Result of the Program is Correct or Not

List of Programs:

1. Write a Program to do Encryption and Decryption using Ceasar Cipher

2. For a Given Text, Perform Encryption and Decryption using Data Encryption Standard

3. Write a Program to do Encryption and Decryption using Advanced Encryption Standard

4. For a Text of 30 Words, Perform Encryption and Decryption using RSA (Rivest–Shamir–Adleman Algorithm)

5. Write a Program to do Encryption and Decryption using Blowfish Algorithm

6. Write a Program that Performs Encryption and Decryption using Vigenere Cipher

7. Write a Program to do Encryption and Decryption using Digital Signature

8. For a Given Text, Perform Encryption and Decryption using Substitution Cipher

9. For a Given Numerical and Textual Data, Perform Web Security

E-Resources :

1. https://www.youtube.com/watch?v=exw3JZl7Fl4
2. https://www.youtube.com/watch?v=obe5Qywq7ME
3. https://www.coursera.org/lecture/asymmetric-crypto/rsa-encryption-and-decryption-bv1j0
4. https://www.youtube.com/watch?v=ap9dTNOqk1E
5. https://www.youtube.com/watch?v=AteFI6QS1hc
6. https://www.youtube.com/watch?v=tGhh9_VWrQg
7. https://www.youtube.com/watch?v=HiKuC96b5cw
8. https://www.youtube.com/watch?v=704dudhA7UI

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Implement Caesar Cipher encryption and decryption	K1,K2
CO2	Apply DES encryption and decryption	K3,K4
CO3	Use AES for encryption and decryption	K5,K6
CO4	Perform RSA encryption for a 30-word text	K7
CO5	Encrypt and decrypt using Blowfish algorithm	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

CourseCode:24MTCS068P **CC-XXVI**

Credits:2 **L-P-C:0-3-2**

LABVIII–COMPUTER GRAPHICS

OBJECTIVES:

- Theobjectiveofthislabistodevelopanabilitytodesignandimplementstaticanddynamic website
- Analyzeawebpageandidentifyitselementsandattributes.
- CreatewebpagesusingXHTMLandCascadingStyleSheets.
- BuilddynamicwebpagesusingJavaScript(Clientsideprogramming).
- CreateXMLdocumentsandSchemas.•BuildinteractivewebapplicationsusingAJAX.

List of Programs:

1.CreateaHTMLtablewithrows&columnsandsplitthemusingRowspanandColspan.

2.Createawebpageintheformatoffrontpageofanewspaperusing Textlinks.Alignthe text with colors.

3.WriteanXMLdocumenttodisplayyourbio-data.WriteanXSLstylesheetandattachthat to theXMLdocument. Validate thedocument usingDTD orXSD.

4. Writean ASP program toprepareEmployeepaybill usingJavaScript.

5.WriteanASPprogramtopreparestudentperformanceevaluationdocumentusingJava Script.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Create HTML table with rowspan and colspan	K1
CO2	Design newspaper-style webpage with text links	K2
CO3	Write and validate XML with XSL and DTD	K3
CO4	Develop employee paybill using ASP and JavaScript	K4
CO5	Create student evaluation document using ASP and JavaScript	K5
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

.

Semester VII

Course Code: 24MTCS071 **CC-XXVII**

Credits: 4 **L-P-C: 4-0-4**

SOFTWARE ENGINEERING

OBJECTIVES:

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modelling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures

UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management- Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III SOFTWARE DESIGN

Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV TESTING AND MAINTENANCE

Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing –Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

UNIT V PROJECT MANAGEMENT

Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision

COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, RFP Risk Management – Identification, Projection – Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

UNIT VI:

Current Contours (for Continuous Internal Assessment Only):
Contemporary Developments Related to the Course during the Semester Concerned.

TEXT BOOKS:

1. Roger S. Pressman, "Software Engineering – A Practitioner‟s Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.

2. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.

2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.

3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.

4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited,2007.

5. http://nptel.ac.in/.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain software engineering and process models	K1,K2
CO2	Describe agile and XP processes	K3,K4
CO3	Discuss requirements analysis and engineering	K4
CO4	Explain design concepts and architectural styles	K3,K4
CO5	Analyze testing, maintenance, and reengineering	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS072 **CC-XXVIII**

Credits: 3 **L-P-C: 4-0-3**

OPEN SOURCE TECHNOLOGIES

OBJECTIVES:

- To introduce open technologies and linux distributions and version control systems..
- To expose students to free open source software environment and introduce them to use open source packages.
- To implement various applications using build systems
- To understand procedural programming and web development with python.
- To understand relational databases and nosql modelling.

UNIT I INTRODUCTION

Need for Free and Open Source Software– Overview of Linux–Distributions–Licensing Schemes – Versions – Collaborative Version Control Systems – Shell Commands

UNIT II PROCEDURAL PROGRAMMING

Object Oriented Programming in Python - Bank account simulations - Problems with procedural implementation - Building software with Classes, Objects and Instantiation

UNIT III WEB DEVELOPMENT WITH PYTHON

HTML – CSS – Bootstrap – Introduction to Flask –Templates –Models – Forms – Modules.

UNIT IV WORKING WITH DATABASES

Introduction to Document Databases –Working – Relational Database versus NOSQL – Modeling – Mapping Classes to MongoDB – Building Data layer with Mongo Engine.

UNIT V WORKING WITH CONTAINERS

Running software in containers – Installing Dockers- Working with databases such as Redis- Building Docker images - Deployment of applications with Docker

UNIT VI:

Current Contours (for Continuous Internal Assessment Only):
Contemporary Developments Related to the Course during the Semester Concerned.

Primary books:

1. Jesus M. Gonzalez Barahona, Joaquin Seoane Pascual, Gregorio Robles, “Introduction to Free Software”, Third Edition, Free Technology Academy, 2009.
2. http://ftacademy.org/sites/ftacademy.org/files/materials/fta–m1–intro_to_FS–v1.pdf
3. Irv Kalb, Object-Oriented Python, O’Reilly, 2022
4. https://getbootstrap.com/
5. Peter Wentworth, Jeffrey Elkner, Allen B.Downey, Chris Meyers, “How to Think Likea Computer Scientist”, Open Book, 2012.
6. Scott Chacon, Ben Straub, “ProGit”, Free ebook under Creative Commons, Second Edition, A press, 2016.
7. Miguel Grinberg, “Flask Web Development Developing Web Applications with Python”, O’Reilly, 2014. 7. Karl Seguin, “The Little Mongo DB Book”,
8. https://github.com/karlseguin/the–little–mongodb–book.
9. Jeff Nickoloff and Stephen Kuenzli, Docker in Action ,Second Edition, Manning Publications, 2020

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain open source and Linux distributions	K1,k2
CO2	Describe object-oriented programming in Python	K2,k3
CO3	Explain web development using Flask	K3,k4
CO4	Discuss relational vs NoSQL databases	K4
CO5	Analyze container deployment using Docker	K5, K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS073 **CC-XXIX**

Credits: 3 **L-P-C: 4-0-3**

MOBILE APPLICATION DEVELOPMENT

OBJECTIVES:

- A good understanding on the Mobile Environment
- To Know the Architecture of the Mobile Application
- To Understand the Features of Android
- To acquired mobile application development skills with Android
- To develop the ability to write database applications using Android

UNIT I:

Introduction to Mobile Applications: Native and web applications - Mobile OS and Databases. Introduction to Android: History - Features – OSS – OHA - Versions - Android devices - Setting up software – IDE. Introduction to iOS – iOS features –user interface - Using Wifi – iPhone marketplace.

UNIT II:

Android Architecture: Android Stack - Linux Kernel - Android Runtime - Dalvik VM - Application Framework - Android emulator - Android applications development -Virtualization – APIs – Android File system – A Basic Android Application - Deployment. Android Activities: The Activity Lifecycle – Lifecycle methods – Creating Activity.

UNIT III:

Intents – Intent Filters – Activity stack. Android Services: Simple services – Binding and Querying the service – Executing services. Broadcast Receivers: Creating and managing receivers – Receiver intents. Content Providers: Creating and using content providers – Content resolver.

UNIT IV:

Android UI - Android Layouts – Attributes – Layout styles - Linear – Relative – Table – Grid – Frame – Menus - Lists and Notifications - Input Controls: Buttons - Text Fields – Check boxes - alert dialogs – Spinners - rating bar – progress bar.

UNIT V:

Working with databases: SQLite – coding for SQLite using Android - Publishing and Internationalizing mobile applications - mobile application deployment: Game, Clock, Calendar, Convertor, Phone book.

UNIT VI:

Current Contours (for Continuous Internal Assessment Only):
Contemporary Developments Related to the Course during the Semester Concerned.

Text Book:

1.Barry Burd,—Android Application Development–All-in-one for Dummies ǁ,2nd Edition, Wiley India, 2016.

References :

1. Lauren Darcey, Shane Conder ,— Sams Teach Yourself Android Application Development in 24 hoursǁ, 2nd edition, Pearson Education,2013.

2. Jerome (J.F) DiMarzio,—Android– Programmer"s Guideǁ, McGraw Hill Education, 8th reprint, 2015.

3. David Mark, Jack Nutting, JeffL a Marcheand Frederic Olsson,—Beginning iOS6 Development: Exploring the iOS SDKǁ, Apress, 2013.

4. http://www.developer.android.com

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain mobile apps and OS basics	K1,k2
CO2	Describe Android architecture and activities	K3,k4
CO3	Discuss intents, services, and content providers	K4,k5
CO4	Explain Android UI and input control	K3,k4
CO5	Analyze mobile databases and app deployment	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS074 **CC-XXX**

Credits: 4 **L-P-C: 4-0-4**

DEEP LEARNING

OBJECTIVES:

- To learn Tensor Flow programming.
- To design and implement CNN for classification.
- To perform sequence analysis.
- To design machine translation networks using RNN.
- To implement a reinforcement learning system.

UNIT I TENSOR FLOW BASICS

Tensor Flow: variables, operations, place holder Tensors, sessions –Navigating variable scopes and shared variables – Managing models over CPU and GPU – Logistic Regression in Tensor Flow–Training Logistic Regression model –Visualizing using Tensor Board – Building multilayer model in Tensor Flow.

UNIT II CONVOLUTIONAL NEURAL NETWORK

Shortcomings of Feature Selection – Width, height and depth of layers – Filters and feature maps – Describing convolutional layer – Max pooling - Architectural Description of Convolution Networks – Recognizing handwritten digits using CNN for MNIST dataset – Image preprocessing pipelines - Training with Batch normalization.

UNIT III AUTO ENCODERS AND SEQUENCE ANALYSIS

Auto encoders and Sequence Analysis Embedding – Principal Component Analysis - Architecture of Auto encoders – Implementing auto encoders in Tensor Flow–De noising - Word2Vec framework for language modelling. Sequence Analysis: seq2seq problem – Dependency parsing – Beam search.

UNIT IV RECURRENT NEURAL NETWORKS

Single neuron and fully connected recurrent layer –Challenges of vanishing gradients-LSTM architecture – Tensor Flow primitives for RNN models – Implementing Sentiment analysis Model –Solving seq2seq tasks with RNN – Augmenting RNN with Attention – Designing Neural Translation Network.

UNIT V DEEP REINFORCEMENT LEARNING

Reinforcement Learning: Markov Decision Processes, Policy, Future return, Discounted future return, Balancing Explore-Exploit dilemma, Annealed e-Greedy – Policy learning and Value learning - Solving Pole Cart problem with Policy Gradients – Q Learning -Deep Q Networks – Deep Q Recurrent Networks – UNREAL Learning.

UNIT VI Current Contours (for Continuous Internal Assessment Only):

Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Nikhil Buduma, Nicholas Locascio. Fundamentals of Deep Learning: Designing Next- Generation Machine Intelligence Algorithms. O'Reilly Media. 2017.
2. Ian Good fellow, Yoshua Bengio, Aaron Courville. Deep Learning (Adaptive Computation and Machine Learning series). MIT Press, 2017.

Reference Books:

1. Francois Chollet. Deep Learning with Python. 1ed,Manning Publications,2017.ISBN 978-1617294433.

E-Learning Resources:

- Related Online Contents [MOOC,SWAYAM, NPTEL, Websites etc.]

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain TensorFlow basics and operations	K1,k2
CO2	Describe CNN architecture and pooling	K2,k3
CO3	Discuss auto encoders and sequence analysis	K3,k4
CO4	Explain RNNs and LSTM architecture	k4,k5
CO5	Analyze deep reinforcement learning models	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS077P **CC-XXXI**

Credits: 2 **L-P-C: 0-3-2**

Lab-IX OPEN SOURCE TECHNOLOGIES

OBJECTIVES:

- To extend the students' knowledge of algorithms and data structures and
- To learn a variety of useful algorithms and techniques
- Explain the internal structure of Linux,
- Write desktop and web applications using PHP,
- Design for extendibility and code reuse
- Develop applications for open source hardware

List of Experiments:

1. Implement the server side PHP program that displays marks, total, grade of a student in tabular format by accepting user inputs for name, number and marks from a HTML form.
2. Create a PHP program that adds products that are selected from a web page to a shopping cart.
3. Design a PHP program to access the data stored in a mysql table.
4. PHP program interface to create a database and to insert a table into it.
5. Develop a PHP program using classes to create a table.
6. Implement the PHP program to upload a file to the server.
7. Design PHP program to create a directory, and to read contents from the directory.
8. Develop a shell program to find the details of an user session.
9. Shell program to change the extension of a given file.
10. Create a mysql table and execute queries to read, add, remove and modify a record from that table.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Implement PHP program for student grades	K1,k2
CO2	Create a PHP shopping cart system	K3,k4
CO3	Access MySQL data using PHP	K5,k6
CO4	PHP program to create and insert a table	K3,k4
CO5	Develop PHP file upload program	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS078P **CC-XXXII**

Credits: 2 **L-P-C: 0-3-2**

Lab-X MOBILE APPLICATION DEVELOPMENT

OBJECTIVES:

- To Know the components and structure of mobile application development frameworks for Android and windows OS based mobiles
- To Understand how to work with various mobile application development frameworks
- To learn the basic and important design concepts and issues of development of mobile applications.
- To Know how to Debug the Errors
- To Understand the capabilities and limitations of mobile devices

List of Experiments:

1. Develop an application that uses GUI components, Font and Colours.
2. Develop an application that uses Layout Managers and event listeners.
3. Develop a native calculator application.
4. Write an application that draws basic graphical primitives on the screen.
5. Develop an application that makes use of database.
6. Implement an application that implements Multithreading
7. Develop a native application that uses GPS location information
8. Implement an application that writes data to the SD card
9. Implement an application that creates an alert upon receiving a message
10. Write a mobile application that creates alarm clock

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Develop a GUI application with fonts and colors	K3,k4
CO2	Create an app using layout managers and events	K3,k4
CO3	Implement a native calculator application	K3,k4
CO4	Create an app that uses multithreading	K3,k4
CO5	Develop a mobile app with GPS functionality	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24VAC03 **VAC-III**

Credits: 0 **L-P-C: 0-0-0**

ETHICAL HACKING

OBJECTIVES:

- To introduce the concept of Hacking and how importance to secure from that.
- To create awareness on Hacking and its danger to the Society.
- Role of Security to develop the future Business and Industry.
- To know about Attacks and how to protect from them.
- To know about Virus and handling the Virus form the system

UNIT I ETHICAL HACKING

Elements of Information Security-Authenticity and Non-Repudiation, Security Challenges-Effects of Hacking,-Hacker – Types of Hacker, Ethical Hacker-Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking &Computer Attacks – Malicious Software (Malware)-Protection Against Malware-Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

UNIT II FOOT PRINTING AND SOCIAL ENGINEERING

Web Tools for Foot Printing-Conducting Competitive Intelligence-Google Hacking-Scanning-Enumeration-Trojans & Backdoors-Virus & Worms-Proxy & Packet Filtering-Denial of Service-Sniffer-Social Engineering – shoulder surfing, Dumpster Diving-Piggybacking.

UNIT III DATA SECURITY

Physical Security – Attacks and Protection, Steganography – Methods, Attacks and Measures-Cryptography– Methods and Types of Attacks-Wireless Hacking-Windows Hacking-Linux Hacking.

UNIT IV NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS

Routers, Firewall & Honey pots- IDS & IPS- Web Filtering-Vulnerability-Penetration Testing-Session-Hijacking-Web Server-SQL Injection- Cross Site Scripting-Exploit Writing, Buffer Overflow,-Reverse-Engineering-Email Hacking-Incident Handling & Response- Bluetooth Hacking- Mobiles Phone Hacking.

UNIT V ETHICAL HACKING LAWS AND TESTS

An introduction to the particular legal-professional and ethical issues likely to face the domain of ethical hacking-ethical responsibilities-professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering- Host Reconnaissance-Session Hijacking-Hacking - Web Server-Database, Password Cracking- Network and Wireless-Trojan-Backdoor- UNIX-LINUX- Microsoft-NOVEL Server-Buffer Overflow- Denial of Service Attack-Methodical Penetration

Testing.

Unit VI

Current Contours (for Continuous Internal Assessment Only):
Contemporary Developments Related to the Course during the Semester Concerned.

Reference books:

1.Michael T. Simpson, Kent Backman, James E. “Corley, Hands-On Ethical Hacking and Network Defense”, Second Edition, CENGAGE Learning, 2010.

2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy”, Syngress Basics Series – Elsevier

E-Resources:

3. https://www.tutorialspoint.com/prime-pack/ethical-hacking

4. https://www.geeksforgeeks.org/ethical-hacking.

OUTCOMES:

- Students can able to understand the concept of Hacking and how importance to secure
- Students can acquire in-depth knowledge on on Hacking and its danger to the Society.
- Students can be familiarizing with the Role of Security to develop the future Business
- Students can understand about the Attacks and how to protect from it.
- Students can able to know about Virus and handling the Virus form the system

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain ethical hacking and penetration testing	K1,k2
CO2	Discuss footprinting and social engineering	K3,k4
CO3	Analyze data security and cryptography methods	K3,k4
CO4	Explain network protection and web server hacking	K3,k4
CO5	Discuss ethical hacking laws and responsibilities	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Semester VIII

Course Code: 24MTCS081 **CC-XXXIII**

Credits: 6 **L-P-C: 6-20-6**

PROJECT

Course Code: 24MTCS082 **CC-XXXIV**

Credits: 3 **L-P-C: 4-0-3**

PROFESSIONAL ETHICS

OBJECTIVES:

- To create awareness on professional ethics and Human Values
- To create awareness on Engineering Ethics providing basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards

UNIT I: HUMAN VALUES

Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT II: ENGINEERING ETHICS

Senses of ―Engineering Ethics" – Variety of moral issues – Types of inquiry – Moral dilemmas– Moral Autonomy – Kohlberg's theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion - Uses of Ethical Theories.

UNIT III: ENGINEERING AS SOCIAL EXPERIMENTATION

Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

UNIT IV: SAFETY, RESPONSIBILITIES AND RIGHTS

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT V: GLOBAL ISSUES

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers - Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

UNIT VI

Current Contours (for Continuous Internal Assessment Only):
Contemporary Developments Related to the Course during the Semester Concerned.

Text Books:

1. Mike W. Martin and Roland Schinzinger, —Ethics in Engineering‖, Tata McGraw Hill, New Delhi,2013.

2. R. Subramanian, —Professional Ethics‖, Oxford University Press, New Delhi, 2013.

3. Govindarajan M, Natarajan S, Senthil Kumar V. S, —Engineering Ethics‖, Prentice Hall of India, New Delhi,2004.

Reference Books:

1. Daniel Albuquerque, —Business Ethics ,Oxford University Press, New Delhi, 2013.
2. Edmund G.Seebauer and Robert L. Barry, —Fundamentals of Ethics, Oxford University Press, New Delhi, 2012.
3. Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ McGraw Hill education, India Pvt. Ltd., New Delhi2013.
4. World Community Service Centre, "Value Education", Vethathiri publications, Erode,2011.

E-References:

1. www.onlineethics.org
2. www.nspe.org
3. www.globalethics.org
4. www.ethics.org

OUTCOMES:

- Upon completion of the course, the student should be able to apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society
- Can analysis and have an idea about the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights
- Inculcate knowledge and exposure on Safety and Risk, Risk Benefit
- Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain human values and ethics	K1,k2
CO2	Discuss theories of engineering ethics	K3,k4
CO3	Analyze engineering as social experimentation	K3,k4
CO4	Explain safety, rights, and responsibilities	K3,k4
CO5	Discuss global issues and professional conduct	K5,k6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

IX SEMESTER

Course Code: 24MTCS091 **CC-XXXV**

Credits: 4 **L-P-C: 5-0-4**

ADVANCED DATA STRUCTURE AND ALGORITHMS

OBJECTIVES:

- To extend the student's knowledge in algorithms and data structures
- To learn a variety of useful algorithms and techniques

UNIT I DESIGN AND ANALYSIS OF ALGORITHMS

Hash Tables – Binary Search Trees - Balanced binary search trees - B/B+ trees - Basic operations on B-trees- AVL trees - red black trees – Rotations – Insertion – Deletion - priority queues

UNIT II ADVANCED DESIGN AND ANALYSIS TECHNIQUES

Dynamic Programming – Assembly-line scheduling – Matrix-chain Multiplication – Greedy Algorithm – Huffman codes –Task Scheduling problem – Amortized analysis – Aggregated analysis – The accounting method – The potential method

UNIT III ADVANCED DATA STRUCTURES

Binomial Heaps – operations on Binomial heaps – Fibonacci Heaps – Structure of Fibonacci heaps – Mergeable-heap operations – Bounding the maximum degree – Data structures for disjoint Sets – Linked-list representation of disjoint sets - Disjoint-set forests

UNIT IV GRAPH ALGORITHMS

Elementary Graph Algorithms – Breadth-first search – Depth-first search – Topological – Minimum spanning trees – The algorithm of Kruskal and Prim – Single-Source Shortest Paths – Bellman-Ford algorithm - Dijkstra's algorithm – All-pairs shortest paths – The Floyd-Warshall algorithm – Maximum Flow- the Ford-Fulkerson method.

UNIT V MUTUAL EXCLUSION AND PATTERN MATCHING ALGORITHM

Sorting Networks – the Zero-one Principle - Bitonic sorting network – sorting network – Matrix operations – Strassen's algorithm for matrix multiplication – Polynomials and FFT – The DFT and FFT – Efficient implementation – String matching – The Rabin-Karp algorithm – The Knuth-Morris-Pratt algorithm.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary books:

1. Cormen T. H., Leiserson C. E., Rivest R. L., Introduction to Algorithms, Prentice Hallof India – 2003.
2.Brassad G. & Bratley P., Fundamentals of Algorithmics, Prentice Hall of India

Reference books

1. Basse S., Computer Algorithms - Introduction to Design and Analysis, AddisonWesley

2.Lynch N. A., Distributed Algorithms, Harcourt Asia (Morgan Kaufman)

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain hash tables and binary trees.	K1, K2
CO2	Describe advanced design techniques.	K3, K4
CO3	Apply dynamic and greedy algorithms.	K5
CO4	Analyze graph algorithms and paths	K3, K4
CO5	Evaluate heaps and disjoint sets K6, K7	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS092 **CC-XXXVI**

Credits: 4 **L-P-C: 5-0-3**

SOCIAL NETWORK SECURITY

OBJECTIVE

- To develop semantic web related simple applications
- To explain Privacy and Security issues in Social Networking
- To explain the data extraction and mining of social networks
- To discuss the prediction of human behavior in social communities
- To describe the Access Control, Privacy and Security management of social networks

UNIT I FUNDAMENTALS OF SOCIAL NETWORKING

Introduction to Semantic Web, Limitations of current Web, Development of Semantic Web, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis, Key concepts and measures in network analysis, Historical overview of privacy and security, Major paradigms, for understanding privacy and security

UNIT II SECURITY ISSUES IN SOCIAL NETWORKS

The evolution of privacy and security concerns with networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNIT III EXTRACTION AND MINING IN SOCIAL NETWORKING DATA

Extracting evolution of Web Community from a Series of Web Archive, Detecting communities in social networks, Definition of community, Evaluating communities, Methods for community detection and mining, Applications of community mining algorithms, Tools for detecting communities social network infrastructures and communities, Big data and Privacy

UNIT IV PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES

Understanding and predicting human behavior for social communities, User data Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacy in online social networks, Trust in online environment, What is Neo4j, Nodes, Relationships, Properties.

UNIT V ACCESS CONTROL, PRIVACY AND IDENTITY MANAGEMENT

Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary books:

1. Peter Mika, Social Networks and the Semantic Web, First Edition, Springer 2007.
2. BorkoFurht, Handbook of Social Network Technologies and Application, First Edition, Springer, 2010.
3. Learning Neo4j 3.x Second Edition By Jérôme Baton, Rik Van Bruggen, Packt publishing 156
4. David Easley, Jon Kleinberg, Networks, Crowds, and Markets: Reasoning about a Highly Connected World‖, First Edition, Cambridge University Press, 2010.

Reference Book

1. Easley D. Kleinberg J., Networks, Crowds, and Markets – Reasoning about a Highly Connected World‖, Cambridge University Press, 2010.
2. Jackson, Matthew O., Social and Economic Networks‖, Princeton University Press, 2008.
3. GuandongXu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling‖, IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, The Social Semantic Web‖, Springer, 2009

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Explain Semantic Web and Social Networks.	K1, K2
CO2	Describe security issues in social networks.	K3, K4
CO3	Apply community detection and mining methods.	K5
CO4	Analyze human behavior and privacy issues.	K3, K4
CO5	Evaluate access control and identity management.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS093 **CC-XXXVII**

Credits: 4 **L-P-C: 5-0-4**

FULL STACK WEB APPLICATION DEVELOPENT

OBJECTIVES:

- To bring both Circuits and System views on design together.
- It offers a profound understanding of the design of complex digital VLSI circuits, computer aided simulation and synthesis tool for hardware design
- To learn the concept of various VLSI technologies.
- To understand the logic design principles.

UNIT I OVERVIEW OF FULL STACK

Understanding the Basic Web Development Framework - Browser – JavaScript – functions, arrays, objects, strings, Web Server –- Backend Services – MVC Architecture – Full stack with JAVA Spring Boot, React, MongoDB

UNIT II FRONT-END DEVELOPMENT

REACT - Virtual DOM, components, props, JSX, Events, conditionals, lists, forms, Routing, Hooks, Redux, Client-server communication, material-UI.

UNIT III JAVA SPRING BOOT

Spring Boot core features, architecture - auto configuration, dependency management, application, component scan, starters-starter web, data JPA, actuators, annotation, POM file. **UNIT IV MONGODB**

Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Spring Boot Spring Data MongoDB, CRUD operations.

UNIT V BUILDING WEBAPPS, WEB SERVICES AND MICROSERVICES WITH SPRING BOOT

using Spring Boot for Building simple web applications, creating RESTful web service, Microservices architecture, Principles of Microservices and its advantages, Service register & API Gateway, Admin Server & Client, Interservice communication, External API communication, Distributed logging

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary books:

1. Wai-kai-Chief, VLSI Technology, CRC Press, 2000, New York.
2. Wai-kai-chen, The VLSI Handbook, CRC Press, 17-Jul-2019 - Technology & Engineering - 1788 pages

Reference:

. 1. John Carnell, Illary Huaylupo Sánchez, "Spring Microservices in Action", 2nd Edition, Manning Publications, 2021.
2. Greg L. Turnquist, Learning Spring Boot 3.0, 3rd Edition, Packt Publishing, 2022.
3. David Herron, Node.js Web Development, Packt Publishing Limited, 5th edition, 2020.
4. David Flanagan, Javascript The Definitive Guide, Oreilly, 7th Edition, 2020.
5. K. Siva Prasad Reddy, Sai Upadhyayula, Beginning Spring Boot 3: Build Dynamic Cloud- Native Java Applications and Microservices, A Press, 2022.
6. Craig Walls, Spring Boot in Action, Manning Publications, 2016.
7. https://spring.io
8. https://react.dev
9. https://www.mongodb.com/compatibility/spring-boot
10. https://nodejs.org/en

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain web development frameworks and services.	K1, K2
CO2	Describe front-end development using React.	K3, K4
CO3	Apply Java Spring Boot features.	K5
CO4	Analyze MongoDB and NoSQL databases.	K3, K4
CO5	Evaluate microservices with Spring Boot.	K6,K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7-Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS094 **CC-XXXVIII**

Credits: 4 **L-P-C: 5-0-4**

INTERNET OF THINGS

OBJECTIVES :

- To provide a Complete Knowledge about the Internet of Things
- Explain the definition and usage of the term "The Internet of Things" in different contexts.
- Understand where the IoT concept fits within the broader ICT industry and possible future trends.
- Appreciate the role of big data, cloud computing and data analytics in a typical IoT system.
- Differentiate between the levels of the IoT stack and be familiar with the key technologies and protocols employed at each layer of the stack.

UNIT I INTRODUCTION

Introduction - Putting the Internet of Things forward to the Next Level - Internet of Things Strategic Research and Innovation Agenda : Internet of Things Vision - Internet of Things Strategic Research and Innovation Directions - IoT Smart X Applications.

UNIT II COMMUNICATION NETWORK FOR IOT

Internet of Things and Related Future Internet Technologies - Network and Communications - Processes - Data Management - Security, Privacy and Trust - Device Level Energy Issues - IoT Related Standardization - IoT Protocols Convergence.

UNIT III INTEGRATION OF APPLICATIONS

Scalable Integration Framework for Hetrogeneous Smart Objects, Applications and Services : IPV6 Potential - IoT6 - IPV6 vsIoT - Adapting IPV6 to IoT Requirements - IoT6 Architecture - DigCovery - IoT6 Integration with the Cloud and EPICS - Enabling Hetrogeneous Integration - IoT6 Smart Office Use Case - Scalability Perceptive.

UNIT IV FEDERATED CLOUD FOR IOT

Insignts on Federated Cloud Service Management and the IoT : Federated Cloud Service Management - Federated Management Service Lifr Cycle - Self Management Life Cycle - Self Organising Cloud Architecture - Horizontal Platform.

UNIT V APPLICATION OF IOT

Internet of Things Applications :OpenIoT - iCORE - Compose.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary book:

Internet of Things - From Research Innovation to Market Deployment by OvidiuVermesan and Peter Friess, River Publishers, 2014.

Reference Book:

Designing the Internet of Things by Adrian McEwen and Hakim Cassimally, John Wiley and Sons, Ltd, 2014.

Expected Course Outcomes:

On the completion of the course the student will be able to

Cos	Course Outcome	Knowledge Level
CO1	Explain IoT vision and applications.	K1, K2
CO2	Describe IoT communication networks and protocols.	K3, K4
CO3	Apply IPV6 in IoT integration.	K5
CO4	Analyze federated cloud service management.	K3, K4
CO5	Evaluate IoT applications and platforms.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS095 **CC-XXXIX**

Credits: 5 **L-T-P-C: 4-0-4**

NETWORK TECHNOLOGIES

OBJECTIVES:

- Formulate and solve problems in the framework of constraint satisfaction problems.
- Formulate and solve planning problems.
- Use probabilistic modelling techniques to solve problems with noise, incomplete information, and uncertainty.
- Summarize the essential components of gradient-based optimization in supervised learning problems
- Explain the impact of step sizes in gradient-based optimization
- Be able to apply the training and running of trained neural networks in tensor flow
- Be able to investigate the impact of essential parameters such as step size, batch size and training iterations when training a neural network
- Discuss the usage of different neural network structures such as fully connected, convolution and pooling layers

UNIT I NETWORK ARCHITECTURE AND QoS

Overview of TCP/IP Network Architecture –High Speed Networks – Frame Relay – Asynchronous Transfer Mode – High-Speed LANs –Integrated Services Architecture – Approach – Components – Services – Queuing Discipline – FQ – PS – BRFQ – GPS – WFQ – Random Early Detection – Differentiated Services

UNIT II CELLULAR NETWORKS

GSM – Mobility Management and call control – GPRS – Network Elements – Radio Resource Management – Mobility Management and Session Management – Small Screen Web Browsing over GPRS and EDGE – MMS over GPRS – UMTS – Channel Structure on the Air Interface – UTRAN – Core and Radio Network Mobility Management – UMTS Security

UNIT III WIRELESS NETWORKS

IEEE 802.16 and WiMAX – Security – Advanced 802.16 Functionalities – Mobile WiMAX – 802.16e – Network Infrastructure – WLAN – Configuration – Management Operation – Security – IEEE 802.11e and WMM – QoS – Comparison of WLAN and UMTS – Bluetooth –Protocol Stack – Security – Profiles.

UNIT IV 4G NETWORKS

LTE – Network Architecture and Interfaces – FDD Air Interface and Radio Networks –Scheduling – Mobility Management and Power Optimization – LTE Security Architecture – Interconnection with UMTS and GSM – LTE Advanced (3GPPP Release 10) – 4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modelling for 4G

UNIT V 5G NETWORKS

Introduction – Pillars – IoT and Context Awareness – Networking Reconfiguration and Virtualization Support – Mobility – QoS Control – Approach for resource over-provisioning – Smart Cells – Capacity limits and achievable gains with densification – Mobile data demand – Next Generation Wireless Networks – Mobile clouds – Technologies and Services for Future Communication Platforms – Cognitive Radio for 5G Wireless Networks.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Primary book:

1 . Martin Sauter, “From GSM to LTE, An Introduction to Mobile Networks and Mobile Broadband”, Wiley, 2014.

Reference BookS:

1. William Stallings, “High Speed Networks and Internets: Performance and Quality of Service”, Prentice Hall, Second Edition, 2002.
2. Savo G Glisic, “Advanced Wireless Networks – 4G Technologies”, John Wiley & Sons, 2007.
3. Jonathan Rodriguez, “Fundamentals of 5G Mobile Networks”, Wiley, 2015.
4. Naveen Chilamkurti, SheraliZeadally, HakimaChaouchi, “Next-Generation Wireless Technologies”, Springer, 2013.
5. Martin Sauter, “Beyond 3G – Bringing Networks, Terminals and the Web Together: LTE, WiMAX, IMS, 4G Devices and the Mobile Web 2.0”, Wiley, 2009.
6. Erik Dahlman, Stefan Parkvall, Johan Skold, “4G: LTE/LTE-Advanced for Mobile Broadband”, Academic Press, 2013.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain network architecture and QoS.	K1, K2
CO2	Describe cellular networks and mobility management.	K3, K4
CO3	Apply wireless network functionalities and security.	K5
CO4	Analyze 4G network protocols and optimization.	K3, K4
CO5	Evaluate 5G technologies and future platforms.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS096P **CC-XL**

Credits: 2 **L-P-C: 0-3-2**

LAB XI - ADVANCED DATA STRUCTURE AND ALGORITHMS

OBJECTIVES:

- To learn to design and implement searching algorithms.
- To learn to implement concurrent data structures.

List of Programs:

1. Linked list implementation of Stack and Queue ADTs
2. Binary Search tree
3. Min/Max Heap
4. AVL tree
5. Red- Black tree
6. Splay Tree
7. Leftist Heap
8. Binomial Heap

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Implement stack and queue using linked list.	K1, K2
CO2	Describe binary search tree operations.	K3, K4
CO3	Apply min/max heap construction.	K5
CO4	Analyze AVL and red-black trees.	K3, K4
CO5	Evaluate advanced heaps and tree structures.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS097P **CC-XLI**

Credits: 2 **L-P-C: 0-3-2**

LAB XII – FULL STACK WEB APPLICATION DEVELOPMENT

OBJECTIVES:

- To learn to design and implement searching algorithms.
- To learn to implement concurrent data structures.

List of Programs

1. Implement JavaScript functions, arrays, objects, strings
2. installing Node.js, Using createRoot() and render() methods,
3. Using React Class and function components, properties, events, conditionals, forms
4. Implementing simple UI like menus
5. Implement simple Client-server communication using TOMCAT from REACT client
6. installing any IDE like STS (Spring Tool Suite) and configuring for spring application
7. Creating Spring Boot project with Spring Initialize
8. implementing a simple hello world web application
9. Install MongoDB Atlas Cluster, use Dependencies, Spring Web and Spring Data MongoDB, Docker, Container
10. Create a CRUD application with MongoDB and Spring Boot.
11. Building RESTful web services with annotations: Rest controller, Request mapping, Request Body, Path Variable.
12. Building Microservice: using the dependencies on the Spring Initialize - Spring Web, Spring Boot DevTools, Spring Boot Actuator, Config Client

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Implement JavaScript functions and components.	K1, K2
CO2	Describe client-server communication with React.	K3, K4
CO3	Apply Spring Boot to build web apps.	K5
CO4	Analyze MongoDB and Spring integration.	K3, K4
CO5	Evaluate RESTful services and microservices.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24VAC05 **VAC-IV**

AUTONOMONUS SYSTEMS

OBJECTIVES:

- To provide a Complete Knowledge about the Autonomous systems
- Explain the definition and usage of the term "Autonomous systems in different contexts.
- Understand where the Autonomous systems concept fits within the broader ICT industry and possiblefuture trends.
- Appreciate the role of big data, cloud computing and data analytics in a typical Autonomous systemssystem.

UNIT I INTRODUCTION TO AUTONOMOUS DRIVING

Autonomous Driving Technologies Overview – Autonomous Driving Algorithms –Autonomous Driving Client System – Autonomous Driving Cloud Platform – Components of autonomy – Difference between Unmanned and Autonomous Vehicles – Introduction to Unmanned Aerial Vehicles (UAVs) – History of UAVs – Classification: scale, lift generation method – Applications: Military, Government and Civil, Application of CARLA simulator in AGVs.

UNIT II SENSORS FOR AUTONOMOUS GROUND VEHICLES 9

Sensor Characteristics –Vehicle Internal State Sensing: OEM Vehicle Sensors, GPS, Inertial Measurements, Magnetometer – External World Sensing: RADAR, Lidar, Image Processing Sensors, IMU sensor for Raspberry Pi, Jetson.

UNIT III ENVIRONMENT PERCEPTION AND MODELING 9

Road Recognition: Basic Mean Shift Algorithm, Mean Shift Clustering, Mean Shift Segmentation, Mean Shift Tracking, Road Recognition Algorithm –Vehicle Detection and Tracking: Generating ROIs, Multi Resolution Vehicle Hypothesis, Vehicle Validation using Gabor Features and SVM, Boosted Gabor Features – Multiple Sensor Based Multiple Object Tracking.

UNIT IV NAVIGATION FUNDAMENTALS 9

Introduction – Navigation: GNSS Overview, GPS, GLONASS, Galileo, Compass – Inertial Navigation Overview: Inertial Sensor Technology – GNSS/INS Integration Overview – Case Study on Kalman Filtering.

UNIT V VEHICLE CONTROL AND CONNECTED VEHICLE 9

Vehicle Control: Cruise Control, Antilock Brake Systems, Steering Control and Lane Following, Parking – Connected Vehicles: Vehicle to Vehicle Communication, Vehicle to Infrastructure Communication, Device to Device Communication, Security for Autonomous Ground Vehicles.

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned

Primary book:

1. Shaoshan Liu, Liyun Li, Jie Tang, Shuang Wu, Jean-Luc Gaudiot, "Creating Autonomous Vehicle Systems", Morgan & Claypool, 2018.

REFERENCES:

1. Umit Ozguner, Tankut Acarman, Keith Redmill, "Autonomous Ground Vehicles", Artech House, 2011.
2. A. R. Jha, " Theory, design and applications of Unmanned Aerial Vehicles", 2016.
3. Hong Cheng, "Autonomous Intelligent Vehicles Theory, Algorithms, and Implementation", Springer, 2011.
4. Mohinder S. Grewal, Angus P. Andrews, Chris G. Bartone, "Global Navigation Satellite Systems, Inertial Navigation, and Integration", Third Edition, John Wiley & Sons, 2013.
5. Kenzo Nonami, Muljiowidodo Kartidjo, "Autonomous Control Systems and Vehicles", Intelligent Unmanned Systems, Springer, 2013.
6. Anthony Finn, Steve Scheding, "Development and challenges for Autonomous Unmanned Vehicles", A compendium, Springer, 2010.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain autonomous driving technologies and systems.	K1, K2
CO2	Describe sensors for autonomous ground vehicles.	K3, K4
CO3	Apply environment perception and tracking methods.	K5
CO4	Analyze navigation fundamentals and integration.	K3, K4
CO5	Evaluate vehicle control and communication systems.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

X SEMESTER

Course Code: 24MTCS101 **CC-XLII**

Credits: 4 **L-P-C: 5-0-4**

MULTICORE ARCHITECTURE

OBJECTIVES:

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multithreaded programming.
- To learn about the various parallel programming paradigms,
- To develop multicore programs and design parallel solutions.

UNIT I- MULTI-CORE PROCESSORS

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks – Symmetric and Distributed Shared Memory Architectures – Cache coherence – Performance Issues – Parallel program design.

UNIT II PARALLEL PROGRAM CHALLENGES

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs – Library functions – Handling Data and Functional Parallelism – Handling Loops – Performance Considerations.

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI

Case studies – n-Body solvers – Tree Search – OpenMP and MPI implementations and comparison.

REFERENCE BOOKS:

1. Peter S. Pacheco, "An Introduction to Parallel Programming, Morgan-Kauffman/Elsevier, 2021.
2. Darryl Gove, "Multicore Application Programming for Windows, Linux, and Oracle Solaris, Pearson, 2011 (unit 2)
3. Michael J Quinn, "Parallel programming in C with MPI and OpenMP, Tata McGraw Hill,2003.
4. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.
5. Yan Solihin, Fundamentals of Parallel Multicore Architecture, CRC Press, 2015.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain multi-core architectures and performance issues.	K1, K2
CO2	Describe parallel programming challenges and synchronization.	K3, K4
CO3	Apply OpenMP for shared memory programming.	K5
CO4	Analyze distributed memory programming with MPI.	K3, K4
CO5	Evaluate OpenMP and MPI implementations.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS102 **CC-XLIII**

Credits: 4 **L-P-C: 5-0-4**

BIG DATA ANALYTICS

OBJECTIVES:

- To explore the fundamental concepts of big data analytics.
- To understand big data security.
- To understand the applications using Map Reduce Concepts.
- To learn Hive and HBase Apache Hive configuration, creating tables and working on the database.
- To learn Pig, its installation and working on its various functions.

UNIT I

Fundamentals of Big Data Understanding Big Data: Concepts and Terminology – Big Data Characteristics – Types of Data – Case Study Background – Drivers for Big Data Adoption: Information and Communication Technology – Big Data Analytics Lifecycle

UNIT II

Fundamentals of Hadoop Core components of Hadoop- Apache Hadoop – HDFS Daemons – MapReduce Daemons – HDFS High Availability Daemons – Benefits and Challenges of HDFS –File Sizes, Block Sizes and Block Abstraction in HDFS – Data Replication – How does HDFS Store,Read, and Write Files? – Data Serialization Options – File System Shell Commands for HDFS

UNIT III

HDFS and MapReduce Choosing Key and Value Types for MapReduce Jobs – The Relationship ofInput Keys to Output Keys – Sorting Keys and Values – Sort and Shuffle Process – MapReduce JobConfiguration and Submission Hadoop Distributed File System – MapReduce Framework – Settingthe Environment – Hadoop Cluster Modes – Running a MapReduce Job with the MR1Framework -Running a MapReduce Job with the Yarn Framework – Running Hadoop Streaming

UNIT IV

Hive and HBase Apache Hive: Setting the Environment – Configuring Hadoop, Hive – StartingHDFS, Hive Server, CLI – Creating and Using a Database– Creating a Managed Table – Loadingdata into a Table – Creating a Table using LIKE – Adding Data into a Table from Queries – AddingData using INSERT INTO TABLE - Adding Data using INSERT OVERWRITE – Creating a tableusing CREATE TABLE AS SELECT – Altering, Truncating and Dropping a Table– Creating anExternal Table – Apache HBase: Setting the Environment - Configuring Hadoop, Hive and HBase –Starting the HBase and HBase Shell-Creating HBase Table – Adding Data to a Table – Listing allTables – Getting a Row of Data – Scanning a Table – Counting the Number of Rows in a Table –Altering
Table – Deleting a Table Row, Column – Disabling and Enabling a Table – Truncating and Dropping a Table – Determining If Table Exists – Creating a Hive External Table stored by HBase.
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UNIT V

Pig Introduction – Installing and Running Pig – Grunt – Pig_s Data Model – Introduction to Pig Latin – Advanced Pig Latin – Developing and Testing Pig Latin Scripts – Making Pig Fly – Writing Evaluation and Filter Functions – Writing and Loading Store Function

UNIT VI

CURRENT CONTOURS (For continuous internal assessment only):
Contemporary Developments Related to the Course during the SemesterConcerned

Reference books:

1. Alan Gates, ―Programming Pig‖, Oreilly Publication, 2011.
2. Deepak Vohra, ―Practical Hadoop Ecosystem: A Definitive Guide to Hadoop-Related Frameworks and Tools‖, Apress, 2016.
3. Thomas Erl, WajidKhattak, Paul Buhler, ―Big Data Fundamentals Concepts, Drivers & Techniques‖, Service Tech Press, 2015.
4. SoumendraMohanty, MadhuJagadeesh and HarshaSrivatsa, ―Big Data Imperatives: Enterprise Big Data Warehouse, BI Implementations and Analytics‖ Apress Media, Springer Science, Business Media New York, 2013
5. AnandRajaraman, Jure Leskovec, Jeffery D. Ullman, ―Mining of Massive Datasets‖, Springer, July 2013.
6. Tom White, ―Hadoop: The definitive Guide‖, O'Reilly Media, 2010.

Reference books:

1. Noreen Burlingame , ―The little book on Big Data‖, New Street publishers, 2012.
2. Anil Maheshwari, ― Data Analytics‖, McGraw Hill Education, 2017.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Understand big data concepts and lifecycle.	K1, K2
CO2	Explain Hadoop core components and benefits.	K3, K4
CO3	Apply MapReduce for data processing.	K5
CO4	Analyze Hive and HBase for data management.	K3, K4
CO5	Evaluate Pig scripts and data models.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS103 **CC-XLIV**

Credits: 4 **L-P-C: 5-0-4**

DIGITAL FORENSICS & CYBER SECURITY

OBJECTIVES:

Students should be able to understand.

- The difference between threat, risk, attack and vulnerability.
- How threats materialize into attacks.
- Where to find information about threats, vulnerabilities and attacks.
- Typical threats, attacks and exploits and the motivations behind them.

UNIT I DIGITAL FORENSICS:

Introduction to Digital Forensics, Open Source Examination Platform - Using Linux and Windows as the Host, Disk and File System Analysis, Media Analysis Concepts , Sleuth Kit, Partitioning and Disk Layouts, Special Containers, Hashing, Forensic Imaging, Internet Artifacts, Browser & Mail Artifacts, File Analysis, Image, Audio, Video, Archives, Documents, Graphical Investigation Environments, PyFLAG, Fiwalk, Forensic Ballistics and Photography, Face, Iris and Fingerprint Recognition.

UNIT II LAWS AND ACTS

Laws and Ethics, Digital Evidence Controls, Evidence Handling Procedures, Basics of Indian Evidence ACT IPC and CrPC , Electronic Communication Privacy ACT, Legal Policies.

UNIT III INTRODUCTION TO CYBER SECURITY

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls - Authentication - Access Control and Cryptography - Web—User Side - Browser Attacks - Web Attacks Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT IV SECURITY IN OPERATING SYSTEM & NETWORKS

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service

UNIT V DEFENCES: SECURITY COUNTERMEASURES

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database

Disclosure - Data Mining and Big Data.

REFERENCE BOOKS:

1. Cory Altheide and Harlan Carvey, ―Digital Forensics with Open Source Tools‖ Elsevier publication, April 2011

2. .Kevin Mandia, Chris Prosise, Matt Pepe, ―Incident Response and Computer Forensics ―, TataMcGraw -Hill, New Delhi, 2006.

3. .Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015

4. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.

5. Martti Lehto, Pekka Neittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Understand digital forensics tools and techniques.	K1, K2
CO2	Explain laws and evidence handling procedures.	K3, K4
CO3	Apply cybersecurity concepts to mitigate threats.	K5
CO4	Analyze security in operating systems and networks.	K3, K4
CO5	Evaluate cryptographic measures and defenses.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS104 **CC-IV**

Credits: 4 **L-P-C: 5-0-4**

NATURAL LANGUAGE PROCESSING

OBJECTIVES:

- To understand the algorithms available for the processing of linguistic information and computational properties of natural languages
- To conceive basic knowledge on various morphological, syntactic and semantic NLP tasks.
- To identify and apply the appropriate training in NLP.
- To classify Language modeling.
- To study the applications of NLP.

UNIT I

Introduction to NLP: NLP – introduction and applications, NLP phases, Difficulty of NLP including ambiguity; Spelling error and Noisy Channel Model; Concepts of Parts-of-speech and Formal Grammar of English

UNIT II

Language Modeling: N-gram and Neural Language Models Language Modeling with N-gram, Simple N-gram models, Smoothing (basic techniques), Evaluating language models; Neural Network basics, Training; Neural Language Model, Case study: application of neural language model in NLP system development

UNIT III

Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tag set; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POS Tagging using Neural Model.

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UNIT IV

Parsing Basic concepts Parts-of-speech Tagging Parts-of-speech Tagging: basic concepts; Tagset; Early approaches: Rule based and TBL; POS tagging using HMM, Introduction to POSTagging using Neural Model. top down and bottom up parsing, treebank; Syntactic parsing:CKY parsing; Statistical Parsing basics: Probabilistic Context Free Grammar (PCFG);Probabilistic CKY Parsing of PCFGs.

UNIT V

Semantics Vector Semantics; Words and Vector; Measuring Similarity; Semantics with dense vectors; SVD and Latent Semantic Analysis; Embedding from prediction: Skip-gram and CBOW; Concept of Word Sense; Introduction to WordNet.

Unit VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned.

REFERENCE BOOKS:

1. Daniel Jurafsky and James H. Martin J.S., "Speech and language processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech

Recognition", 2nd Edition, Upper Saddle River, NJ: Prentice-Hall, 2008.
2. Goldberg Yoav "A Primer on Neural Network Models for Natural Language Processing".

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Understand NLP phases and applications.	K1, K2
CO2	Explain language modeling with N-grams.	K3, K4
CO3	Apply POS tagging methods in NLP.	K5
CO4	Analyze parsing techniques and treebanks.	K3, K4
CO5	Evaluate vector semantics and word embeddings.	K6, K7
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS106P **CC-XLVI**

Credits: 2 **L-P-C: 0-3-2**

LAB-XII BIG DATA ANALYTICS

OBJECTIVES:

- To implement mathematical aggregation operators in ―R-script‖.
- To understand the Statistical operations in ―R‖.
- To learn KNN applications for data processing.
- To understand different data analytics techniques.
- To understand the practical application of data processing.

LIST OF PROBLEMS:

1. To get the input from the user and perform numerical operations (MAX, MIN, AVG, SUM, SQRT, ROUND) using in R.
2. To perform data import/export (.CSV, .XLS, .TXT) operations using data frames in R.
3. To get the input matrix from the user and perform Matrix addition, subtraction, multiplication, inverse transpose, and division operations using vector concept in R.
4. To perform statistical operations (Mean, Median, Mode, and Standard deviation) using R.
5. To perform data pre-processing operations i) Handling Missing data ii) Min-Max normalization
6. To perform dimensionality reduction operation using PCA for Houses Data Set
7. To perform Simple Linear Regression with R.
8. To perform K-Means clustering operation and visualize for iris data set
9. Write R script to diagnose any disease using KNN classification and plot the results.
10. To perform market basket analysis using Association Rules (Apriori).

E-RESOURCES:

1. https://www.analyticsvidhya.com/trainings/data-analytics-using-r-analytics-lab/
2. https://r4ds.had.co.nz/introduction.html
3. https://www.youtube.com/watch?v=32o0DnuRjfg

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Perform numerical operations in R.	K1, K2
CO2	Import/export data using R data frames.	K3, K4
CO3	Execute matrix operations in R.	K5
CO4	Conduct statistical analysis in R.	K6, K7
CO5	Apply PCA and clustering for data analysis.	K5
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS107P **CC-XLVII**

Credits: 2 **L-P-C: 0-3-2**

NATURAL LANGUAGE PROCESSING LAB

OBJECTIVES:

To familiarize the students with practical aspects of processing Natural Language.

- To Understand the Logic of NLP Techniques.
- To Know the Implementation of NLP Techniques.
- To Apply Present Compatible Programming Language for NLP.

LIST OF PROGRAMS:

1. Tokenizing Text and WordNet basics: Tokenizing text into sentences, Tokenizing sentences into words, Tokenizing sentences using regular expressions, Filtering stop words in a tokenized sentence, Looking up synsets for a word in WordNet, Looking up lemmas and synonyms in WordNet, Calculating WordNet synset similarity Discovering word collocations.

2. Replacing and correcting words: Stemming words, Lemmatizing words with WordNet, Translating text with Babelfish, Replacing words matching regular expressions, Removing repeating characters, Spelling correction with Enchant, Replacing synonyms, Replacing negations with antonyms.

3. Creating Custom Corpora : Setting up acustom corpus, Creating a word list corpus, Creating a part of speech tagged word corpus, Creating a chunked phrase corpus, Creating a categorized text corpus, Creating a categorized chunk corpus reader, Lazy corpus loading, Creating a custom corpus view, Creating a MongoDB backed corpus reader, Corpus editing with file locking.

4. Parts-of -Speech Tagging: Training a unigram part-of-speech tagger, Combining taggers with backoff tagging, Training and combining Ngram taggers, Creating a model of likely word tags, Tagging with regular expressions, Affix tagging, Training a Brill tagger, Training the TnT tagger Using WordNet for tagging, Tagging proper names, Classifier based tagging.

5. Extracting Chunks : Chunking and chinking with regular expressions, Merging and splitting chunks with regular expressions, Expanding and removing chunks with regular expressions, Partial parsing with regular expressions, Training a tagger-based chunker, Classification-based chunking, extracting named entities, Extracting proper noun chunks, Extracting location chunks, Training a named entity chunker.

6. Transforming Chunks and Trees: Filtering insignificant words, Correcting verb forms, Swapping verb phrases, Swapping noun cardinals, Swapping infinitive phrases, Singularizing plural nouns, Chaining chunk transformations, Converting a chunk tree to text, Flattening a deep tree, Creating a shallow tree, Converting tree nodes.

7. Parsing Specific Data: Parsing dates and times with Date util, Time zone lookup and conversion, Tagging temporal expressions with Timex, Extracting URLs from HTML

with lxml, Cleaning and stripping HTML, Converting HTML entities with Beautiful Soup.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Tokenize text and use WordNet.	K1, K2
CO2	Replace and correct words.	K3. K4
CO3	Create custom corpora.	K5, K6
CO4	Perform parts-of-speech tagging.	K5, K6
CO5	Extract and transform chunks.	K4, K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

XI SEMESTER

Course Code: 24MTCS111 **CC- XLVIII**

Credits: 2 **L-P-C: 3-0-2**

RESEARCH METHODOLOGY AND IPR

Objective

- To develop an appropriate framework for research studies.
- To develop an understanding of various research designs and techniques.
- To identify various sources of information for literature review and data collection.
- To develop an understanding of the ethical dimensions of conducting applied research.
- To Demonstrate enhanced Scientific writing skills, academic writing, patenting and avoid the common mistakes in the field of research methodology.

UNIT I: Research Problem Formulation

Objectives of research, types of research, research process, approaches to research; conducting literature review- information sources, information retrieval, tools for identifying literature, Indexing and abstracting services, Citation indexes, summarizing the review, critical review, identifying research gap, conceptualizing and hypothesizing the research gap.

UNIT II: Research Design and Data Collection

Statistical design of experiments- types and principles; data types & classification; data collection - methods and tools

UNIT III: Data Analysis, Interpretation and Reporting

Sampling, sampling error, measures of central tendency and variation,; test of hypothesis-concepts; data presentation- types of tables and illustrations; guidelines for writing the abstract, introduction, methodology, results and discussion, conclusion sections of a manuscript; guidelines for writing thesis, research proposal; References – Styles and methods, Citation and listing system of documents; plagiarism, ethical considerations in research

UNIT IV: Intellectual Property Rights

Patent, Designs, Trademarks and Trade secrets, Geographical indications, Copy rights, applicability of these IPR; , IPR & biodiversity; IPR development process, role of WIPO and WTO in IPR establishments,

common rules of IPR practices, types and features of IPR agreement, functions of UNESCO in IPR maintenance

UNIT IV: Patents

Patents – objectives and benefits of patent, concept, features of patent, inventive steps, specifications, types of patent application; patenting process - patent filling, examination of patent, grant of patent, revocation; equitable assignments; Licenses, licensing of patents; patent agents, registration of patent agents

Reference Book:

1. Cooper Donald R, Schindler Pamela S and Sharma JK, "Business Research Methods", Tata McGraw Hill Education, 11e (2012).

2. Soumitro Banerjee, "Research methodology for natural sciences", IISc Press, Kolkata, 2022,

3. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.

4. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007.

5. The Institute of Company Secretaries of India, Statutory body under an Act of parliament, "Professional Programme Intellectual Property Rights, Law and practice", September 2013.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Formulate research problem and objectives	K1,K2
CO2	Conduct literature review and gap analysis	K3,K4
CO3	Design experiments and collect data	K5
CO4	Analyze data and report findings	K6,K7
CO5	Understand IPR and patenting process	K3,K4
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS112 **CC- XLIX**

Credits: 4 **L-P-C: 4-0-4**

IMAGE PROCESSING AND COMPUTER VISION

Objective

- Understand the Fundamentals of Image Processing.
- Apply Image Enhancement Techniques and Transforms.
- Master Image Restoration and Boundary Detection Methods.
- Perform Image Segmentation and Feature Extraction.
- Utilize Image Classifiers and Clustering Techniques.

UNIT I Fundamentals of Image Processing

Introduction – Applications of Image Processing – Steps in Image Processing Applications – Human vision and color perception- Digital Imaging System – Imaging sensors-Sampling and Quantization – Pixel Connectivity – Distance Measures – Colour Fundamentals and Models – File Formats – Image Operations.

UNIT II Image Enhancement and Transforms

Image Transforms: Discrete Fourier Transform – Fast Fourier Transform – – Wavelet Transforms -Image Enhancement in Spatial and Frequency Domain – Grey Level Transformations – Histogram Processing –Spatial Filtering – Smoothing And Sharpening – Frequency Domain: Filtering in Frequency Domain.

UNIT III Restoration and Boundary Detection

Image Restoration – Image Degradation Model – Noise Modeling – Blur – Order Statistic Filters – Image Restoration - Morphological Operations- Dilation-Erosion-Opening-Closing- Edge Detection-Corner Detection - Detection Of Discontinuities Edge Linking and Boundary Detection.

UNIT IV Image Segmentation and Feature Extraction

Image Segmentation — Thresholding – Region based Segmentation – Image Features and Extraction – Image Features – Types of Features – Feature extraction – SIFT ,SURF– Feature reduction algorithms- PCA.

UNIT V Image Classifier and Applications

Image Classifiers – Supervised Learning – Maximum Likely Hood-Minimum Distance –

Parallopiped-Support Vector Machines, Image Clustering – Unsupervised Learning – K-meansHierarchical and Partition Based Clustering Algorithms –ANN – Deep Learning Image Classifier.

REFERENCES:

1. Rafael Gonzalez, Richard E. Woods, “Digital Image Processing”, Fourth Edition, Pearson Education, 2018
2. S. Sridhar, “Digital Image Processing”, Second Edition, Oxford University Press, 2016.
3. Forsyth and Ponce, “Computer Vision – A Modern Approach”, Second Edition, Prentice Hall, 2011.
4. Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice Hall Information , 2011
5. Milan Sonka, Vaclav Hlavac, Roger Boyle, “Image Processing Analysis and Machine Vision”, Fourth Edition, Cengage India, 2017.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Understand image processing fundamentals	K1,K2
CO2	Apply image enhancement techniques	K3,K4
CO3	Perform image restoration and boundary detection	K5
CO4	Segment images and extract features	K3,K4
CO5	Implement image classifiers and clustering	K5,K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes

COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS113 **CC-L**

Credits: 4 **L-P-C: 5-0-4**

BLOCK CHAIN TECHNOLOGY

Objectives:

- To Introduce the Concepts of Block chain Technologies.
- To be familiar with the types of Block chain.
- To understand the concept of Private and Public Block chain
- To understand the Security in Block chain Technology.
- To know the Applications of Block chain Technology.

UNIT I: FUNDAMENTALS OF BLOCK CHAIN :
Introduction - Origin of Blockchain - Blockchain Solution - Components of Blockchain - Components of Blockchain - Block in Blockchain - The Technology and the Future

UNIT II: BLOCKCHAIN TYPES AND CONSENSUS MECHANISM :

Introduction-Decentralization and Distribution - Types of Blockchain - Consensus Protocol - CRYPTOCURRENCY - BITCOIN, ALTCOIN and TOKEN : Introduction - Bitcoin and Cryptocurrency Basics - Types of Cryptocurrency - Cryptocurrency Usage

UNIT III: PUBLIC BLOCKCHAIN SYSTEM :

Introduction - Public Blockchain - Popular Public Blockchains - The Bitcoin Clockchain - Etherum Blockchain

UNIT IV: PRIVATE BLOCKCHAIN SYSTEM :

Introduction - Key Characteristics of Private Blockchain - Why We Need Private Blockchain - Private Blockchain Examples - Private Blockchain and Open Source - E-Commerce Site Examples - Varous Commands in E-Commerce Blockchain - Smart Contract in Private Environment - State Machine - Different Algorithms of Permissioned Blockchain - Byzantine Fault - Multichain

UNIT V: SECURITY IN BLOCKCHAIN : Introduction - Security Aspects in Bitcoin - Security and Privacy Challenges of Blockchain in General - Performance and Scalability - Identity Management and Authentication - Regularity Compliance and Assurance -Safeguarding Blockchain Smart Contract - Security Aspects in Hyperledger Fabric - APPLICATIONS OF BLOCKCHAIN : Blockchain in Banking and Finance - Blockchain inHealthcare.

Unit VI

Current Contours (for Continuous Internal Assessment Only): Contemporary DevelopmentsRelated to the Course during the Semester Concerned.

Text Book:

1. Blockchain Technology, Chandramouli Subramaniam, Asha A George, Abhilash K A,Meera Karthikeyan, University Press, 2020

Reference Books:

1. Blockchain Basics: A Non-Technical Introduction, Daniel Drescher, Apress, 2017
2. BlockChain From Concept to Execution, Debajani Mohanty, BPB,2018

E-Resourses

1 . https://www.pdfdrive.com/blockchain-books.html2.https://www.blockchain.com/

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Explain blockchain fundamentals and components	K1,K2
CO2	Describe blockchain types and consensus mechanisms	K3,K4
CO3	Analyze public blockchain systems	K5,K6
CO4	Explore private blockchain systems	K7
CO5	Evaluate blockchain security and applications	K1,K2
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation;K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

Course Code: 24MTCS116 **CC-LI**

Credits: 4 **L-P-C: 0-10-4**

PROJECT PHASE-I

Course Code: 24VAC04 **VAC-V**

DRONE TECHNOLOGY

OBJECTIVES:

- To understand the basics of drone concepts
- To learn and understand the fundaments of design, fabrication and programming of drone
- To impart the knowledge of an flying and operation of drone
- To know about the various applications of drone
- To understand the safety risks and guidelines of fly safely

UNIT I INTRODUCTION TO DRONE TECHNOLOGY

Drone Concept - Vocabulary Terminology- History of drone - Types of current generation of drones based on their method of propulsion.

UNIT II DRONE TECHNOLOGY IN BUSINESS

Drone technology impact on the businesses- Drone business through entrepreneurship- Opportunities/applications for entrepreneurship and employability.

UNIT III DRONE PROGRAMMING

The methods of programming drone- Download program Install program on computer- Running Programs

UNIT IV DRONE SAFETY

The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license.

UNIT V FUTURE DRONES

Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms

UNIT VI

Current Contours (for Continuous Internal Assessment Only): Contemporary Developments Related to the Course during the Semester Concerned

Primary book:

1. Daniel Tal and John Altschuld, “Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation”, 2021 John Wiley & Sons, Inc.

2. Terry Kilby and Belinda Kilby, “Make: Getting Started with Drones “,Maker Media, Inc, 2016

REFERENCES:

1. John Baichtal, “Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs”, Que Publishing, 2016

2. Zavrsnik, “Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance”, Springer, 2018.

Expected Course Outcomes:

On the completion of the course the student will be able to

COs	Course Outcome	Knowledge Level
CO1	Understand drone technology and history.	K1, K2
CO2	Analyze drone impact on business.	K3, K4
CO3	Implement drone programming methods.	K5
CO4	Apply drone safety guidelines and regulations.	K3, K4
CO5	Explore future drone advancements.	K5, K6
K1 - Knowledge; K2 - Understanding; K3 - Practice; K4 – Analysis; K5 - Synthesis; K6 – Creation; K7- Evaluation		

Mapping with Programme Outcomes													
COS	Programme Outcomes					Programme Specific Outcomes							
	PO1	PO2	PO3	PO4	PO5	PS01	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	S	M	M	S	L	M	S	M	L	M	S	L	M
CO2	S	M	M	S	L	M	S	M	L	M	S	L	M
CO3	S	S	S	S	L	S	S	M	M	S	S	L	M
CO4	S	S	S	M	L	S	S	M	M	S	M	L	M
CO5	S	S	S	M	L	S	S	M	M	S	M	L	M
S-Strong; M-Medium; L-Low													

XII SEMESTER

Course Code: 24MTCS121 **CC-LII**

Credits: 12 **L-P-C: 10-20-12**

PROJECT PHASE II