K.S. Rangasamy College of Technology

(Autonomous)

CURRICULUM & SYLLABI

Of

MASTER OF COMPUTER APPLICATIONS

(For the Batch Admitted in 2025 - 2026)

R 2025

NAAC with 'A++' Grade,
Approved by AICTE, Affiliated to Anna University, Chennai

KSR Kalvi Nagar, Tiruchengode – 637 215.
Namakkal District, Tamil Nadu, India

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

DEPARTMENT OF MASTER OF COMPUTER APPLICATIONS

VISION OF THE DEPARTMENT

- To be a premier department in computer applications, empowering students with advanced technological expertise, fostering innovation and shaping ethical leaders to contribute to global progress and societal well-being.

MISSION OF THE DEPARTMENT

- Provide a dynamic learning environment that integrates cutting-edge technology, industry exposure, and ethical values.
- Enable students to excel as competent professionals in the evolving field of computer applications.
- Foster innovation and problem-solving skills to meet real-world challenges.
- Cultivate a sense of responsibility, ethics, and commitment towards society and the IT industry.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO1 : Graduates of the program will apply the fundamental concepts of Computer Science and Applications to pursue successful careers in the software industry and academia, leveraging their knowledge in both theoretical and application-oriented courses.

PEO2 : Graduates of the program will apply software technology to solve problems in mathematics, science, computing, and communication networking, while engaging in lifelong learning to pursue research-oriented initiatives.

PEO3 : Graduates of the program will prepare themselves for personal and professional success, both individually and as part of a team, with a strong sense of excellence, leadership, and a commitment to their ethical and social responsibilities.

PROGRAMME OUTCOMES (POs)

MCA Graduates will be able to:

PO1 (Foundation Knowledge): Apply knowledge of mathematics, programming logic and coding fundamentals for solution architecture and problem solving.

PO2 (Problem Analysis): Identify, review, formulate and analyse problems for primarily focussing on customer requirements using critical thinking frameworks.

PO3 (Development of Solutions): Design, develop and investigate problems with as an innovative approach for solutions incorporating ESG/SDG goals.

PO4 (Modern Tool Usage): Select, adapt and apply modern computational tools such as development of algorithms with an understanding of the limitations including human biases.

PO5 (Individual and Teamwork): Function and communicate effectively as an individual or a team leader in diverse and multidisciplinary groups. Use methodologies such as agile.

PO6 (Project Management and Finance): Use the principles of project management such as scheduling, work breakdown structure and be conversant with the principles of Finance for profitable project management.

PO7 (Ethics): Commit to professional ethics in managing software projects with financial aspects. Learn to use new technologies for cyber security and insulate customers from malware

PO8 (Life-long learning): Change management skills and the ability to learn, keep up with contemporary technologies and ways of working.

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K.S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE - 637215

(An Autonomous Institution, Affiliated to Anna University, Chennai)

COURSES OF STUDY

(For the candidates admitted from 2025 - 2026 onwards)

SEMESTER I

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	70 PMC 101	Mathematical Foundations of Computer Applications	PC	5	3	1	0	4
2.	70 PMC 102	Data Structures and Algorithms	PC	3	3	0	0	3
3.	70 PMC 103	Database Technologies	PC	3	3	0	0	3
4.	70 PMC 104	Java Programming	PC	5	3	0	2	4
5.	70 PMC 105	Advanced Operating Systems	PC	5	3	1	0	4
6.	70 PMC 106	Advanced Software Engineering	PC	3	3	0	0	3
7.	70 PAC 001	English for Research Paper Writing	AC	2	2	0	0	0
PRACTICALS								
8.	70 PMC 1P1	Data Structures and Algorithms Laboratory	PC	3	0	0	3	1.5
9.	70 PMC 1P2	Database Technologies Laboratory	PC	3	0	0	3	1.5
SKILL ENHANCEMENT COURSE								
10.	70 PCG 001	Career Skill Development - I	CG	2	2	0	0	1*
			Total	**34**	**22**	**2**	**8**	**24**

***Skill Enhancement Courses - additional credit is offered not accounted for CGPA.**

SEMESTER II

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	70 PMC 201	Internet of Things	PC	5	3	0	2	4
2.	70 PMC 202	Software Development for Mobile Devices	PC	3	3	0	0	3
3.	70 PMC 203	Web Technologies	PC	3	3	0	0	3
4.	70 PIS 001	Research Methodology and IPR	PC	3	3	0	0	3
5.	70 PMC E1*	Professional Elective I	PE	3	3	0	0	3
6.	70 PMC E2*	Professional Elective II	PE	3	3	0	0	3
7.	70 PAC 002	Disaster Management	AC	2	2	0	0	0
PRACTICALS								
8.	70 PMC 2P1	Full Stack Development Laboratory	PC	3	0	0	3	1.5
9.	70 PMC 2P2	Mobile Application Development Laboratory	PC	3	0	0	3	1.5
10.	70 PMC 2P3	Mini Project	PC	4	0	0	4	2
SKILL ENHANCEMENT COURSE								
11.	70 PCG 002	Career Skill Development – II	CG	2	2	0	0	1*
12.	70 PCG 004	Internship	CG	-	-	-	-	1/2/3*
			Total	**34**	**22**	**0**	**12**	**24**

***Skill Enhancement Courses - additional credit is offered not accounted for CGPA.**

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SEMESTER III

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	70 PMC 301	Artificial Intelligence and Machine Learning	PC	3	3	0	0	3
2.	70 PMC 302	Cloud Technologies and IT Service Management	PC	3	3	0	0	3
3.	70 PMC 303	Automated Software Testing	PC	5	3	0	2	4
4.	70 PMC E3*	Professional Elective III	PE	3	3	0	0	3
5.	70 PMC E4*	Professional Elective IV	PE	3	3	0	0	3
6.	70 PMC E5*	Professional Elective V	PE	3	3	0	0	3
PRACTICALS								
7.	70 PMC 3P1	Artificial Intelligence and Machine Learning Laboratory	PC	3	0	0	3	1.5
8.	70 PMC 3P2	Cloud Infrastructure & Operations Laboratory	PC	3	0	0	3	1.5
9.	70 PMC 3P3		CG	2	0	0	2	0
SKILL ENHANCEMENT COURSES								
10.	70 PCG 003	Career Skill Development - III	CG	2	2	0	0	1*
11.	70 PCG 004	Internship	CG	-	-	-	-	1/2/3*
			Total	**30**	**20**	**0**	**10**	**22**

***Skill Enhancement Courses - additional credit is offered not accounted for CGPA.**

SEMESTER IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Practical								
1.	70 PMC 4P1	Project Work	CG	24	0	0	24	12
			Total	**24**	**0**	**0**	**24**	**12**

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 82

K.S. RANGASAMY COLLEGE OF TECHNOLOGY

Credit Distribution for M.C.A Program: 2026 - 2027 Batch

S.No.	Category	Credits per Semester				Total Credits	%
		I	II	III	IV		
1.	PC	24	18	13	-	**55**	**66**
2.	PE	-	6	9	-	**15**	**18**
3.	CG	2*	2*	2*+1	12	**13**	**16**
4.	AC	-	-	-	-	**-**	**-**
Total		**24**	**24**	**22**	**12**	**82**	**100**

PC – PROFESSIONAL CORE ; PE – PROFESSIONAL ELECTIVE ; CG - CAREER GUIDANCE COURSE
AC- AUDIT COURSE
* Additional credit is offered not accounted for CGPA.

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PROFESSIONAL ELECTIVE I

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	70 PMC E11	Data Ethics and Privacy	PE	3	3	0	0	3
2.	70 PMC E12	Data Processing Techniques	PE	3	3	0	0	3
3.	70 PMC E13	Network Security Administration	PE	3	3	0	0	3
4.	70 PMC E14	Game Programming	PE	3	3	0	0	3
5.	70 PMC E15	Computer Vision	PE	3	3	0	0	3
6.	70 PMC E16	IoT Systems Design	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE II

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	70 PMC E21	Secure Software Development	PE	3	3	0	0	3
2.	70 PMC E22	Augmented Reality and Virtual Reality Application Development	PE	3	3	0	0	3
3.	70 PMC E23	Principles of Data Science	PE	3	3	0	0	3
4.	70 PMC E24	Embedded Systems for IoT	PE	3	3	0	0	3
5.	70 PMC E25	Data Modelling	PE	3	3	0	0	3
6.	70 PMC E26	Social Network Analysis	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE III

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	70 PMC E31	3D Modelling and Game Design	PE	3	3	0	0	3
2.	70 PMC E32	Big Data Analytics	PE	3	3	0	0	3
3.	70 PMC E33	Ethical Hacking and Network Defence	PE	3	3	0	0	3
4.	70 PMC E34	IoT Application Development	PE	3	3	0	0	3
5.	70 PMC E35	Blockchain Technologies	PE	3	3	0	0	3
6.	70 PMC E36	Next Generation Networks	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE IV

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	70 PMC E41	Responsible AI	PE	3	3	0	0	3
2.	70 PMC E42	Advanced Metaverse Technologies	PE	3	3	0	0	3
3.	70 PMC E43	Wireless Sensor Networks and Body Area Networks	PE	3	3	0	0	3
4.	70 PMC E44	Data Analysis and Visualization	PE	3	3	0	0	3
5.	70 PMC E45	Cyber Ethics and Laws	PE	3	3	0	0	3
6.	70 PMC E46	3D Printing	PE	3	3	0	0	3

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PROFESSIONAL ELECTIVE V

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1.	70 PMC E51	Robotic Operating Systems	PE	3	3	0	0	3
2.	70 PMC E52	Application of Bio Python in Bioinformatics	PE	3	3	0	0	3
3.	70 PMC E53	Generative AI	PE	3	3	0	0	3
4.	70 PMC E54	Business Intelligence for Decision Making	PE	3	3	0	0	3
5.	70 PMC E55	Natural Language Processing	PE	3	3	0	0	3
6.	70 PMC E56	Visualization Techniques	PE	3	3	0	0	3

Professional Electives	Vertical 1	Vertical 2	Vertical 3	Vertical 4	Vertical 5	Vertical 6
Elective – I	Data Ethics and Privacy	Data Processing Techniques	Network Security Administration	Game Programming	Computer Vision	IoT Systems Design
Elective - II	Secure Software Development	Augmented Reality and Virtual Reality Application Development	Principles of Data Science	Embedded Systems for IoT	Data Modelling	Social Network Analysis
Elective - III	3D Modelling and Game Design	Big Data Analytics	Ethical Hacking and Network Defence	IoT Application Development	Blockchain Technologies	Next Generation Networks
Elective - IV	Responsible AI	Advanced Metaverse Technologies	Wireless Sensor Networks and Body Area Networks	Data Analysis and Visualization	Cyber Ethics and Laws	3D Printing
Elective - V	Robotic Operating Systems	Application of Bio Python in Bioinformatics	Generative AI	Business Intelligence for Decision Making	Natural Language Processing	Visualization Techniques

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70 PMC 101	Mathematical Foundations of Computer Applications	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To get exposed to logical arguments and construct simple mathematical statements.
- To provide fundamental principles of combinatorial counting techniques.
- To impart knowledge of the basic concepts of graph theory.
- To provide understanding of formal models of computation and languages.
- To learn the behaviour of state machines in various devices using automata theory.

Pre-requisites

- Basic knowledge of algebra, logic, and mathematical reasoning skills

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the logical arguments and construct simple mathematical statements.	Understand
CO2	Apply permutation, combination in real time situations and solve recurrence relations.	Apply
CO3	Apply graph theory in real life situations.	Apply
CO4	Design computational models and understand formal languages.	Apply
CO5	Understand the relationship between NFAs and regular languages.	Understand

Mapping with Programme Outcomes

COs	POs							
	1	**2**	**3**	**4**	5	6	**7**	8
CO1	3	3	-	3	-	-	-	-
CO2	3	3	-	3	-	-	-	-
CO3	3	3	-	3	-	-	-	-
CO4	3	3	-	3	-	-	-	-
CO5	3	3	-	3	-	-	-	-
3 - Strong; 2 - Medium; 1 - Some								

Assessment Patter

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	**2**	
Remember	10	10	10
Understand	10	10	20
Apply	40	40	70
Analyze	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous R2025

MCA – Master of Computer Applications

70 PMC 101 - MATHEMATICAL FOUNDATIONS OF COMPUTER APPLICATIONS

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	40	60	100

Mathematical Logic Basic connective and truth table – Logical equivalences and implications – Propositional logic – First order Logic –Laws of logic – Rules of Inference – Quantifiers – Universe of discourse – Statement – Calculus – Predicate calculus– Inference Theory – Introduction to proofs - Proof methods and strategy.	[9]
Combinatorics Permutations and Combinations – Mathematical Induction – Pigeonhole principle – Principle of inclusion and exclusion – Recurrence relations – Solution by generating functions and characteristics equations.	[9]
Basic Graph Theory Introduction to graphs – Terminology – Directed and undirected graphs – Adjacency matrices – Incidence matrices –Paths – Euler and Hamiltonian paths – Dijkstra's shortest path algorithm – Tree – Simple applications – Spanning tree– Kruskal algorithm.	[9]
Formal Languages Languages and grammars – Phrase structure grammar – Classification of grammars – Pumping lemma for regular languages – Context free languages.	[9]
Finite State Automata Finite State Automata – Deterministic Finite State Automata (DFA), Non-Deterministic Finite State Automata (NFA) – Equivalence of DFA and NFA – Equivalence of NFA and Regular Languages.	[9]
Total Hours: 45+15(Tutorial)	**60**

Text Book(s):

1. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Tata McGraw Hill, 8th Edition, 2021.
2. Trembley.J.P. and Manohar R. "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw – Hill Publishing Company Limited, 2017

Reference(s):

1. John E. Hopcroft Rajeev Motwani and Jelfrey D.Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education, 3rd edition, 2014.
2. Grimaldi R.P. and Ramana B.V., "Discrete and Combinatorial Mathematics", Pearson Edition, 5th Edition, 2013.
3. Thomas Koshy, "Discrete Mathematics with Applications", Academic Press, 2005.
4. Judithi L. Gersting, "Mathematical Structures for Computer Science", W.H.Freeman and Co., 2014.

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S. No	Topic	No. of hours
1.0	**Mathematical Logic**	
1.1	Basic connective and truth table	1
1.2	Logical equivalences and implications	1
1.3	Propositional logic	1
1.4	Rules of Inference	1
1.5	Quantifiers	1
1.6	Calculus	1
1.7	Predicate calculus	1
1.8	Inference Theory	1
1.9	Introduction to proofs	1
1.10	Proof methods and strategy	1
1.11	Tutorial	2
2.0	**Combinatorics**	
2.1	Permutations	1
2.2	Mathematical Induction	1
2.3	Pigeonhole principle	1
2.4	Principle of inclusion and exclusion	2
2.5	Recurrence relations	2
2.6	Solution by generating functions	1
2.7	Characteristics equations.	2
2.8	Tutorial	2
3.0	**Basic Graph Theory**	
3.1	Directed and undirected graphs	1
3.2	Adjacency matrices	1
3.3	Incidence matrices	1
3.4	Paths	1
3.5	Euler and Hamiltonian paths	1
3.6	Dijkstra's shortest path algorithm	2
3.7	Spanning tree	2
3.8	Kruskal's algorithm	1
3.9	Tutorial	2
4.0	**Formal Languages**	
4.1	Languages and grammars	2
4.2	Phrase structure grammar	2
4.3	Classification of grammars	2
4.4	Pumping lemma for regular languages	2
4.5	Context free languages	2
4.6	Tutorial	2
5.0	**Finite State Automata**	
5.1	Finite State Automata	2
5.2	Deterministic Finite State Automata	2
5.3	Non-Deterministic Finite State Automata	2
5.4	Equivalence of DFA and NFA	2
5.5	Equivalence of NFA and Regular Languages	2
5.6	Tutorial	2
	Total	**60**

Course Designer(s)

1. Dr.K.Kiruthika –kiruthika@ksrct.ac.in

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70 PMC 102	Data Structures and Algorithms	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To impart knowledge on linear data structures such as arrays and lists.
- To introduce non-linear data structures including binary trees, AVL trees, and graphs.
- To develop skills in algorithmic problem-solving and analysis frameworks.
- To explore problem-solving strategies like the divide-and-conquer method, greedy algorithms, and dynamic programming.
- To understand and apply techniques such as backtracking and branch-and-bound.

Prerequisite

- Basic knowledge of Computer Programming Languages

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the linked list on the applications like polynomial addition and multiplication.	Understand
CO2	Apply the stack and queue concepts for the real time scenarios.	Create
CO3	Design an algorithm for finding shortest path problem for the given graph.	Apply
CO4	Design an algorithm to find the solution for applications of trees.	Apply
CO5	Design an algorithm for searching and sorting techniques.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	1	3	2
CO2	3	3	3	3	3	1	3	2
CO3	3	3	3	3	3	1	3	2
CO4	3	3	3	3	3	1	3	2
CO5	3	3	3	3	3	1	3	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	20	20	30
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 102 - Data Structures and Algorithms

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Linear Data Structures – List List ADT Array-based implementation - Linked list implementation - Singly linked lists - Circularly linked lists Doubly-linked lists - Applications of lists -Polynomial Manipulation - All operations (Insertion, Deletion, Merge, and Traversal).	[9]
Linear Data Structures – Stack and Queue Abstract Data Types (ADTs) - Stack ADT - Operations - Static and Dynamic Implementation - Applications - Evaluating arithmetic expressions - Conversion of Infix to postfix expression - Queue ADT - Circular Queue - Priority Queue - Applications of Queue.	[9]
Non-Linear Data Structures - Graphs Representation of Graph - Types of graph – Graph Traversals - Minimum Spanning Trees – Topological Sort - Bi-connectivity - Cut vertex - Euler circuits -Applications of graphs - String Matching - Rabin-Karp Algorithm.	[9]
Non-Linear Data Structures -Trees Tree ADT - Tree Traversals – Binary Tree ADT - Expression Trees- Binary search tree ADT – AVL Trees - BTree - Red Black Trees - Applications of Trees - Heap - Applications of heap.	[9]
Sorting And Searching Searching- Linear Search - Binary Search. Sorting - Sorting: Straight Sorting Method - Quick Sort - Merge Sort - Radix Sort – Hashing: Hash Function - Collision - Clustering - Chaining - Open Addressing - Rehashing - Extendible Hashing - Priority Queue.	[9]
Total Hours:	45

Text Book(s):

1.	Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson, 2020 Units I -V.

Reference(s):

1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, "Introduction to algorithms" PHI, 3rd Edition, 2010.
2.	T.Cormen, C.Lieserson, R.Rivest, and C.Stein, "Introductions to Algorithms", Prentice-Hall/India, 3rd edition, 2009.
3.	VijayalakshmiPai G.A, “Data Structures and Algorithms: Concepts Techniques and Applications", Mc Graw Hill, 2009.
4.	Manesh & Abraham, "C Programming and Data Structures: A Textbook of C programming and Data Structures with solved examples", Notion Press, 2017

Course Contents and Lecture Schedule

S.No	Topics	No. of hours
1.0	**Linear Data Structures – List**	
1.1	List ADT Array-based implementation	1
1.2	Linked list implementation	1
1.3	Singly linked lists	2
1.4	Circularly linked lists	1
1.5	Applications of lists -Polynomial Manipulation -	2
1.6	All operations (Insertion, Deletion, Merge, and Traversal).	2

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2.0	**Linear Data Structures – Stack and Queue**	
2.1	Abstract Data Types (ADTs)- Stack ADT	1
2.2	Operations- Static and Dynamic Implementation	1
2.3	Applications - Evaluating arithmetic expressions	1
2.4	Conversion of Infix to postfix expression	2
2.5	Circular Queue	1
2.6	Priority Queue	1
2.7	Applications of Queue	2
3.0	**Non-Linear Data Structures - Graphs**	
3.1	Representation of Graph	1
3.2	Types of graph- Graph Traversals	1
3.3	Minimum Spanning Trees	2
3.4	Bi-connectivity - Cut vertex	1
3.5	Euler circuits	1
3.6	Applications of graphs	1
3.8	String Matching - Rabin-Karp Algorithm.	2
4.0	**Non-Linear Data Structures -Trees**	
4.1	Tree ADT	1
4.2	Tree Traversals	1
4.3	Binary Tree ADT	1
4.4	Expression Trees	1
4.5	Binary search tree ADT	1
4.6	AVL Trees	1
4.7	BTree	1
4.8	Red Black Trees- Applications of Trees	1
4.9	Heap - Applications of heap.	1
5.0	**Sorting and Searching**	
5.1	Searching- Linear Search- Binary Search	2
5.2	Sorting: Straight Sorting Method	1
5.3	Quick Sort- Merge Sort- Radix Sort	2
5.4	Hashing: Hash Function - Collision	1
5.5	Clustering- Chaining	2
5.6	Extendible Hashing - Priority Queue	1
	Total Hours:	**45**

Course Designer

MS.U.Megala - megala@ksrct.ac.in

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70 PMC 103	Database Technologies	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the fundamentals of database systems.
- To develop skills in database design and normalization.
- To master transaction management and concurrency control.
- To explore indexing and query optimization techniques.
- To familiarize students with advanced database topics and emerging trends.

Prerequisite

- Basic knowledge of computers and fundamental programming concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use the techniques, components and tools of a typical database management system.	Analyse
CO2	Understand basic database concepts, including the structure and operation of the relational data model.	Apply
CO3	Demonstrate the different types of database implementation concepts.	Apply
CO4	Understand the emerging database technologies.	Apply
CO5	Familiarize with NoSQL concepts.	Analyse

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	2	-	2	2	2	-
CO2	3	3	2	-	2	2	2	-
CO3	3	3	2	-	2	-	-	-
CO4	3	3	2	-	2	2	2	-
CO5	3	3	2	-	2	2	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	20	20	30
Analyse	20	20	30
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 103 - Database Technologies

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Database Concepts **Database Systems:** Purpose of Database System - Types of Databases - Problems with File System Data Processing. **Data Models:** Data Modeling and Data Models - The Evolution of Data Models - Degrees of Data Abstraction	[7]
Design Concepts **The Relational Database Model:** A Logical View of Data - Keys - Integrity Rules - Relational Algebra - Relationships within the Relational Database. **Entity Relationship (ER) Modeling:** The Entity Relationship Model (ERM) - Developing an ER Diagram. **Normalization of Database Tables:** Database Tables and Normalization - The Normalization Process - Higher-Level Normal Forms	[11]
Advanced Design and Implementation **Introduction to Structured Query Language (SQL):** Data Definition Commands - Data Manipulation Commands - SELECT Queries - Additional SELECT Query Keywords. **Advanced SQL** SQL Join Operators - Subqueries and Correlated Queries - SQL Functions - Relational Set Operators - Procedural SQL	[9]
Database Design The Systems Development Life Cycle - The Database Life Cycle - Conceptual Design - DBMS Software Selection - Logical Design - Physical Design	[8]
Advanced Database Concepts **Transaction Management and Concurrency Control:** What Is a Transaction? - Concurrency Control - Concurrency Control with Locking Methods. **Big Data Analytics and NoSQL:** Big Data - Hadoop - NoSQL - Data Analytics	[10]
Total Hours:	**45**

Text Book(s):

1. Carlos Coronel, Steven Morris, Peter Rob, “Database Systems: Design, Implementation and Management”, Twelfth Edition, Cengage Learning, 2017

Reference(s):

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, “Database System Concepts”, Seventh Edition, Tata McGraw Hill, 2020.
2. Shakuntala Gupta Edward and Navin Sabharwal, “Practical MongoDB: Architecting, Developing, and Administering MongoDB”, Apress, 2015
3. Raghu Ramakrishnan, Johannes Gehrke, “Database Management Systems”, Fourth Edition, Tata McGraw Hill, 2010.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Database Concepts**	
1.1	Purpose of Database System	1
1.2	Types of Databases	1
1.3	Problems with File System Data Processing	1
1.4	Data Modeling and Data Models	1
1.5	The Evolution of Data Models	2
1.6	Degrees of Data Abstraction	1
2.0	**Design Concepts**	
2.1	A Logical View of Data	1
2.2	Keys - Integrity Rules	2
2.3	Relational Algebra	1
2.4	Relationships within the Relational Database	1
2.5	The Entity Relationship Model (ERM)	1
2.6	Database Tables and Normalization	1
2.7	The Normalization Process	2
2.8	Higher-Level Normal Forms	2
3.0	**Advanced Design and Implementation**	
3.1	Data Definition Commands	1
3.2	Data Manipulation Commands	1
3.3	SELECT Queries	1
3.4	Additional SELECT Query Keywords	1
3.5	SQL Join Operators	1
3.6	Subqueries and Correlated Queries	1
3.7	SQL Functions	1
3.8	Relational Set Operators	1
3.9	Procedural SQL	1
4.0	**Database Design**	
4.1	The Systems Development Life Cycle	1
4.2	The Database Life Cycle	1
4.3	Conceptual Design	2
4.4	DBMS Software Selection	1
4.5	Logical Design	1
4.6	Physical Design	2
5.0	**Advanced Database Concepts**	
5.1	What Is a Transaction	1
5.2	Concurrency Control	2
5.3	Concurrency Control with Locking Methods	2
5.4	Big Data	1
5.5	Hadoop	1
5.6	NoSQL	2
5.7	Data Analytics	1
	Total Hours:	**45**

Course Designer

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Approved in Academic Council Meeting held on 03.01.2026

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70 PMC 104	Java Programming	Category	L	T	P	Credit
		PC	3	0	2	4

Objectives

- To learn object-oriented programming concepts
- To understand Java fundamentals and String Methods
- To implement code reduction through packages and collection methods
- To apply the knowledge of Threads and IO streams
- To build applications with JDBC technology for real world problems.

Prerequisite

- Basic knowledge of Computer Programming Languages

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply Java fundamentals to construct functional programs to solve real-world problems.	Apply
CO2	Implement object-oriented principles, exception handling and string operations to solve real world problems.	Apply
CO3	Design packages and utilize collections to achieve reusability.	Apply
CO4	Apply multithreading concepts and IO Streams in various real-world scenario.	Apply
CO5	Explore database using regular expression with JDBC.	Analyse

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	2	2	-	3	-	-	-
CO2	3	3	2	-	3	-	-	2
CO3	2	3	3	-	3	-	-	2
CO4	3	3	3	2	3	-	-	-
CO5	2	3	3	2	3	-	-	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				End Sem Examination (Marks)	
	Test 1		Test 2			
	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	-	10	-	10	-
Understand	10	-	10	-	10	-
Apply	20	50	20	50	30	50
Analyse	20	50	20	50	50	50
Evaluate	-	-	-	-	-	-
Create	-	-	-	-	-	-
Total	60	100	60	100	100	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 104 - Java Programming

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	2	60	4	50	50	100

Introduction of Java Fundamentals and OOP Features of Java, The Java Environment, Java Source File Compilation, Structure of Java, Data Types, Variables, Operators, Control Flow, Arrays, Concepts of Object-Oriented Programming - OOP in Java, Defining classes and methods in Java, constructors, access specifiers, final and static keywords.	[9]
Java OOP Concepts and Strings Java Inheritance, Polymorphism, Interfaces, Abstract class, Exception handling - exception hierarchy, throwing and catching exceptions, built-in exceptions, creating own exceptions, String handling with String and String Buffer classes	[9]
Packages and Collection Framework Packages – Pre defined and user defined Packages, Boxing and Unboxing, Wrapper classes, Introduction to Collection, The Collection Interfaces – List, Set, Map, Generic Class, Vector, Iterator and List Iterator, String Tokenizer.	[9]
Java Multithread and I/O Streams Multithreaded programming-The Java Thread Model-Lifecycle, The Main Thread, creating a Thread, Creating multiple Threads, Thread priority, Input / Output Basics, Streams, The Byte Streams, The Character Streams, Reading and Writing Console, Reading and Writing Files, Object Serialization and Object De-Serialization.	[9]
Java Database Connectivity and Regex Database Programming – Introduction, SQL queries, JDBC, Statement, Prepared Statement, Regular Expression: Matcher Class, Pattern class and Pattern Syntax, Exception class, Regex Character Classes and Quantifiers, Metacharacters.	[9]
Practical 1. Implementation of java fundamentals to solve real world problems 2. Demonstrate Class and method, Constructor and Inheritance 3. Demonstrate Polymorphism, Abstract and Interface 4. Implementation of Exception Handling to check abnormal condition 5. Implementation of String and String Buffer 6. Demonstrate various methods of Collection and Iterator 7. Implementation of multithreading and IO Streams 8. Implementation of Database Connectivity using JDBC	[15]
Total Hours (Theory:45+Practical:15):	**60**

Text Book(s):

1.	Herbert Schildt, “Java: The complete Reference”, Comprehensive coverage of the Java language, Oracle press, 12th Edition, Tata McGraw-Hill, 2021.
2.	Vivian Siahaan, Rismon Hasiholan Sianipar, “Java in Practice: JDBC And Database Applications”, Sparta Publishing, Kindle 1 st Edition, 2019.

Reference(s):

1.	Kathy Sierra, Bert Bates, “Head First Java”, A Brain Friendly Guide, O’Reilly, 3rd Edition, 2022.
2.	Cay S.Horstman, “Core Java Volume – I Fundamentals”,’ 11th Edition, 2018.
3.	Daniel Liang Y, “Introduction to Java Programming”, Comprehensive Version,10th Edition, Pearson Education,2015 [JDBC only].
4.	Jeffrey E. F. Friedl, "Mastering Regular Expressions", 3rdEdition, O'Reilly Media, Inc.,2006.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to OOP and Java Fundamentals**	
1.1	Features of Java, The Java Environment	1
1.2	Structure of Java, Data Types, Variables	1
1.3	Operators, Control Flow	1
1.4	Arrays	1
1.5	Object Oriented Programming - Objects and Classes	1
1.6	OOP in Java	1
1.7	Defining classes and methods in Java	1
1.8	Constructors	1
1.9	Access specifiers, Final, Static Keywords	1
2.0	**Java Concepts and Strings**	
2.1	Java Inheritance	1
2.2	Polymorphism	1
2.3	Interfaces, Abstract class	1
2.4	Exception handling- built-in exceptions	1
2.5	Try, Catch, Finally	1
2.6	Throw, Throws	1
2.7	Creating own exceptions	1
2.8	String Methods	1
2.9	String Buffer	1
3.0	**Packages And Collection Framework**	
3.1	Packages	1
3.2	User defined Packages	1
3.3	Boxing and Unboxing	1
3.4	Wrapper classes	1
3.5	Introduction to Collection	1
3.6	Set, List, Map	2
3.7	Vector	1
3.8	Iterator	1
4.0	**Java Multithreading and Stream IO**	
4.1	The Java Thread Model-Lifecycle	1
4.2	The Main Thread	1
4.3	Creating a thread	1
4.4	Creating Multiple Thread	1
4.5	Thread Priority	1
4.6	IO Basics	1
4.7	Reading and Writing Console	1
4.8	Reading and Writing Files	1
4.9	Object Serialization and Object De-Serialization	1
5.0	**Regex and Java Database Connectivity**	
5.1	Database Programming – Introduction	1
5.2	SQL queries	1
5.3	JDBC- Statement	1
5.4	Prepared Statement	1
5.5	Regular Expression: Matcher Class, Pattern class	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

5.6	Pattern Syntax, Exception class	1
5.7	Regex Character Classes and Quantifiers	1
5.8	Meta characters	1
Practical:		
1.	Implementation of java fundamentals to solve real world problems	1
2.	Demonstrate Class and method, Constructor and Inheritance	2
3.	Demonstrate Polymorphism, Abstract and Interface	2
4.	Implementation of Exception Handling to check abnormal condition	2
5.	Implementation of String and String Buffer	2
6.	Demonstrate various methods of Collection and Iterator	2
7.	Implementation of multithreading and IO Streams	2
8.	Implementation of Database Connectivity using JDBC	2
	Total Hours:(Theory + Practical):	**60**

Course Designer

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70 PMC 105	Advanced Operating Systems	Category	L	T	P	Credit
		PC	3	1	0	4

Objectives

- To understand the fundamentals of operating systems.
- To analyse process management and synchronization techniques.
- To examine CPU scheduling and deadlock handling strategies.
- To understand memory, I/O, and file management concepts.
- To study virtual machines and relevant case studies.

Prerequisite

- Basic knowledge of computer organization, operating system concepts, and programming fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Know the basic concepts of operating systems.	Understand
CO2	Understand process management, synchronization and deadlock concepts.	Apply
CO3	Analyse various memory management techniques and disk scheduling algorithms.	Apply
CO4	Demonstrate file system, Allocation Methods and Free space management.	Apply
CO5	Understand Virtualization. Compare various mobile operating System.	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	3	3	2
CO2	3	3	3	3	3	3	3	2
CO3	2	3	3	3	3	3	3	2
CO4	3	3	3	2	3	3	3	2
CO5	3	3	3	2	3	3	3	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 105 – Advanced Operating Systems

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	40	60	100

Operating System Overview Introduction to operating systems - Computer system organization, architecture - Operating system structure, operations-Process, memory, storage management-Protection and security-Distributed systems - Computing Environments - Open-source operating systems - OS services - User operating-system interface - System calls - Types - System programs - OS structure - OS generation - System Boot - Process concept, scheduling - Operations on processes - Cooperating processes - Inter-process communication - Examples - Multithreading models – Thread Libraries - Threading issues – OS examples.	[9]
Process Management Basic concepts - Scheduling criteria - Scheduling algorithms - Thread scheduling -Multiple processor scheduling - Operating system examples - Algorithm Evaluation - The critical-section problem - Peterson's solution - Synchronization hardware - Semaphores - Classic problems of synchronization - Critical regions - Monitors - Synchronization examples - Deadlocks - System model - Deadlock characterization - Methods for handling deadlocks - Deadlock Prevention - Deadlock Avoidance - Deadlock detection - Recovery from deadlock.	[9]
Memory Management Main Memory - Swapping - Contiguous memory allocation - Paging -Segmentation - Virtual Memory: Background - Demand paging - Copy on write - Page replacement - Allocation of frames - Thrashing.	[9]
I/O Systems Mass Storage system - Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access methods - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems - I/O Hardware, Application I/O interface, Kernel I/O subsystem.	[9]
Virtual Machines and Mobile OS Virtual Machines - History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.	[9]
Case Study Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer. File System- Google File System-Ocean Store.	[15]
Total Hours (Theory:45+Practical:15)	**60**

Text Book(s):

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts",10th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", 5th Edition, Pearson - New Delhi, 2022.

Reference(s):

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

1.	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018.
2.	Achyut S. Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3.	G. Coulouris, J. Dollimore, and T. Kindberg, "Distributed Systems: Concepts & Design", Fifth edition, Addison-Wesley, 2012.
4.	Mukesh Singhal and N. G. Shivaratri, "Advanced Concepts in Operating Systems", McGraw-Hill, 1st Edition, 2001.
5.	Rajiv Chopra, "Operating Systems - A Practical Approach", 4th Edition, S Chand & Company, 2016.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Operating System Overview**	
1.1	Introduction to operating systems- Computer system organization	1
1.2	Architecture - Operating system structure	1
1.3	Operations-Process, memory, storage management	1
1.4	Protection and security	1
1.5	Distributed systems - Computing Environments - Open-source operating systems	1
1.6	OS services - User operating-system interface - System calls - Types - System programs	1
1.7	OS structure - OS generation	1
1.8	System Boot - Process concept, scheduling - Operations on processes - Cooperating processes - Inter-process communication - Examples	1
1.9	Multithreading models – Thread Libraries - Threading issues - OS examples.	1
2.0	**Process Management**	
2.1	Basic concepts - Scheduling criteria	1
2.2	Scheduling algorithms - Thread scheduling -Multiple processor scheduling	1
2.3	Operating system examples	1
2.4	Algorithm Evaluation - The critical-section problem - Peterson's solution	1
2.5	Synchronization hardware – Semaphores- Classic problems of synchronization	1
2.6	Critical regions - Monitors - Synchronization examples	1
2.7	Deadlocks - System model - Deadlock characterization	1
2.8	Methods for handling deadlocks - Deadlock Prevention	1
2.9	Deadlock Avoidance - Deadlock detection - Recovery from deadlock.	1
3.0	**Memory Management**	
3.1	Main Memory	1
3.2	Swapping	1
3.3	Contiguous memory allocation	1
3.4	Paging	1
3.5	Segmentation- Virtual Memory	1
3.6	Background - Demand paging	1
3.7	Copy on write - Page replacement	1
3.8	Allocation of frames	1
3.9	Thrashing	1
4.0	**I/O Systems**	
4.1	Mass Storage system	1
4.2	Disk Structure- Disk Scheduling and Management	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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4.3	File-System Interface - File concept - Access methods	1
4.4	Directory Structure - Directory organization	1
4.5	File system mounting - File Sharing and Protection	1
4.6	File System Implementation - File System Structure	1
4.7	Directory implementation - Allocation Methods	1
4.8	Free Space Management	1
4.9	I/O Systems - I/O Hardware, Application I/O interface, Kernel I/O subsystem.	1
5.0	**Virtual Machines and Mobile OS**	
5.1	Virtual Machines	1
5.2	History- Benefits and Features,	1
5.3	Building Blocks	1
5.4	Types of Virtual Machines and their Implementations	2
5.5	Virtualization and Operating System Components	2
5.6	Mobile OS	1
5.7	iOS and Android.	1
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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70 PMC 106	Advanced Software Engineering	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To explore the fundamental concepts of Software Engineering
- To gain knowledge and analyse document requirements
- To learn the software design principles
- To explore the different software testing strategies
- To provide basic knowledge about software project management

Prerequisite

- Basic knowledge of programming, software development concepts, and computer fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop models for the software to be developed.	Understand
CO2	Understand the need of system requirements.	Understand
CO3	Acquire knowledge about various design patterns and principles.	Apply
CO4	Learn various testing strategies and the relevant software quality models	Analyse
CO5	Analyze, Design and implement a system based on software engineering practice and principles. Manage the software for any futuristic emerging systems.	Analyse

Mapping with Programme Outcomes

COs	Pos							
	1	2	3	4	5	6	7	8
CO1	3	3	2	3	-	-	-	-
CO2	3	3	3	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-
CO4	3	3	3	2	3	-	-	-
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous							
MCA – Master of Computer Applications							
70 PMC 106 – Advanced Software Engineering							
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**	
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

Introduction to Software Engineering Introduction - Software processes: Software process models - Process activities - Coping with change - The rational unified process - Agile software development - System modelling - Architectural design	[9]
Design and implementation - Software testing: Development testing - Test-driven development - Release testing - User testing - Software evolution: Evolution processes - Program evolution dynamics - Software maintenance - Legacy system management	[9]
Dependability and Security Sociotechnical systems - Dependability and security - Dependability and security specification - Dependability engineering - Security engineering - Dependability and security assurance	[9]
Advanced Software Engineering Software reuse - Component-based software engineering - Distributed software engineering - Service-oriented architecture - Embedded software - Aspect-oriented software engineering	[9]
Software Management Project management - Project planning - Quality management - Configuration management - Process improvement	[9]
Total Hours:	**45**

Text Book(s):	
1.	Ian Sommerville, Engineering Software Products: An Introduction to Modern Software Engineering, Ninth edition, Pearson India, 2020.
Reference(s):	
1.	Roger Pressman and Bruce Maxim, Software Engineering: A Practitioner's Approach Eighth Edition, McGraw Hill publications, 2019.
2.	Ian Sommeville , Software Engineering , Tenth Edition ,Pearson Education ,2018.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Software Engineering**	
1.1	Software process models	1
1.2	Process activities	1
1.3	Coping with change	2
1.4	The rational unified process	1
1.5	Agile software development	2
1.6	System modelling	2
2.0	**Design and implementation**	
2.1	Development testing	1
2.2	Test-driven development	2
2.3	Release testing	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

2.4	Program evolution dynamics	2
2.5	Legacy system management	2
3.0	**Dependability and Security**	
3.1	Sociotechnical systems	1
3.2	Dependability and security	1
3.3	Dependability and security specification	2
3.4	Dependability engineering	2
3.5	Security engineering	1
3.6	Dependability and security assurance	2
4.0	**Advanced Software Engineering**	
4.1	Software reuse	1
4.2	Component-based software engineering	2
4.3	Distributed software engineering	2
4.4	Service-oriented architecture	2
4.5	Embedded software	1
4.6	Aspect-oriented software engineering	1
5.0	**Software Management**	
5.1	Project management	1
5.2	Project planning	2
5.3	Quality management	2
5.4	Configuration management	2
5.5	Process improvement	2
	Total Hours:	**45**

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Approved in Academic Council Meeting held on 03.01.2026

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70 PAC 001	English for Research Paper Writing	Category	L	T	P	Credit
		AC	2	0	0	0

Objectives

- Teach how to improve writing skills and level of readability
- Tell about what to write in each section
- Summarize the skills needed when writing a Title
- Infer the skills needed when writing the Conclusion
- Ensure the quality of paper at very first-time submission

Prerequisite

- Basic knowledge of reading and writing in English

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand that how to improve your writing skills and level of readability	Understand
CO2	Learn about what to write in each section	Remember
CO3	Understand the skills needed when writing a Title	Understand
CO4	Understand the skills needed when writing the Conclusion	Understand
CO5	Ensure the good quality of paper at very first-time submission	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)	
	1	2
Remember	30	30
Understand	30	30
Apply	40	40
Analyse	-	-
Evaluate	-	-
Create	-	-
Total	100	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PAC 001 - English for Research Paper Writing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	2	0	0	30	0	40	60	100

Introduction to Research Paper Writing Planning and Preparation- Word Order- Breaking up long sentences- Structuring Paragraphs and Sentences- Being Concise and Removing Redundancy- Avoiding Ambiguity and Vagueness	[6]
Presentation Skills Clarifying Who Did What- Highlighting Your Findings-Hedging and Criticizing- Paraphrasing and Plagiarism- Sections of a Paper- Abstracts- Introduction	[6]
Title Writing Skills Key skills are needed when writing a Title-key skills are needed when writing an Abstract - key skills are needed when writing an Introduction- skills needed when writing a Review of the Literature- Methods- Results- Discussion- Conclusions- The Final Check	[6]
Result Writing Skills Skills are needed when writing the Methods- skills needed when writing the Results - skills are needed when writing the Discussion- skills are needed when writing the Conclusions	[6]
Verification Skills Useful phrases- checking Plagiarism- how to ensure paper is as good as it could possibly be the first time submission	[6]
Total Hours:	**30**

Text Book(s):	
1.	Adrian Wallwork, English for Writing Research Papers, Springer New York Dordrecht Heidelberg London, 2015
2.	Day R How to Write and Publish a Scientific Paper, Cambridge University Press 2016
Reference(s):	
1.	Goldbort R Writing for Science, Yale University Press (available on Google Books) 2016
2.	Highman N, Handbook of Writing for the Mathematical Sciences, SIAM. Highman's book 2018.
3.	Phill Williams, Advanced Writing skills for students of English, Rumian Publishers, 2018
4.	Sudhir S. Pandhye, English Grammar and Writing Skills, Notion Press, 2017.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Research Paper Writing**	
1.1	Planning and Preparation, Word Order	2
1.2	Breaking up long sentences, Structuring Paragraphs and Sentences	1
1.3	Being Concise and Removing Redundancy	2
1.4	Avoiding Ambiguity and Vagueness	1
2.0	**Presentation Skills**	
2.1	Clarifying Who Did What, Highlighting Your Findings	2
2.2	Hedging and Criticizing	2
2.3	Paraphrasing and Plagiarism, Sections of a Paper	1
2.4	Abstracts, Introduction	1
3.0	**Title Writing Skills**	
3.1	Key skills are needed when writing a Title	1
3.2	Key skills are needed when writing an Abstract, key skills are needed when writing an Introduction	2
3.3	Skills needed when writing a Review of the Literature	2

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Approved in Academic Council Meeting held on 03.01.2026

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3.4	Methods, results, discussion, conclusions, the final check	1
4.0	**Result Writing Skills**	
4.1	Skills are needed when writing the Methods	2
4.2	Skills needed when writing the Results	1
4.3	Skills are needed when writing the Discussion	1
4.4	Skills are needed when writing the Conclusions	2
5.0	**Verification Skills**	
5.1	Useful phrases	2
5.2	Checking Plagiarism	2
5.3	How to ensure paper is as good as it could possibly be the first time submission	2
	Total Hours:	**30**

Course Designer

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70 PMC 1P1	Data Structures and Algorithms Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To impart knowledge on linear data structures such as lists, stacks, and queues using arrays and pointers.
- To introduce various non-linear data structures, including trees, binary trees, and binary search tree implementations.
- To explore tree and graph algorithms and their applications.
- To apply greedy and dynamic programming approaches to problem-solving.
- To solve problems using backtracking and branch-and-bound techniques.

Prerequisite

- Basic knowledge of Computer Programming Languages

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate the implementation of Linear Data structures and its applications	Apply
CO2	Investigate Balanced Parenthesis and Postfix expressions with the help of Stack ADT	Apply
CO3	Implement Non-Linear Data Structure	Apply
CO4	Implement sorting and searching techniques	Apply
CO5	Implement Hashing Techniques, Shortest Path and Minimum Spanning Tree Algorithm	Analyse

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	2	-	-	-	-	-
CO2	3	3	2	3	-	-	-	-
CO3	3	3	2	2	2	2	-	-
CO4	3	3	2	3	2	-	-	3
CO5	3	3	2	-	2	2	2	3
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Lab Experiment Assessment (Marks)		End Sem Examination (Marks)
	Lab	Activity	
Remember	-	-	-
Understand	-	-	-
Apply	40	15	80
Analyse	10	10	20
Evaluate	-	-	-
Create	-	-	-
Total	50	25	100

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K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC 1P1 – Data Structures and Algorithms Laboratory								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	1.5	60	40	100

List of Experiments:

1. Array Implementation of List ADT
2. Linked List Implementation
3. Circular Linked List
4. Doubly Linked List
5. Stack ADT - Infix to Postfix Conversion & Evaluation
6. Queue ADT - Circular Queue Implementation
7. Binary Search Tree - Creation, Insertion, Deletion and Traversal
8. Graph Representation and Traversal (BFS & DFS)
9. Sorting Algorithms - Quick Sort / Merge Sort
10. Hashing and Collision Resolution

Course Designer

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC 1P2	Database Technologies Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To master SQL and PL/SQL Commands
- To develop Proficiency in Advanced SQL Operations
- To understand Database Object Management
- To implement PL/SQL Programming Techniques
- To familiarize with Modern Database Systems

Prerequisite

- Basic knowledge of SQL and fundamental programming concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design and implement a database schema for a given problem domain.	Apply
CO2	Construct simple and advanced database queries using Structured Query Language (SQL).	Apply
CO3	Populate and query a database using TCL/DCL commands.	Apply
CO4	Program in PL/SQL including stored procedures, stored functions, cursors and packages	Apply
CO5	Design and build a GUI application using 4GL.	Analyse

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Lab Experiment Assessment (Marks)		End Sem Examination (Marks)
	Lab	Activity	
Remember	-	-	-
Understand	-	-	-
Apply	40	15	80
Analyse	10	10	20
Evaluate	-	-	-
Create	-	-	-
Total	50	25	100

Passed in BoS Meeting held on 20.12.2025
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K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC 1P2 – Database Technologies Laboratory								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
I	0	0	3	45	1.5	60	40	100

List of Experiments:

1. Execute Data Definition Language and Data Manipulation Language commands.
2. Demonstrate Data Control Language and Transaction Control Language commands.
3. Implement Data Query Language.
4. Execute SQL Functions.
5. Evaluate Set Operations.
6. Implement Join Operations.
7. Execute Complex and Sub Queries.
8. Execution of PL/SQL Commands.
9. Record Management using Cursors.
10. Create Triggers

Course Designer

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Approved in Academic Council Meeting held on 03.01.2026

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70 PCG 001	Career Skill Development - I	Category	L	T	P	Credit
		CG	2	0	0	1*

Objectives

- To help learners improve their vocabulary and to enable them to use words appropriately in different academic and professional contexts
- To help learners develop strategies that could be adopted while reading texts
- To help learners acquire the ability to speak effectively in English in real life and career related situations
- To equip students with effective speaking and listening skills in English
- To facilitate learners to enhance their writing skills with coherence and appropriate format effectively

Prerequisite

- Basic knowledge of reading and writing in English

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Listen and comprehend complex academic texts	Understand
CO2	Read and infer the denotative and connotative meanings of technical texts	Analyse
CO3	Write definitions, descriptions, narrations, and essays on various topics	Apply
CO4	Speak fluently and accurately in formal and informal communicative contexts	Apply
CO5	Appraise the verbal ability skills in the career development and professional contexts	Analyse

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

Passed in BoS Meeting held on 20.12.2025
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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PCG 001 - Career Skill Development - I

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	2	0	0	30	1*	100	0	100

Listening * Listening for General Information - Specific Details - Audio / Video (Formal & Informal) - Listen to Podcasts/ TED talks/ Anecdotes / Stories / Event Narration / Documentaries and Interviews with Celebrities - Listen to a Product and Process Descriptions, Advertisements about Products or Services.	[6]
Speaking *** Self-Introduction; Introducing a friend; Conversation - Politeness Strategies - Narrating Personal Experiences / Events; Interviewing a Celebrity; Reporting / and Summarizing of Documentaries / Podcasts/ Interviews - Picture Description; giving instruction to use the product; presenting a product - Small Talk; Mini presentations - Group discussions, debates & role plays.	[6]
Reading* Loud reading vs Silent reading, Skimming & Scanning of passages, reading brochures (technical context), social media messages relevant to technical contexts and emails - Biographies, travelogues, newspaper reports and travel & technical blogs - Advertisements, gadget reviews and user manuals - Newspaper articles and Journal reports - Editorials; and opinion blogs	[6]
Writing ** Writing letters — informal and formal — basics and format orientation - paragraph texting, short report on an event (field trip etc.) - Definitions; instructions; and product /process description - Note-making / Note-taking; recommendations; transferring information from non-verbal (charts, graphs to verbal mode) - Essay texting	[6]
Verbal Ability I * Reading Comprehension (MCQs) – Cloze Test - Sequencing of sentences – Summarizing and paraphrase – Error Detection – Spelling Test – Sentence Improvement – Preposition	[6]
Total Hours:	**30**

Text Book(s):

1.	-

Reference(s):

1.	"English for Engineers & Technologists", Orient Blackswan Private Ltd.,Department of English, Anna University, 2020.
2.	Norman Lewis, "Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book", Penguin Random House India, 2020.
3.	Michael McCarthy and Felicity O Dell, "English Vocabulary in Use: Upper Intermediate", Cambridge University Press, N.York, 2012
4.	Lakshmi Narayanan, "A Course Book on Technical English", Scitech Publications (India) Pvt. Ltd. 2020

*SDG 4 - Quality Education
**SDG 8 - Decent Work and Economic Growth
***SDG 17 - Partnerships for the goals

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Listening**	
1.1	Listening for general information and Specific details	1
1.2	Listening to podcasts, documentaries and interviews with celebrities	1
1.3	Narrating personal experiences	1
1.4	Reading relevant to technical contexts and emails	1
1.5	Listen to a product and process descriptions	2
2.0	**Speaking**	
2.1	Self-introduction	1
2.2	Summarizing of documentaries & Picture Narration	1
2.3	Small Talk; Mini presentations	1
2.4	Group discussions, debates & role plays.	1
2.5	Group discussions	2
3.0	**Reading**	
3.1	Loud reading vs Silent reading, Skimming & Scanning of passages	1
3.2	Reading social media messages relevant to technical contexts	1
3.3	Reading newspaper reports and travel & technical blogs	1
3.4	Reading advertisements, gadget reviews and user manuals	1
3.5	Reading newspaper articles and journal reports	2
4.0	**Writing**	
4.1	Writing letters – informal and formal	1
4.2	Paragraph Texting	1
4.3	Definitions and instructions	1
4.4	Note-making / Note-taking	1
4.5	Essay texting	2
5.0	**Verbal Ability**	
5.1	Reading Comprehension (MCQs) and Cloze Test	1
5.2	Sequencing of sentences	1
5.3	Paraphrasing and Summarizing	1
5.4	Error Detection and Spelling Test	1
5.5	Prepositions	2
	Total Hours:	**30**

Course Designer

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70 PMC 201	Internet of Things	Category	L	T	P	Credit
		PC	3	0	2	4

Objectives

- Understand the fundamental concepts and evolution of IoT
- Develop proficiency in IoT hardware and software platforms
- Comprehend IoT communication protocols and networking standards
- Leverage cloud platforms and analytics for IoT applications
- Apply IoT concepts to real-world domains through case studies

Prerequisite

Basic knowledge of programming fundamentals and computer systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the evolution of the Internet and the impact of IoT in the society.	Understand
CO2	Design portable IoT devices using Arduino IDE/ Raspberry Pi with Python.	Create
CO3	Apply appropriate protocols in various parts of IoT based systems.	Apply
CO4	Use cloud offerings and big data tools in IoT based systems.	Apply
CO5	Implement Map-Reduce based programs using Apache frameworks.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				End Sem Examination (Marks)	
	Test 1		Test 2			
	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	-	10	-	10	-
Understand	10	-	10	-	10	-
Apply	20	50	20	50	30	50
Analyse	20	50	20	50	50	50
Evaluate	-	-	-	-	-	-
Create	-	-	-	-	-	-
Total	60	100	60	100	100	100

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Syllabus

K.S. Rangasamy College of Technology - Autonomous

M.C.A - Master of Computer Applications

70 PMC 201 - Internet of Things

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	2	60	4	50	50	100

Introduction to Internet of Things Introduction to Internet of Things – Evolution of Internet to Internet of Things – Real-world Objects and Smart Objects – Characteristics of IoT Systems – Basic IoT Architecture (Device, Gateway and Cloud layers) – Role of Sensors and Actuators in IoT – Introduction to ESP32 and Raspberry Pi as IoT devices – Data flow in IoT (Sense–Process–Act) – Simple IoT application examples	[9]
IoT Devices and Embedded Programming Basics Microcontrollers vs Single Board Computers – ESP32 architecture overview – Raspberry Pi Zero overview – Open-source hardware and software – Programming model of ESP32 – GPIO programming concepts – Analog and Digital data – Sensor interfacing basics – Actuator control – Basic embedded logic using conditions and thresholds	[9]
IoT Communication and Application Protocols Need for communication in IoT – Device-to-Device and Device-to-Cloud communication models – Overview of TCP/IP for IoT – Introduction to IoT protocols – HTTP, MQTT and REST APIs– Serial communication between devices – Data transfer between ESP32 and Raspberry Pi – Message-based communication in IoT applications	[9]
Data Handling, Cloud and Visualization for IoT Introduction to IoT data – Data collection and storage – Cloud platforms for IoT – Role of cloud in monitoring and control – Data logging techniques – Introduction to dashboards and visualization – Simple analytics using thresholds and alerts – Local vs cloud-based IoT data processing – Python support for IoT data handling.	[9]
IoT Applications, Management and System Design IoT system design methodology – Functional block diagram and flowchart for IoT solutions – Device management concepts – Basic IoT system monitoring – Security considerations in IoT – IoT application case studies: Smart home, Environmental monitoring, Smart agriculture, Air quality monitoring – Design considerations for scalable IoT solutions –Mini-Project planning.	[9]
Practical: 1. ESP32 GPIO programming to Blink an LED. 2. ESP32 UART and PWM programming 3. ESP32 GPIO control through IoT Cloud 4. Display Real Time Sensor Data in Cloud and control GPIO based on threshold 5. Automation using Open-source application firmware 6. Study of Single board computer applications in IoT	[15]
Total Hours: (Theory - 45; Practical - 15)	**60**

Text Book(s):

1.	Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A Hands-On Approach”, Universities Press, First Edition, 2015.

Reference(s):

1.	Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, First Edition, 2014
2.	David Hanes, Gonzalo Salguerio, Patrick Grossetete, Rob Barton, Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for Internet of Things”, Cisco Press, 2017. 4. Perry Lea, “Internet of Things for Architects”, PACKT, 2018.
3.	Andy King, “Programming the Internet of Things: An Introduction to Building Integrated, Device to Cloud IoT solutions”, O’REILLY’, 2021

Passed in BoS Meeting held on 20.12.2025
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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Internet of Things**	
1.1	Introduction to Internet of Things	1
1.2	Evolution of Internet to Internet of Things	1
1.3	Real-world Objects and Smart Objects	1
1.4	Characteristics of IoT Systems	1
1.5	Basic IoT Architecture (Device, Gateway and Cloud layers)	1
1.6	Role of Sensors and Actuators in IoT	1
1.7.	Introduction to ESP32 and Raspberry Pi as IoT devices	1
1.8	Data flow in IoT (Sense–Process–Act)	1
1.9	Simple IoT application examples	1
2.0	**IoT Devices and Embedded Programming Basics**	
2.1	Microcontrollers vs Single Board Computers –	1
2.2	ESP32 architecture and Raspberry Pi Zero overview	1
2.3	Open-source hardware and software	1
2.4	Programming model of ESP32	1
2.5	GPIO programming concepts	1
2.6	Analog and Digital data	1
2.7	Sensor interfacing basics	1
2.8	Actuator control	1
2.9	Basic embedded logic using conditions and thresholds	1
3.0	**IoT Communication and Application Protocols**	1
3.1	Need for communication in IoT	1
3.2	Device-to-Device and Device-to-Cloud communication models	1
3.3	Overview of TCP/IP for IoT	1
3.4	Introduction to IoT protocols	1
3.5	HTTP, MQTT and REST APIs	1
3.6	Serial communication between devices	1
3.7	Data transfer between ESP32	1
3.8	Raspberry Pi	1
3.9	Message-based communication in IoT applications	1
4.0	**Data Handling, Cloud and Visualization for IoT**	
4.1	Introduction to IoT data	1
4.2	Data collection and storage	1
4.3	Cloud platforms for IoT	1
4.4	Role of cloud in monitoring and control	1
4.5	Data logging techniques	1
4.6	Introduction to dashboards and visualization	1
4.7	Simple analytics using thresholds and alerts	1
4.8	Local vs cloud-based IoT data processing	1
4.9	Python support for IoT data handling.	1
5.0	**IoT Applications, Management and System Design**	
5.1	IoT system design methodology .	1
5.2	Functional block diagram and flowchart for IoT solutions	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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5.3	Device management concepts	1
5.4	Basic IoT system monitoring	1
5.5	Security considerations in IoT	1
5.6	IoT application case studies: Smart home, Environmental monitoring	1
6.7	Smart agriculture, Air quality monitoring	1
5.8	Design considerations for scalable IoT solutions	1
5.9	Mini-Project planning.	1
	Practical	
1	ESP32 GPIO programming to Blink an LED	2
2	ESP32 UART and PWM programming	2
3	ESP32 GPIO control through IoT Cloud	2
4	Display Real Time Sensor Data in Cloud and control GPIO based on threshold	3
5	Automation using Open-source application firmware	3
6	Study of Single board computer applications in IoT	3
	Total	**60**

Course Designer

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70 PMC 202	Software Development for Mobile Devices	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the working of mobile applications & their features
- To develop Android applications with user interfaces by creating layouts, Views and Menus
- To utilize the power of background services, threads, notifications and communication APIs
- To learn using data persistence, location-based services, sensors and maps in Android applications
- To learn user interface and functionality design in iOS app development

Prerequisite

- Basic knowledge of programming fundamentals and object-oriented concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Utilize the Android OS, Development Frame Work, Software Stack and Application Architecture.	Understand
CO2	Design Android UI Layout and develop event driven programs.	Create
CO3	Develop applications using menus and dialog boxes	Apply
CO4	Design data persistence and location-based apps, including GPS, sensors and Maps API	Apply
CO5	Design User Interfaces for iOS App	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	1	2		
Remember	10	10	20	20
Understand	10	10	20	20
Apply	20	20	30	30
Analyse	20	20	30	30
Evaluate	-	-	-	-
Create	-	-	-	-
Total	60	60	100	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 202 - Software Development for Mobile Devices

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Android OS Concepts and App Development Framework Overview of Android - Android application (app) development: background and future - Android Ecosystem – Pre-installed Android apps – Android SDK features - Android Development Framework - Android Software Stack - Android Run Time - Android application architecture - Android Libraries – Developing Android apps - Android Support Library Package – Hardware-imposed design considerations - Android Development Tools - Android Studio - Android Virtual Device manager - Android Emulator – Android Profiler – Android Debug Bridge – APK Analyzer – Android Manifest File - The Lint Tool – Monkey, Monkey Runner and Expresso UI Testing – Gradle	[9]
Android Activities and Ui Design Design Android UI Layout: Android application components Intent, Activity, Activity Lifecycle, Broadcast receivers, Services and Manifest - Create Application and new Activities- Expressions and Flow control, Android Manifest - Simple UI -Layouts and Layout properties - Fundamental Android UI Design - Introducing Layouts • Creating new Layouts - Drawable Resources - Resolution and density independence - Use GUI Objects to develop applications: XML Introduction to GUI objects: Push Button - Text / Labels - Edit Text - Toggle Button - Weight Sum – Padding	[9]
Advanced UI Programming Develop event driven Programming in Android: Event driven Programming in Android (Text Edit, Button clicked etc.) - Creating a splash screen - Android Activity Lifecycle - Introduction to threads in Android - Toast, Menu, Dialog, List and Adapters: Menu: Custom Vs. System Menus - Creating and Using Handset menu Button (Hardware) -Android Themes, Dialog, create an Alter Dialog - Toast in Android, List & Adapters - Android Manifest - XML File	[9]
Data Persistence and Native Applications SQLite: Open Helper and create database, Open and close a database - Shared Preferences - Content Provider - Internal and External Storage – Firebase - Native Application development: Media Player – Bluetooth – Camera – GPS - Google Map – Sensors - Send SMS and Email.	[9]
IOS User Interface & Functionality Design UI Overview, Views, Gestures, View Controller Lifecycle, Storyboard, Auto-layout, Scroll View, Multithreading, Table View, Unwind Segues, Alerts, Timers, View Animation, Dynamic Animation, Application Lifecycle, Core Motion, Core Location, Map Kit, Modal Segues, Camera, Persistence, Embed Segues, Internationalization and Settings.	[9]
Total Hours:	**45**

Text Book(s):

1. Reto Meier, Ian Lake, “Professional Android”, 4th edition, Wiley, 2018. (Units I, II, III & IV)
2. Raywenderlich Tutorial Team, Joey deVilla, Eli Ganim, Matthijs Hollemans, “iOS Apprentice: Beginning iOS Development with Swift and UIKit,” 8th edition, Razeware LLC, 2019. (Unit V)

Reference(s):

1. John Horton, “Android Programming for Beginners: Build in-depth, full-featured Android Apps starting from Zero programming Experience”, 3rd Edition, Packt Publishing, 2021.
2. Dawn Griffiths & David Griffiths, “Head First Android Development, A Brain-Friendly Guide”,2ndEdition, O’Reilly, 2017.
3. Bill Phillips, Chris Stewart, Kristin Marsicano, “Android Programming: The Big Nerd Ranch Guide“,3rd edition, Big Nerd Ranch Guides, 2017.
4. Joseph Annuzi, Jr., Lauren Darcey and Shane Conder, “Introduction to Android Application Development: Android Essentials,” 5th Edition, Pearson, 2016
5. Ahmad Sahar, Craig Clayton, “iOS 16 Programming for Beginners: Kickstart your iOS app development journey with a hands-on guide to Swift 5.7 and Xcode 14”, 7th Edition,Packt Publishing, 2022

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Android OS Concepts and App Development Framework**	
1.1	Overview of Android	1
1.2	Android SDK features	1
1.3	Android Software Stack	1
1.4	Android Libraries	1
1.5	Developing Android apps	1
1.6	Android Emulator	2
1.7	APK Analyzer	2
2.0	**Android Activities and Ui Design**	
2.1	Android application components	2
2.2	Expressions and Flow control	1
2.3	Simple UI	1
2.4	Layouts and Layout properties	1
2.5	Drawable Resources	2
2.6	Text / Labels - Edit Text	1
2.7	Weight Sum – Padding	1
3.0	**Advanced UI Programming**	
3.1	Event driven Programming in Android	1
3.2	Creating a splash screen	1
3.3	Android Activity Lifecycle	2
3.4	Toast, Menu, Dialog, List and Adapters	1
3.5	Custom Vs. System Menus	2
3.6	Creating and Using Handset menu Button	1
3.7	Android Themes	1
4.0	**Data Persistence and Native Applications**	
4.1	Open Helper and create database	1
4.2	Open and close a database	1
4.3	Shared Preferences	1
4.4	Internal and External Storage	1
4.5	Media Player – Bluetooth	1
4.6	Camera	1
4.7	Camera - GPS	1
4.8	Google Map	1
4.9	Sensors - Send SMS and Email	1
5.0	**IOS User Interface & Functionality Design**	
5.1	UI Overview	1
5.2	Views, Gestures	1
5.3	View Controller Lifecycle	2
5.4	Storyboard, Auto-layout, Scroll View	1
5.5	Table View, Unwind Segues	2
5.6	Timers, View Animation	2

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 203	Web Technologies	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To impart knowledge on interactive web page development.
- To explore the features of JavaScript and jQuery.
- To understand the significance of TypeScript and MongoDB.
- To develop components using the REACT framework.
- To practice programming using Express and Node.js

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Prerequisite

- Basic knowledge of computers and fundamentals of programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Create interactive and visually engaging web pages	Understand
CO2	Develop web-based applications using JavaScript and jQuery	Create
CO3	Comprehend the importance of leveraging TypeScript and MongoDB in application development	Apply
CO4	Build dynamic applications using React JS	Apply
CO5	Develop full-stack applications with the MERN stack, incorporating Express and Node.js	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Understand	10	10	20
Apply	40	40	60
Create	10	10	20
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 203 - Web Technologies

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

HTML and CSS Markup Language (HTML): Introduction to HTML and HTML5 - Formatting and Fonts – Hyperlinks – Lists – Tables – Frames – HTML Forms- Introduction to CSS – Inline Styles – Embedding Style Sheets	[9]
JAVASCRIPT and JQUERY Introduction to JavaScript - Syntax - Variables and data types - JavaScript Control Statements - Functions - Objects - Fundamentals of jQuery – jQuery selectors - Traversing - Manipulators	[9]
TYPESCRIPT and MONGODB Type Script Introduction-Data Types-Special types -Arrays-Tuples-object types-unions - functions - MongoDB - MongoDB Basics - Documents - Collections - Query Language - Reading from MongoDB - Writing to MongoDB - CRUD operations - projections	[9]
React JS React Introduction - React ES6 - React Render HTML - React JSX - Components -React Classes - Composing Components - Passing Data - Dynamic Composition - Stateless Components - Designing components- React Forms - React CSS - React SaaS	[9]
Node.JS Node.js basics - Local and Export Modules - Node Package Manager - Node.js web server - Express.js Web App - Node.js Data Access - Express REST APIs - REST - Resource Based - HTTP Methods as Actions - JSON- Express - Routing – Handler Function	[9]
Total Hours:	45

Text Book(s):

1.	Thomas A. Powell, “HTML & CSS: The Complete Reference”, Fifth Edition, McGraw-Hill Education, 2010
2.	David Herron, “Node.js Web Development: Server-side web development made easy with Node.js 14 using practical examples”, Fifth Edition, Packt Publishing, 2020
3.	Shannon Bradshaw, Eoin Brazil & Kristina Chodorow, “MongoDB: The Definitive Guide”, Third Edition, O’Reilly Media, 2025

Reference(s):

1.	Frank Zammetti, “Modern Full–Stack Development”, Apress, 2020.
2.	Nathan Rozentals, Build Enterprise-ready, Modular Web Applications Using TypeScript 4 and Modern Frameworks, Packt Publishing ,2021
3.	Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Vasan Subramanian, A Press Publisher, 2019
4.	Dan Vanderkami, Effective TypeScript, O'Reilly Media Publishers,2019
5.	Anthony Accomazzo, Full Stack React, Kindle Edition,2017

Course Contents and Lecture Schedule

S. No	Topics	No. of hours
1.0	**HTML and CSS**	
1.1	Introduction to HTML and HTML5	1
1.2	Formatting and Fonts	1
1.3	Hyperlinks	1
1.4	Lists	1

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1.5	Frames	1
1.6	Introduction to CSS	2
1.7	Inline Styles	2
2.0	**JAVASCRIPT and JQUERY**	
2.1	Introduction to JavaScript	1
2.2	Syntax	1
2.3	Variables and data types	1
2.4	JavaScript Control Statements	1
2.5	Functions	2
2.6	Fundamentals of jQuery	1
2.7	jQuery selectors	1
2.8	Manipulators	1
3.0	**TYPESCRIPT and MONGODB**	
3.1	Type Script Introduction	1
3.2	Data Types	1
3.3	Arrays-Tuples	2
3.4	MongoDB	1
3.5	Collections	2
3.6	Reading from MongoDB	1
3.7	CRUD operations	1
4.0	**React JS**	
4.1	React ES6	1
4.2	React Render HTML	1
4.3	React Classes	2
4.4	Dynamic Composition	1
4.5	Stateless Components	1
4.6	Designing components	2
4.7	React SaaS	1
5.0	**Node.JS**	
5.1	Node.js basics	1
5.2	Node Package Manager	1
5.3	Express.js Web App	2
5.4	Express REST APIs	1
5.5	HTTP Methods as Actions	2
5.6	JSON- Express	1
5.7	Routing – Handler Function	1

Course Designer

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Chairman Bos

70 PIS 001	Research Methodology and IPR	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the research process and design
- To gain the knowledge about sources and collection of research data
- To understand the procedure of data analysis and preparation of reports
- To gain the knowledge on intellectual property rights
- To enlighten the system of patents and benefits

Prerequisite

- Basic understanding of research fundamentals and academic writing skills

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the evolution of the Internet and the impact of IoT in the society.	Understand
CO2	Design portable IoT devices using Arduino IDE/ Raspberry Pi with Python.	Create
CO3	Apply appropriate protocols in various parts of IoT based systems.	Apply
CO4	Use cloud offerings and big data tools in IoT based systems.	Apply
CO5	Implement Map-Reduce based programs using Apache frameworks.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
60 PIS 001 – Research Methodology and IPR								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Research Design Overview of research process and design- Use of Secondary and exploratory data to answer the research question-Qualitative research- Observation studies- Experiments and Surveys- Selection of the Right Medium and Journal for publication- Translation of Research	[9]
Data Collection and Sources Measurements- Measurement Scales- Questionnaires and Instruments- Sampling and methods-Data – Preparing- Exploring- examining and displaying.	[9]
Data Analysis and Reporting Overview of Multivariate Analysis- Hypotheses testing and Measures of Association- Presenting Insights and findings using written reports and oral presentation- Checks for Plagiarism- Falsification- Fabrication- and Misrepresentation	[9]
Intellectual Property Rights Intellectual Property – The concept of IPR- Evolution and development of concept of IPR- IPR development process- Trade secrets-utility Models-IPR & Bio diversity- Role of WIPO and WTO in IPR establishments- Right of Property- Common rules of IPR practices-Types and Features of IPR Agreement-Trademark- Functions of UNESCO in IPR maintenance	[9]
Patents Patents – objectives and benefits of patent-Concept, features of patent-Inventive step-Specification-Types of patent application-process E-filling-Examination of patent-Grant of patent- Revocation- Equitable Assignments- Licences- Licensing of related patents- patent agents-Registration of patent agents	[9]
Total Hours:	**45**

Text Book(s):	
1.	David I. Bainbridge, “Intellectual Property”, Longman, 9th Edition, 2012.
2.	Cooper Donald R, Schindler Pamela S and Sharma JK, “Business Research Methods”, Tata McGraw Hill Education, 11e (2012).
Reference(s):	
1.	Hawla H S., “Introduction to Intellectual Property Rights”, CBS PUB & DIST PVT Limited, INDIA, 2019.
2.	Catherine J. Holland, “Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets”, Entrepreneur Press, 2017
3.	David Hunt, Long Nguyen, Matthew Rodgers, “Patent searching: tools & techniques”, Wiley, 2017
4.	Arun K. Narasani, Kankanala K.C., Radhakrishnan V., “Indian Patent Law and Practice”, Oxford University Press, 2015.
5.	Richard Stim, “Patent, Copyright & Trademark - An Intellectual Property Desk Reference”, NOLO Publishers, 2020.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Research Design**	
1.1	Introduction of research process and design	1
1.2	Use of Secondary and exploratory data	1

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1.3	Qualitative research	1
1.4	Observation studies in research design	2
1.5	Journal for publication	1
1.6	Translation of Research	1
1.7	Experiments and Surveys	2
2.0	**Data Collection and Sources**	
2.1	Measurements	1
2.2	Measurement Scales	2
2.3	Questionnaires	1
2.4	Instruments	2
2.5	Sampling and methods	1
2.6	Data - Preparing, Exploring, examining and displaying.	2
3.0	**Data Analysis and Reporting**	
3.1	Overview of Multivariate Analysis	1
3.2	Hypotheses testing and Measures of Association	1
3.3	Presenting Insights	2
3.4	Checks for Plagiarism	1
3.5	Falsification	2
3.6	Fabrication	1
3.7	Misrepresentation	1
4.0	**Intellectual Property Rights**	
4.1	Intellectual Property	1
4.2	The concept of IPR	2
4.3	utility Models	1
4.4	IPR & Bio diversity	1
4.5	Role of WIPO and WTO	1
4.6	IPR establishments	2
4.7	Functions of UNESCO in IPR maintenance	1
5.0	**Patents**	
5.1	Introduction to Patents	1
5.2	objectives and benefits of patent	1
5.3	Features of patent	1
5.4	Inventive step	1
5.5	Equitable Assignments	1
5.6	Licenses	1
5.7	Equitable Assignments	1
5.8	Patent agents	1
5.9	Licensing of related patents	1

Course Designer

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Chairman Bos

70 PAC 002	Disaster Management	Category	L	T	P	Credit
		AC	2	0	0	0

Objectives

- Summarize basics of disaster
- Explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.
- Illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
- Describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
- Develop the strengths and weaknesses of disaster management approaches Teach how to improve writing skills and level of readability

Prerequisite

Basic awareness of geography, environment, and general social science concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Ability to summarize basics of disaster	Apply
CO2	Ability to explain a critical understanding of key concepts in disaster risk reduction and humanitarian response.	Analyse
CO3	Ability to illustrate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.	Understand
CO4	Ability to describe an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.	Analyse
CO5	Ability to develop the strengths and weaknesses of disaster management approaches	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	2	2	3	1	2	-
CO2	3	3	2	2	3	1	2	-
CO3	3	3	2	2	3	1	2	-
CO4	3	3	2	3	2	1	2	-
CO5	3	3	2	3	2	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)	
	1	2
Understand	30	30
Apply	40	40
Analyse	30	30
Total	100	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PAC 002 - Disaster Management

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	2	0	0	30	0	40	60	100

Introduction Disaster: Definition, Factors and Significance; Difference between Hazard and Disaster; Natural and Manmade Disasters: Difference, Nature, Types and Magnitude.	[6]
Repercussions of Disasters and Hazards Economic Damage, Loss of Human and Animal Life, Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	[6]
Disaster Prone Areas In India Study of Seismic Zones; Areas Prone to Floods and Droughts, Landslides and Avalanches; Areas Prone to Cyclonic and Coastal Hazards with Special Reference To Tsunami; Post-Disaster Diseases and Epidemics	[6]
Disaster Preparedness and Management Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard; Evaluation of Risk: Application of Remote Sensing, Data from Meteorological and other Agencies, Media Reports: Governmental and Community Preparedness.	[6]
Risk Assessment Disaster Risk: Concept and Elements, Disaster Risk Reduction, Global and National Disaster Risk Situation. Techniques of Risk Assessment, Global Co-Operation in Risk Assessment and Warning, People's Participation in Risk Assessment. Strategies for Survival.	[6]
Total Hours:	**30**

Text Book(s):

1.	Goel S. L., Disaster Administration and Management Text and Case Studies", Deep & Deep Publication Pvt. Ltd., New Delhi,2009.
2.	NishithaRai, Singh AK, "Disaster Management in India: Perspectives, issues and strategies "'New Royal book Company,2007.

Reference(s):

1.	Sahni, Pardeepet.al.," Disaster Mitigation Experiences and Reflections", Prentice Hall of India, 2001.
2.	Subramanian R," Disaster Management", Vikas publishing Housing Pvt. Ltd., 2018.
3.	Chu-huaKuei, Christian N Madu, Handbook of Disaster Management Risk Reduction & Management: Climate change and Natural Disaster, world scientific, 2017.
4.	JankiAndharia, Disaster studies: Exploring Intersectional ties in Disaster Discourse, Springer, 2020.

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Disaster: Definition, Factors and Significance	2
1.2	Difference between Hazard and Disaster	2
1.3	Natural and Manmade Disasters	2
1.4	Difference, Nature	2
1.5	Types and Magnitude	1
2.0	**Repercussions of Disasters and Hazards**	
2.1	Economic Damage, Loss of Human and Animal Life	2
2.2	Destruction of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones	2
2.3	Tsunamis, Floods, Droughts And Famines, Landslides and Avalanches	2
2.4	Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents	1
2.5	Oil Slicks and Spills, Outbreaks of Disease and Epidemics, War And Conflicts	2
3.0	**Disaster Prone Areas In India**	
3.1	Study of Seismic Zones	1
3.2	Areas Prone to Floods and Droughts	2
3.3	Landslides and Avalanches	2
3.4	Areas Prone to Cyclonic and Coastal Hazards with Special Reference to Tsunami	2
3.5	Post-Disaster Diseases and Epidemics	2
4.0	**Disaster Preparedness and Management**	
4.1	Preparedness: Monitoring of Phenomena Triggering a Disaster or Hazard	2
4.2	Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches	2
4.3	Tsunamis, Floods, Droughts and Famines, Landslides and Avalanches	2
4.4	Application of Remote Sensing, Data from Meteorological and other Agencies	2
4.5	Media Reports: Governmental and Community Preparedness	1
5.0	**Risk Assessment**	
5.1	Disaster Risk: Concept and Elements	2
5.2	Disaster Risk Reduction, Global and National Disaster Risk Situation	2
5.3	Techniques of Risk Assessment	2
5.4	Global Co-Operation in Risk Assessment and Warning	2
5.5	People's Participation in Risk Assessment. Strategies for Survival	1
	Total Hours:	**30**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 2P1	Full Stack Development Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To build Web Development Foundations
- To enhance Frontend Development Skills
- To explore TypeScript Programming Features
- To implement Backend Development and Database Integration
- To design Full-Stack Applications with the MERN Stack

Prerequisite

Basic knowledge of HTML, CSS, JavaScript, and programming fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design Interactive Web Pages	Understand
CO2	Use JavaScript / jQuery for web-based applications	Create
CO3	Understand the significance of using Typescript and MongoDB	Apply
CO4	Design Applications with React JS	Apply
CO5	Develop MERN applications using Express-Node.JS	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Understand	10	10	20
Apply	40	40	60
Create	10	10	20
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC 2P1 - Full Stack Development Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	0	0	3	45	1.5	60	40	100

List of Experiments

1. Create a website to demonstrate HTML Frames and Forms
2. Create a website using internal and external CSS
3. Build an application using JavaScript Array Methods
4. Create a star rating system using jQuery
5. Develop an application to demonstrate tuples, object types and unions in Typescript
6. Develop an application to perform CRUD operations in Mongo DB
7. Create a simple calculator Application using React JS
8. Create a voting application using React JS
9. Backend application development with Node.js and Express
10. Design and develop a simple MERN STACK application

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 2P2	Mobile Application Development Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To learn installation of mobile app development environment.
- To become familiar with using the built-in widgets and components of mobile app development platforms
- To develop Android applications with user interfaces by creating layouts, Views and Menus
- To utilize the power of background services, threads, notifications and communication APIs
- To learn using data persistence, location-based services, sensors and maps in Android applications

Prerequisite

Basic knowledge of programming concepts and fundamentals of mobile application development

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design Android UI Layout and develop event driven programs	Understand
CO2	Use the built-in widgets and components of mobile app development platforms	Create
CO3	Develop applications using views, menus and dialog boxes	Apply
CO4	Develop location-based apps, including GPS, sensors and Maps API	Apply
CO5	Develop apps that store data in internal/external memory	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology - Autonomous								
M.C.A - Master of Computer Applications								
70 PMC 2P2 - Mobile Application Development Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	0	0	3	45	1.5	60	40	100

List of Experiments

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

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 2P3	Mini Project	Category	L	T	P	Credit
		PC	0	0	4	2

Objectives

- To understand the software engineering methodologies for project development
- To gain knowledge about open-source tools
- To develop applications in various domains

Prerequisite

Basic knowledge of programming, problem-solving skills, and understanding of the relevant course domain

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze the requirements of the end user	Analyze
CO2	Design software in an efficient manner	Create
CO3	Understand various software tools	Understand
CO4	Implement the applications in various domains	Apply
CO5	Create Test Plan and perform testing	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Review I (R1)			Review II (R2)		Review III (R3)			Total (R1+R2 +R3)	Internal
Literature Survey	Topic Identification & Justification	Work Plan	Approach	Conclusion	Demo	Presentation	Report	Total	
10	10	10	20	20	10	10	10	100	100

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PCG 002	Career Skill Development - Ⅱ	Category	L	T	P	Credit
		CG	2	0	0	1*

Objectives

- To help learners improve their logical reasoning skills at different academic and professional contexts
- To help learners relate basic quantitative problems and solve them
- To help learners Infer critically the statements with optimal conclusions and assumptions
- To Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively
- To compute quantitative problems related to time and work speed and distance, and simple and compound interest

Prerequisite

- Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Deduce the topics in logical reasoning at the preliminary and intermediate level.	Analyse
CO2	Relate basic quantitative problems and solve them effectively at the preliminary level.	Apply
CO3	Infer critically the statements with optimal conclusions and assumptions with the data and information given.	Analyse
CO4	Solve the quantitative problems pertaining to calculations of averages, ratio and proportions, and profit and loss effectively at the pre- Intermediate level.	Apply
CO5	Compute quantitative problems related to time and work, speed and distance, and simple and compound interest at intermediate level.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

Passed in BoS Meeting held on 20.12.2025
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Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PCG 002 - Career Skill Development - II								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	2	0	0	30	1*	100	0	100

Logical Reasoning* Analogies — Alpha and numeric series - Number Series - Coding and Decoding - Blood Relations - Coded Relations - Order and Ranking — odd man out - Direction and distance.	[6]
Quantitative Aptitude–Part 1 Number system – Squares & cubes – Divisibility – Unit digits – Remainder Theorem - HCF& LCM –Geometric and Arithmetic progression - Surds& indices.	[6]
Critical Reasoning Syllogism — Statements and Conclusions ,Cause and Effect ,Statements and Assumptions - identifying Strong Arguments and Weak Arguments – Cause and Action -	[6]
Quantitative Aptitude–Part 2 Average- Ratio and proportion – Ages – Partnership – Percentage - Profit & loss– Discount- Mixture and Allegation.	[6]
Quantitative Aptitude–Part 3 Time& Work – Pipes and cistern –Time, Speed & distance-Trains – Boats and Streams - Simple interest and Compound interest.	[6]
Total Hours:	**30**

Text Book(s):

	-

Reference(s):

1.	Aggarwal, R.S.'A Modern Approach to Verbal and Non-verbal Reasoning' ,Revised Edition 2008,Reprint 2009,S.Chand&CoLtd.,New Delhi.
2.	AbhijitGuha, 'Quantitative Aptitude', McGraw Hill Education, 6thedition,2016
3.	DineshKhattar, 'Quantitative Aptitude For Competitive Examinations', Pearson Education 2020.
4.	Anne Thomson ,'Critical Reasoning: A Practical Introduction'LexiconBooks,3rd edition,2022.

*SDG 4 – Quality Education

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Logical Reasoning**	
1.1	Analogies- Alpha and numeric series	1
1.2	Number Series - Coding and Decoding	1
1.3	Blood Relations - Coded Relations	1
1.4	Order and Ranking, odd man out	1
1.5	Direction and Distance	2
2.0	**Quantitative Aptitude–Part 1**	
2.1	Number System	1
2.2	Squares &cubes-Divisibility	1
2.3	Unit digits - Remainder Theorem	1
2.4	HCF& LCM-Geometric and Arithmetic progression	1
2.5	Surds& Indices	2
3.0	**Critical Reasoning**	
3.1	Syllogism	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

3.2	Statements and Conclusions ,Cause and effects	1
3.3	Statements and Assumptions	1
3.4	Identifying Strong Arguments and Weak Arguments	1
3.5	Cause and Action- Data sufficiency	2
4.0	**Quantitative Aptitude–Part 2**	
4.1	Average-Ratio and proportion	1
4.2	Ages–Partnership	1
4.3	Percentage	1
4.4	Profit& loss	1
4.5	Discount-Mixture and Allegation	2
5.0	**Quantitative Aptitude–Part 3**	
5.1	Time& work	1
5.2	Pipes and cistern	1
5.3	Time, Speed &distance -Trains	1
5.4	Boats and Streams	1
5.5	Simple interest and Compound interest	2
	Total Hours:	**30**

Course Designer

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Chairman Bos

70 PMC 301	Artificial Intelligence and Machine Learning	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand the fundamentals of Search techniques
- To understand the reasoning methods in Intelligent systems
- To understand the basic concepts of machine learning and probability theory.
- To appreciate supervised learning and their applications.
- To understand unsupervised learning like clustering and EM algorithms

Prerequisite

- Basic knowledge of Computer Networks, Fundamentals of Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Formulate a problem and find the solution using searching techniques	Understand
CO2	Use the knowledge and the process of inference to derive new facts	Create
CO3	Use the Machine Learning algorithms for practical problems	Apply
CO4	Design and apply Unsupervised Learning models	Apply
CO5	Design and apply Unsupervised Learning models	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 301 - Artificial Intelligence and Machine Learning

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Agents and Search Agents and Environments – Good Behavior: The Concepts of Rationality – The Nature of Environments – The Structure of Agent - Problem Solving by Search – Uninformed Search – Searching with Costs – Informed State Space Search: Greedy and A* search – Game Search – Constraint Satisfaction Problems.	[9]
Logic and Reasoning Proposition Logic - Syntax - Semantics - First Order Logic - Syntax - Semantics - Conversion from English Statements to First order logic formula - Reasoning methods - Forward chaining - Backward chaining – Resolution – Introduction to Probabilistic Reasoning.	[9]
Machine Learning Machine Learning – Types of Machine Learning – Supervised Learning – Unsupervised Learning – Basic Concepts in Machine Learning – Machine Learning Process – Weight Space – Testing Machine Learning Algorithms – A Brief Review of Probability Theory – Turning Data into Probabilities – The Bias-Variance Trade-off.	[9]
Supervised Learning Linear Models for Regression –The Bias-Variance Decomposition –Common Regression Algorithms – Simple Linear Regression – Multiple Linear Regression – Linear Models for Classification – Discriminant Functions – Probabilistic Generative Models – Naive Bayesian Classifier - Probabilistic Discriminative Models – Common Classification Algorithms – k-Nearest Neighbours–Decision Trees – Random Forest model – Support Vector Machines	[9]
Unsupervised Learning Mixture Models and EM – K-Means Clustering – Dirichlet Process Mixture Models – Spectral Clustering – Hierarchical Clustering – The Curse of Dimensionality – Dimensionality Reduction – Principal Component Analysis – Latent Variable Models (LVM) – Latent Dirichlet Allocation (LDA).	[9]
Total Hours:	45

Text Book(s):

1.	Stuart Russell, Peter Norvig, "Artificial Intelligence: A Modern Approach", Pearson education, Fourth edition, 2022

Reference(s):

1	Lavika Goel, Artificial Intelligence: Concepts and Applications", Wiley, 2021.
2	Jagreet Kaur, Navdeep Singh Gill, "Artificial Intelligence and Deep Learning for Decision Makers", BPB Publications, 2020
3	Fabio Nelli, "Python Data Analytics with Pandas, Numpy, and Matplotlib ", Second Edition, Apress, 2018. Nilakshi Jain, "Artificial Intelligence: Making a System Intelligent", Wiley, 2019
4	Ethem Alpaydin, "Introduction to Machine Learning", Third Edition, Prentice Hall of India, 2015

Course Contents and Lecture Schedule

S. No	Topics	No. of hours
1.0	**Agents and Search**	
1.1	Agents and Environments	1
1.2	The Concepts of Rationality	1
1.3	The Structure of Agent	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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1.4	Uninformed Search	1
1.5	Searching with Costs	1
1.6	Informed State Space Search	1
1.7	Greedy and A* search	1
1.8	Game Search	1
1.9	Constraint Satisfaction Problems	1
2.0	**Logic and Reasoning**	
2.1	Proposition Logic	1
2.2	First Order Logic	2
2.3	Semantics	1
2.4	Reasoning methods	2
2.5	Backward chaining	1
2.6	Introduction to Probabilistic Reasoning	2
3.0	**Machine Learning**	
3.1	Types of Machine Learning	1
3.2	Supervised Learning	1
3.3	Unsupervised Learning	2
3.4	Machine Learning Process	1
3.5	Testing Machine Learning Algorithms	2
3.6	A Brief Review of Probability Theory	1
3.7	The Bias-Variance Trade-off	1
4.0	**Supervised Learning**	
4.1	Linear Models for Regression	1
4.2	The Bias-Variance Decomposition	2
4.3	Linear Models for Classification	1
4.4	Probabilistic Generative Models	1
4.5	Naive Bayesian Classifier	2
4.6	Decision Trees	1
4.7	Random Forest model	1
5.0	**Unsupervised Learning**	
5.1	Mixture Models and EM	1
5.2	Dirichlet Process Mixture Models	2
5.3	Hierarchical Clustering	1
5.4	The Curse of Dimensionality	2
5.5	Principal Component Analysis	
5.6	Latent Variable Models (LVM)	
5.7	Latent Dirichlet Allocation (LDA)	1

Course Designer

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Chairman Bos

70 PMC 302	Cloud Technologies and IT Service Management	Category	L	T	P	Credit
		PC	3	0	0	3

Objectives

- To understand Cloud Computing Concepts
- To design and Develop Cloud-Based Applications
- To explore Cloud Service Providers and Technologies
- To analyze Security and Compliance in the Cloud
- To optimize Cloud Resources and Performance

Prerequisite

- Basic knowledge of Computer Networks, Fundamentals of Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design and develop elegant and flexible cloud software solutions	Understand
CO2	Manage and deploy a cloud-based application	Create
CO3	Analyze a real-world problem and develop a cloud-based software solution	Apply
CO4	Evaluate the deployment of web services from cloud architecture	Apply
CO5	Evaluate the security issues related to the development of cloud applications	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 302 - Cloud Technologies and IT Service Management

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	L	T	P
III	3	0	0	45	3	3	0	0

Introduction Overview – Applications – Intranets and the Cloud – First Movers in the Cloud – Benefits –Limitations – Security Concerns, Introduction to IT Service Management (ITSM) in Cloud Environments, ITIL 4 Overview: Service Value System, Practices	[9]
Cloud Computing Technology Cloud Computing Services: IaaS – PaaS – SaaS – Software Plus Services – Hardware and Infrastructure: Clients – Security – Network – Services – Accessing the cloud: Platforms – Web Applications – Web APIs – Web Browsers, ITIL Service Catalogs for Cloud Services	[9]
Cloud Storage and Standards Cloud Storage: Overview – Cloud Storage Providers – Standards: Application – Client – Infrastructure – Service, ITIL Change Management for Cloud Storage & Migration	[9]
Developing applications Google: Payment – Force.com and Google – Google Gears – Microsoft: Live services – MS SQL Services – MS .NET Services – MS SharePoint Services – Dynamic CRM Services – Design – Development: Amazon Web Services - Google App Engine – Salesforce – MS Windows Azure – SAP HANA- Trouble Shooting – Application Management	[9]
Cloud Design Web Application Design – Machine Image Design – Privacy Design – Database Management, Service Design in ITIL: Capacity, Availability, Security, and Continuity for Cloud **Cloud Security** Data Security – Network Security – Host Security – Compromise response - ITIL Service Operation in the Cloud (Monitoring, SLA management) - System Monitoring & Alerting Tools (Azure Monitor, CloudWatch, Nagios)	[9]
Total Hours:	**45**

Text Book(s):

1.	George Reese, “Cloud Application Architectures”, O'Reilly SPD, First Edition, 2011

Reference(s):

1	Buyya R., Broberg J., Goscinski A., “Cloud Computing: Principles and Paradigm”, John Wiley& Sons, 2011
2	Denys van Kempen, ”SAP HANA 2.0: An Introduction ”, SAP Press,2019
3	Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing: A Practical Approach”, McGraw-Hill Education; FirstEdition , 2017
4	AXELOS, *“ITIL® 4 Foundation: ITIL 4 Edition”*, The Stationery Office (TSO), 2019
5	Ernest Brewster, *“Foundations of IT Service Management with ITIL 4”*, BCS Learning & Development Limited; Fourth Edition, 2021
6	Ronald L. Krutz, Russell Dean Vines, *“Cloud Security: A Comprehensive Guide to Secure Cloud Computing”*, Wiley; First Edition, 2010

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Applications	1
1.2	Intranets and the Cloud	1
1.3	First Movers in the Cloud	1
1.4	Security Concerns	1
1.5	Limitations	1
1.6	Security Concerns	1
1.7	Introduction to IT Service Management (ITSM)	1
1.8	Service Value System	1
1.9	Practices	1
2.0	**Cloud Computing Technology**	
2.1	IaaS– PaaS – SaaS	1
2.2	Hardware and Infrastructure	2
2.3	Web Applications	1
2.4	Web APIs	2
2.5	Web Browsers	1
2.6	ITIL Service Catalogs for Cloud Services	2
3.0	**Cloud Storage and Standards**	
3.1	Cloud Storage Providers	1
3.2	Standards	1
3.3	Application	2
3.4	Client	1
3.5	Infrastructure	2
3.6	Service	1
3.7	ITIL Change Management for Cloud Storage & Migration	1
4.0	**Developing applications**	
4.1	Google Gears	1
4.2	MS .NET Services	2
4.3	Dynamic CRM Services	1
4.4	Amazon Web Services	1
4.5	MS Windows Azure	1
4.6	SAP HANA	1
4.7	Trouble Shooting	2
5.0	**Cloud Design, Cloud Security**	
5.1	Web Application Design	1
5.2	Privacy Design	1
5.3	Database Management	1
5.4	Service Design in ITIL	1
5.5	Data Security	2
5.6	Compromise response	1
5.7	ITIL Service Operation in the Cloud	2

Course Designer

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Approved in Academic Council Meeting held on 03.01.2026

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70 PMC 303	Automated Software Testing	Category	L	T	P	Credit
		PC	3	0	2	4

Objectives

- To understand Advanced Testing Concepts
- To master Automation Testing Tools
- To design Comprehensive Test Strategies.
- To implement Agile and DevOps Testing Practices.
- To analyze and manage Test Metrics

Prerequisite

- Basic knowledge of Computer Networks, Fundamentals of Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply various testing techniques to test the software	Understand
CO2	Create test cases for different scenario	Create
CO3	Analyze the output on the outcome of testing	Apply
CO4	Apply the Automated testing tools for specific testing methods	Apply
CO5	Understand the testing tools to be used for the application	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)				End Sem Examination (Marks)	
	Test 1		Test 2			
	Theory	Lab	Theory	Lab	Theory	Lab
Remember	10	-	10	-	10	-
Understand	10	-	10	-	10	-
Apply	20	50	20	50	30	50
Analyse	20	50	20	50	50	50
Evaluate	-	-	-	-	-	-
Create	-	-	-	-	-	-
Total	60	100	60	100	100	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 303 - Automated Software Testing

Semester	Hours/Week			Total Hours	Credit	MAXIMUM MARKS		
	L	T	P		C	CA	ES	Total
III	3	0	2	60	4	50	50	100

Testing Principles and Axioms Testing as a Process – Testing Maturity Model- Testing Axioms – Software Testing Principles – Origins and Cost of Defects – Defect Classes and Examples – Developer/Tester Support of Developing a Defect Repository – Defect Analysis and Prevention Strategies	[9]
Black Box, White Box Testing and Test Adequacy Test Case Design Strategies – Black Box Approach –Boundary Value Analysis – Equivalence Class Partitioning – Syntax testing - Finite State-Based Testing – User Documentation Testing –White Box Approach – Static Testing vs. Structural Testing – Code Functional Testing – Coverage and Control Flow Graphs – Covering Code Logic – Paths – Cyclomatic Complexity – Test Adequacy Criteria-Evaluating Test Adequacy Criteria	[9]
Levels of Testing Unit Test Planning – Designing and Running the Unit Tests– Integration Test Planning – Scenario Testing – System Testing–Defect Bash Elimination System Testing- Acceptance Testing – Performance Testing – Regression Testing – Internationalization Testing – Ad-Hoc Testing – Alpha, Beta Tests.	[9]
Test Management Organization Structures for Testing Teams – Testing Services – Test Planning– Locating Test Items – Test Management – Reporting Test Results – The Role of Three Groups in Test Planning and Policy Development – Introducing the Test Specialist – Skills Needed by a Test Specialist – Structure of Testing Group -Building a Testing Group. Integration of tests into Build tools (Maven/Gradle) - Introduction to Continuous Integration pipelines (Jenkins/GitHub Actions) - Test runners (JUnit/TestNG for Java, Pytest for Python, Jest for JavaScript)	[9]
Test Automation Software Test Automation – Framework for test automation-Skill Needed for Automation – Scope of Automation – Generic Test Automation Architecture – Requirements & Criteria for Test Tool selection -Challenges in Automation – Test Metrics and Measurements – CASE STUDY: Web Accessibility Testing, Disabled Object Verification Through Force - End-to-End Testing for web apps (Selenium + TestNG) - Continuous Integration setup with automated tests - Best practices for Web, Mobile & API automation in CI/CD pipelines	[9]
Practical: 1. Write a Java program based on JUnit & TestNG for Unit testing. 2. Perform Integration & Functional Testing of a web application using Selenium. 3. Write a Selenium script integrated with Maven/Gradle build tool. 4. Use JMeter for Performance testing. 5. Perform API testing with Postman and automate via Newman CLI. 6. Write Selenium Python code for End-to-End web testing. 7. Execute Mobile testing with Appium. 8. Use Pytest for running multiple API test cases. 9. Set up a Jenkins pipeline to run Selenium + API tests automatically. 10. Generate automated Test Reports using Extent Reports/Allure.	[15]
Total Hours: (Lecture - 45; Practical - 15)	**60**

Text Book(s):

1.	Jorgensen, Paul C. Software testing: a craftsman's approach. CRC press, Fourth Edition, 2018.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Reference(s):	
1	Aniche, M. Effective Software Testing: A developer's guide. Simon and Schuster, 2022
2	Unmesh Gundecha, “Selenium WebDriver 3 Practical Guide: End-to-end automation testing for web and mobile browsers with Selenium WebDriver”, 2nd Edition" 2018.
3	Mark Collin, “Mastering Selenium WebDriver 3.0: Boost the performance and reliability of your automated checks by mastering Selenium WebDriver”, 2nd Edition" 2018.
4	Pallavi Sharma, Selenium with Java - A Beginner's Guide, BPB Publications, 2022
5	Boni Garcia, Mastering Software Testing with JUnit 5, Packt Publishing, 2018

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Testing Principles and Axioms**	
1.1	Testing as a Process	1
1.2	Testing Maturity Model	1
1.3	Testing Axioms	1
1.4	Origins and Cost of Defects	2
1.5	Defect Classes and Examples	2
1.6	Defect Analysis and Prevention Strategies	2
2.0	**Black Box, White Box Testing and Test Adequacy**	
2.1	Test Case Design Strategies	1
2.2	Equivalence Class Partitioning	1
2.3	Syntax testing	1
2.3	Boundary Value Analysis	1
2.4	User Documentation Testing	1
2.5	White Box Approach	1
2.6	Static Testing vs. Structural Testing	1
2.7	Coverage and Control Flow Graphs	1
2.8	Test Adequacy Criteria	1
2.9	Evaluating Test Adequacy Criteria	1
3.0	**Levels of Testing**	
3.1	Unit Test Planning	1
3.2	Designing and Running the Unit Tests	1
3.3	Integration Test Planning	1
3.4	Scenario Testing	1
3.5	System Testing	1
3.6	Acceptance Testing	1
3.7	Performance Testing	1
3.8	Internationalization Testing – Ad-Hoc Testing	1
3.9	Alpha, Beta Tests	1
4.0	**Test Management**	
4.1	Organization Structures for Testing Teams	1
4.2	Testing Services	1
4.3	Test Management	1
4.4	Skills Needed by a Test Specialist	1
4.5	Structure of Testing Group -Building a Testing Group	1
4.6	Building a Testing Group	1
4.7	Introduction to Continuous Integration pipeline	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

4.8	Test runners	1
4.9	JUnit/TestNG for Java, Pytest for Python, Jest for JavaScript)	1
5.0	**Test Automation**	
5.1	Software Test Automation	1
5.2	Scope of Automation	1
5.3	Framework for test automation	1
5.4	Generic Test Automation Architecture	1
5.5	Requirements & Criteria for Test Tool selection	1
5.6	Challenges in Automation	1
5.7	Test Metrics and Measurements	1
5.8	Best practices for Web,	1
5.9	Mobile & API automation in CI/CD pipelines	1
	Practical	
1	Write a Java program based on JUnit & TestNG for Unit testing.	1
2	Perform Integration & Functional Testing of a web application using Selenium.	2
3	Write a Selenium script integrated with Maven/Gradle build tool.	2
4	Use JMeter for Performance testing.	2
5	Perform API testing with Postman and automate via Newman CLI.	2
6	Write Selenium Python code for End-to-End web testing.	1
7	Execute Mobile testing with Appium.	2
8	Use Pytest for running multiple API test cases.	2
9	Set up a Jenkins pipeline to run Selenium + API tests automatically. Generate automated Test Reports using Extent Reports/Allure.	1
	Total	**60**

Course Designer

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Chairman Bos

70 PMC 3P1	Artificial Intelligence and Machine Learning Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To understand about data cleaning and data pre-processing
- To familiarize with the Supervised Learning algorithms and implement them in practical situations
- To familiarize with unsupervised Learning algorithms and carry on the implementation part
- To practice ML algorithms and techniques
- To use algorithms for real time data sets

Prerequisite

- Basic knowledge of Computer Networks, Fundamentals of Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply data pre-processing technique and explore the structure of data to prepare for predictive modelling	Understand
CO2	Select and train a model and measure the performance	Create
CO3	Apply feature selection techniques in Machine Learning	Apply
CO4	Construct Bayesian Network for appropriate problem	Apply
CO5	Apply parametric and non-parametric machine Learning algorithms and implement to practical situations	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Lab Experiment Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	40	15	80	80
Analyse	10	10	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC 3P1 - Artificial Intelligence and Machine Learning Laboratory								
Semester	**Hours/Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	1.5	60	40	100

List of Experiments

1. Exercise using Linear Regression and Multiple Regression
2. Exercise using K-Nearest Neighbour Classifier
3. Root Node Attribute Selection for Decision Trees Using ID3
4. Solving Regression & Classification using Decision Trees - Cart
5. Using Weka Tool for SVM Classification for Chosen Domain Application
6. Data & Text Clustering Using K-Means Algorithm
7. Dimensional Reduction Algorithms in Image Processing Applications
8. Exercise using Naive Bayes Classifier
9. Exercise using Random Forest
10. Exercise on Data Visualization

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 3P2	Cloud Infrastructure & Operations Laboratory	Category	L	T	P	Credit
		PC	0	0	3	1.5

Objectives

- To understand Cloud Service Models
- To Explore Cloud Storage and Management.
- To Implement Networking and Content Delivery.
- To Monitor and Automate Cloud Operations.
- To Build Advanced Applications with Cloud Services.

Prerequisite

- Basic knowledge of Computer Networks, Fundamentals of Programming

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Design and develop elegant and flexible cloud software solutions	Understand
CO2	Manage and deploy a cloud-based application	Create
CO3	Analyze a real-world problem and develop a cloud-based software solution	Apply
CO4	Evaluate the deployment of web services from cloud architecture	Apply
CO5	Evaluate the security issues related to the development of cloud applications	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	1	3	1	2	2	2	2	-
CO2	2	2	3	3	3	2	2	-
CO3	3	1	2	3	3	1	2	-
CO4	2	1	2	3	3	2	2	-
CO5	2	1	2	3	3	1	2	-
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Lab Experiment Assessment (Marks)		Model Examination (Marks)	End Sem Examination (Marks)
	Lab	Activity		
Remember	-	-	-	-
Understand	-	-	-	-
Apply	40	15	80	80
Analyse	10	10	20	20
Evaluate	-	-	-	-
Create	-	-	-	-
Total	50	25	100	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 3P2 - Cloud Infrastructure & Operations Laboratory

Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	3	45	1.5	60	40	100

List of Experiments

1. Develop cloud applications using IAAS, PAAS and SAAS.
2. Create a Virtual Private Cloud (VPC) using networking and content delivery services.
3. Develop an application using storage services with versioning (S3, Azure Blob).
4. Deploy an application using Elastic Beanstalk (or Azure App Service).
5. Set up CloudWatch/Azure Monitor to trigger email/SMS notifications
6. Create and manage a role using IAM (Identity and Access Management)
7. Log and manage incidents in ServiceNow (ticketing workflow)
8. Create and approve a Change Request in ServiceNow.
9. Configure a basic compliance policy using Microsoft Intune (or SCCM)
10. Mini Project – Cloud Operations Workflow

    Deploy a VM on AWS/Azure

    Monitor it (CloudWatch/Azure Monitor)

    Simulate an incident in ServiceNow and resolve it

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC 3P3	Term Paper and Technical Seminar	Category	L	T	P	Credit
		CG	0	0	2	0

Objectives

- To gain knowledge on audio/visual and presentation tools
- To improve communication skills of students
- To improve presentation skills of students
- To improve inter/intra personal skills of students
- To improve their leadership skills

Prerequisite

- Basic knowledge of research skills, technical writing, and presentation skills

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use audio/visual and presentation tools properly	Analyse
CO2	Demonstrate professional presentation abilities	Analyse
CO3	Apply acquired knowledge in research	Apply
CO4	Use verbal/non-verbal communication effectively	Analyse
CO5	Use inter/intra-personal skills effectively	Analyse

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC 3P3 – Term Paper and Technical Seminar

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	2	30	0	100	0	100

Students will be giving presentations on advanced concepts and technologies in IT and submit the report with presentation. Student shall collect literature on the advanced topic in relevant fields & critically review the literature and submit it in the form of report & shall make an oral presentation.

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Chairman Bos

70 PG 003	Career Skill Development - III	Category	L	T	P	Credit
		CG	2	0	0	1*

Objectives

- To help learners improve their vocabulary and enable them to use words appropriately in different academic and professional contexts.
- To help learners develop strategies that could be adopted while reading texts.
- To help learners acquire the ability to speak and write effectively in English in real life and career related situations.
- Improve listening, observational skills, and problem-solving capabilities
- Develop message generating and delivery skills

Prerequisite

- Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare and contrast products and ideas in technical texts.	Analyse
CO2	Identify cause and effects in events, industrial processes through technical texts	Analyse
CO3	Analyse problems in order to arrive at feasible solutions and communicate them orally and in the written format.	Analyse
CO4	Report events and the processes of technical and industrial nature.	Apply
CO5	Articulate their opinions in a planned and logical manner, and draft effective résumés in context of job search.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 - Low								

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PCG 002 - Career Skill Development - Ⅱ								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	2	0	0	30	1*	100	0	100

Verbal & Analytical Reasoning Seating Arrangements – Analytical Reasoning (PUZZELS) – Machin input and output - Coded Inequality — Eligibility Test	[6]
Quantitative Aptitude - Part – 4 Permutation and Combination - Probability - Quadratic equation - Geometry – Clock – Calendar – Logarithmic.	[6]
Non-Verbal Reasoning Series Completion of Figures — Classification — Courting of figure — Figure matrix — Embedded Figure – Complete Figure – Paper Cutting and Folding – Mirror images and Water Images	[6]
Quantitative Aptitude - Part – 5 Mensuration of Area, Volume and Surface area in 2D and 3D Shapes – 2D Shapes – Square, Rectangle, Triangle, Circle, etc. - 3D Shapes — Cube, Cuboid , Sphere , Cone , etc.	[6]
Data Interpretation and Analysis Data interpretation Based on text - Data Interpretation Based on Tabulation, Pie chart, Bar graph, And Line graph — Venn Diagram - Data sufficiency.	[6]
Total Hours:	**30**

Text Book(s):	
1.	Data Interpretation and Analysis Data interpretation Based on text - Data interpretation Based on Tabulation, Pie chart, Bar graph, And Line graph — Venn Diagram - Data sufficiency..
2.	Crouse W. H., and Anglin D. L., "Automotive Mechanics", 10th Edition, McGraw Hill Education Private Limited, New Delhi, 2017.
Reference(s):	
1.	Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Good Heart – Will Cox Company Inc, USA, 2012.
2.	Abhijit Guha, 'Quantitative Aptitude', McGraw Hill Education, 6th edition, 2016
3.	Dinesh Khattar, 'Quantitative Aptitude For Competitive Examinations', Pearson Education (2020)
4.	Anne Thomson, 'Critical Reasoning: A Practical Introduction' Lexicon Books, 3rd edition, 2022. Warszaw

*SDG 9 – Industry Innovation and Infrastructure
**SDG 3 – Good Health and Well Being
***SDG 7 – Affordable and Clean Energy

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Verbal & Analytical Reasoning**	
1.1	Seating Arrangements 1 1.2 Analytical Reasoning (PUZZELS)	1
1.2	Machine input and output	1
1.3	Coded Inequality	1
1.4	Eligibility Test	1
1.5	Vehicle Aerodynamics	2
2.0	**Quantitative Aptitude - Part – 4**	
2.1	Permutation and Combination	1
2.2	Probability	1
2.3	Quadratic equation – Geometry	1
2.4	Clock – Calendar	1
2.5	Logarithmic	2

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3.0	**Non-Verbal Reasoning**	
3.1	Series Completion of Figures – Classification	1
3.2	Courting of figure – Figure matrix	1
3.3	Embedded Figure – Complete Figure	1
3.4	Paper Cutting and Folding	1
3.5	Mirror images and Water Images	2
4.0	**Quantitative Aptitude - Part – 5**	
4.1	Mensuration of Area, Volume	1
4.2	Mensuration of Volume	1
4.3	Surface area in 2D and 3D Shapes	1
4.4	2D Shapes – Square, Rectangle, Triangle, Circle, etc.	1
4.5	3D Shapes – Cube, Cuboid , Sphere , Cone , etc	2
5.0	**Data Interpretation and Analysis**	
5.1	Data interpretation Based on text	1
5.2	Data interpretation Based on Tabulation, Pie chart	1
5.3	Bar graph , And Line graph	1
5.4	Venn Diagram	1
5.5	Data sufficiency	2
	Total Hours:	**30**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC 4P1	Project Work	Category	L	T	P	Credit
		CG	0	0	24	12

Objectives

- To implement their innovative ideas in practical
- To retrieve the hazards by adopting suitable assessment methodologies and staring it to global.
- To strengthens the students to carry out the problems on their own
- To improve the leadership skills and work in a group
- To solve complex problems and obtaining solution for them

Pre-requisites

- Basic knowledge in computer operation.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop attitude of lifelong learning and will develop interpersonal skills to deal with people working in diversified field.	Analyse
CO2	Write technical reports and research papers to publish at national and international level.	Analyse
CO3	Develop strong communication skills to defend their work in front of technically qualified audience.	Apply
CO4	Learn about Patent filing and IPR	Apply
CO5	Gain knowledge about new business ideas and product development	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	-	3	2	2	-
CO2	3	3	3	-	3	2	2	-
CO3	3	3	3	-	3	2	2	-
CO4	3	3	3	-	3	2	2	-
CO5	3	3	3	-	3	2	2	-
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Internal Assessment (60)					End Semester (40)
Items	Review 1	Review 2	Review 3	Publication	
Marks	5	10	15	30	40
	Total internal marks 60				

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology - Autonomous

M.C.A - Master of Computer Applications

70 PMC 4P1 – Project Work

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	24	360	12	60	40	100

Methodology:

The objective of Project Work & Dissertation is to enable the student to extend further investigative a study on the project

1. Three reviews shall be conducted by project review committee (Project coordinator, Project Guide and HOD/Subject experts in the department)
2. Student(s) shall make a presentation on the progress made by him / her / them during the reviews
3. Student(s) shall submit a project technical report comprising of title, problem statement, importance of work, methodology, experimental work and outcome of the work carried out during the 3rd review
4. The work carried out may be either under the guidance of a supervisor from the department or jointly with a supervisor drawn from other department / academic institution / R& D laboratory / Industry
5. The project reviews (R1+R2+R3) shall carry a maximum of 60 marks
6. The project report shall be submitted as per the approved guidelines given by the college, the viva-voce examination shall carry 40 marks
7. Marks are awarded to each student of the project group based on the individual performance in the viva-voce examination

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Chairman Bos

70 PMC E11	Data Ethics and Privacy	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand the Impact of Data Bias and Ethics in AI
- To Learn Ethical Practices in Data Management
- To Analyze Privacy and Accuracy in Data Science
- To Develop Privacy-Aware Machine Learning Techniques
- To Apply Data Encryption for Privacy and Compliance

Prerequisite

- Basic knowledge of data, computing fundamentals, and awareness of ethics and privacy concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Develop an awareness of the impact of data-related decisions on individuals and society.	Understand
CO2	Identify the challenges and consequences of Biased datasets.	Apply
CO3	Examine the importance of Data security and Accuracy.	Apply
CO4	Apply the aspects of distributed data and associated risks.	Analyze
CO5	Apply the knowledge of encryption for data.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology - Autonomous								
M.C.A - Master of Computer Applications								
70 PMC E11 - Data Ethics and Privacy								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Databias Introduction- Data vs Information vs Facts- Algorithmic Bias- Privacy- Biased Datasets- Purpose of Corporation/AI-Fairness, Predictive Analytics & Mistakes- Surveillance & Power- Disparate Treatment/Impact	[9]
Ethics in Data Science Ethics in data management- Role of AI Ethics in Corp- Privacy & Shared Responsibility- Surveillance/Power and Shared Responsibility- Disparate Treatment/Impact- Economics of Trust- Transparency vs accountability.	[9]
Accuracy and Privacy Creating & Measuring Accuracy-Data Science Ethics-Data Science Hate Privacy-Respecting Data Science- Misconceptions About Data Science Ethics- Accountability and Governance- Data Provenance and Aggregation.	[9]
Privacy Attacks Defining Differential Privacy- Privacy Loss- Privacy attacks- Types of privacy attacks- Privacy Aware Machine Learning and Data Science- Architecting Privacy in Data and Machine Learning- Open-Source Libraries for PPML Projects- Distributed Data- Federated Learning.	[9]
Data Encryption for Privacy Encrypted Computation- Types of Encrypted Computation- Real-World Encrypted Computation- Navigating the Legal Side of Privacy- GDPR: An Overview- Privacy and Practicality Considerations- Getting Practical: Managing Privacy and Security Risk.	[9]
Total Hours:	**45**
Text Book(s):	
1. Katharine Jarmul, Practical Data Privacy Released April 2023 Publisher(s): O'Reilly Media, Inc.	
Reference(s):	
1. Loukides, Mike, Hilary Mason, and DJPatil.2018. Ethics and Data Science. Sebastopol, CA: O'Reilly Media.	

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Databias**	
1.1	Introduction	1
1.2	Data vs Information vs Facts	1
1.3	Algorithmic Bias	1
1.4	Privacy	1
1.5	Biased Datasets	1
1.6	Purpose of Corporation/AI-Fairness	1
1.7	Predictive Analytics & Mistakes	1
1.8	Surveillance & Power-Disparate Treatment/Impact	2
2.0	**Ethics in Data Science**	
2.1	Ethics in data management	1
2.2	Role of AI Ethics in Corp	1
2.3	Privacy & Shared Responsibility	1

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2.4	Surveillance/Power and Shared Responsibility	2
2.5	Disparate Treatment/Impact	1
2.6	Economics of Trust	1
2.7	Transparency vs accountability.	2
3.0	**Accuracy and Privacy**	
3.1	Creating & Measuring Accuracy	1
3.2	Data Science Ethics	1
3.3	Data Science Hate Privacy	1
3.4	Respecting Data Science	1
3.5	Misconceptions About Data Science Ethics	2
3.6	Accountability and Governance	2
3.7	Data Provenance and Aggregation	1
4.0	**Privacy Attacks**	
4.1	Defining Differential Privacy	1
4.2	Privacy Loss	1
4.3	Privacy attacks- Types of privacy attacks	2
4.4	Privacy Aware Machine Learning and Data Science	1
4.5	Architecting Privacy in Data and Machine Learning	1
4.6	Open-Source Libraries for PPML Projects	1
4.7	Distributed Data	1
4.8	Federated Learning	1
5.0	**Data Encryption for Privacy**	
5.1	Encrypted Computation	1
5.2	Types of Encrypted Computation	1
5.3	Real-World Encrypted Computation	2
5.4	Navigating the Legal Side of Privacy	1
5.5	GDPR: An Overview	1
5.6	Privacy and Practicality Considerations	1
5.7	Getting Practical: Managing Privacy and Security Risk.	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E12	Data Processing Techniques	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Data Processing and Big Data Challenges
- To Learn Real-Time Data Processing Techniques
- To Explore Incremental and In-Memory Processing
- To Implement Data Transformation and Preprocessing
- To Develop Skills in Data Visualization and Analytics

Prerequisite

- Basic knowledge of programming, data handling, and fundamentals of computer systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze the data processing concepts in data science.	Understand
CO2	Apply the Real time data processing in machine learning model.	Apply
CO3	Illustrate the change Data capture Techniques and Strategies in Incremental Processing.	Apply
CO4	Apply the Learning algorithms for incremental processing in data.	Analyze
CO5	Correlating the Traditional disk system with In-Memory Database.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous							
MCA – Master of Computer Applications							
70 PMC E12 - Data Processing Techniques							
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**	
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Data Processing Overview of Data processing in Data science–Importance of Efficiency and Scalability – challenges in Big Data Processing–Parallel and Distributed Processing –Apache Hadoop– Map reduce – Integration of Data mining system with a Data warehouse–Major issues in Data Mining–Data Preprocessing.	[12]
Real Time Data Processing Incremental processing in Data science–Change Data Capture Techniques (CDC)-Strategies-Delta Processing for incremental updates- Incremental Learning algorithms.	[12]
Incremental Processing Principles of In-Memory Processing-comparisons Of Traditional Disk based systems -In-Memory database and data structures-In-Memory computing in spark-Resilient Distributed datasets (RDD) And Data frames-In-Memory analytics with SAP HANA-Performance Tuning and optimization.	[12]
In-Memory Processing Strings–Datetimes–Hierarchical Indexing–Visualizing data Frames – Pandas Profiling – Data Transformation-handling Null values-categorical values-Data Aggregation-Data Filtering handling Outliers.	[9]
Total Hours:	**45**

Text Book(s):	
1.	"Practical Real-time Data Processing and Analytics: Distributed Computing and Event Processing using Apache Spark, Flink, Storm, and Kafka", by Shilpi Saxena and Sharub Gupta, 1st Edition, Kindle Edition 2017.
2.	"Data Warehouse ETL Toolkit: Practical Techniques for Extracting, Cleaning, Conforming, and Delivering Data" by Ralph Kimball and Joe Caserta, 1st Edition 2004.
Reference(s):	
1.	Building a Scalable Data Warehouse with Data Vault 2.0", by Dan Linstedt ,2015.
2.	"High Performance Spark: Best Practices for Scaling and Optimizing Apache Spark" by Holden Karau, Rachel Warren, 1st edition, 2017.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Data Processing**	
1.1	Overview of Data processing in Data science	1
1.2	Importance of Efficiency and Scalability	1
1.3	challenges in Big Data Processing	1
1.4	Parallel and Distributed Processing	2
1.5	Apache Hadoop	1
1.6	Map reduce	2
1.7	Integration of Data mining system with a Data warehouse	2
1.8	Major issues in Data Mining	1
1.9	Data Preprocessing	1
2.0	**Real Time Data Processing**	
2.1	Incremental processing in Data science	2
2.2	Change Data Capture Techniques (CDC)	3

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Approved in Academic Council Meeting held on 03.01.2026

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2.3	Strategies	2
2.4	Delta Processing for incremental updates	2
2.5	Incremental Learning algorithms	3
3.0	**Incremental Processing**	
3.1	Principles of In-Memory Processing	1
3.2	comparisons Of Traditional Disk based systems	2
3.3	In-Memory database and data structures	2
3.4	In-Memory computing in spark	3
3.5	Resilient Distributed datasets (RDD) And Data frames	2
3.6	In-Memory analytics with SAP HANA	1
3.7	Performance Tuning and optimization.	1
4.0	**In-Memory Processing**	
4.1	Strings	1
4.2	Datetimes	1
4.3	Hierarchical Indexing	1
4.4	Visualizing data Frames	1
4.5	Pandas Profiling	1
4.6	Data Transformation	1
4.7	Handling Null values	1
4.8	Categorical values	1
4.9	Data Aggregation- Data Filtering handling Outliers.	1
	Total Hours:	**45**

Course Designer

MS.U.Megala - megala@ksrct.ac.in

70 PMC E13	Network Security Administration	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Network Security Basics and Attacks
- To Explore Network Security Algorithms and Encryption
- To Learn Email Security Protocols
- To Develop Network Security Management Skills
- To Implement and Configure Network Security Solutions

Prerequisite

- Basic knowledge of computer networks, security concepts, and fundamental programming skills

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify types of security attacks, services and mechanisms.	Understand
CO2	Interpret the implementation of Internetwork security model and its standards	Apply
CO3	Illustrate Email privacy system and compare Pretty Good Privacy (PGP and S/MIME	Apply
CO4	Interpret the primary components of a Three-Tier Architecture and explain how they work together firewall environment.	Analyze
CO5	Explain how communication is secured and how traffic is routed in firewall environment	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E13 - Network Security Administration								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Network Security Basics Security Attacks (Interruption, Interception, Modification and Fabrication), Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms, A model for Internetwork security, Internet Standards and RFCs, Buffer overflow & format string vulnerabilities, TCP session hijacking, ARP attacks, route table modification, UDP hijacking, and man-in-the-middle attacks.	[9]
Network Security Algorithm Conventional Encryption Principles, Conventional encryption algorithms, cipher block modes of operation, location of encryption devices, key distribution Approaches of Message Authentication, Secure Hash Functions and HMAC	[9]
Email Security Email privacy: Good Privacy (PGP) and S/MIME.IP Security Overview, IP Security Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations and Key Management.	[9]
Network Security Management Deploying Smart Console - Security Management Server - Security Gateway - Configuring Objects in Smart Console-Establishing Secure Internal Communication - Managing Administrator Access - Managing Licenses - Creating a Security Policy -Configuring Order Layers.	[9]
Network Security Configuration Configuring a Shared Inline Layer - Configuring NAT - Integrating Security with a Unified Policy - Elevating Security with Autonomous -Threat Prevention - Configuring a Locally Managed Site- to-Site VPN - Elevating Traffic View - Monitoring System States - Maintaining the Security Environment.	[9]
Total Hours:	45

Text Book(s):	
1.	Network Security Essentials (Applications and Standards) by William Stallings Pearson Education 2018.
2.	Network Security and Cryptography: Bernard Menezes, CENGAGE Learning, 2010.
Reference(s):	
1.	Cryptography and network Security, Third edition, Stallings, PHI/Pearson 4. Principles of Information Security, Whitman, Cengage Learning, 2006.
2.	Network Security - Private Communication in a Public World by Charlien Kaufman, Radia Perlman and Mike Speciner, Pearson/PHI 2002.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Network Security Basics**	
1.1	Security Attacks (Interruption, Interception, Modification and Fabrication)	1
1.2	Security Services (Confidentiality, Authentication, Integrity, Non-repudiation, access Control and Availability) and Mechanisms	1
1.3	A model for Internetwork security	1
1.4	Internet Standards and RFCs	1
1.5	Buffer overflow & format string vulnerabilities	1
1.6	TCP session hijacking	1
1.7	ARP attacks	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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1.8	route table modification	1
1.9	UDP hijacking and man-in-the-middle attacks	1
2.0	**Network Security Algorithm**	
2.1	Conventional Encryption Principles	1
2.2	Conventional encryption algorithms	2
2.3	Cipher block modes of operation	2
2.4	Location of encryption devices	1
2.5	Key distribution Approaches of Message Authentication	2
2.6	Secure Hash Functions and HMAC	1
3.0	**Email Security**	
3.1	Email privacy:	1
3.2	Good Privacy (PGP) and S/MIME	1
3.3	IP Security Overview	1
3.4	IP Security Architecture	1
3.5	Authentication Header	2
3.6	Encapsulating Security Payload	1
3.7	Combining Security Associations and Key Management	2
4.0	**Network Security Management**	
4.1	Deploying Smart Console	1
4.2	Security Management Server	1
4.3	Security Gateway	1
4.4	Configuring Objects in Smart Console	1
4.5	Establishing Secure Internal Communication	1
4.6	Managing Administrator Access	1
4.7	Managing Licenses	1
4.8	Creating a Security Policy- Configuring Order Layers	2
5.0	**Network Security Configuration**	
5.1	Configuring a Shared Inline Layer	1
5.2	Configuring NAT	1
5.3	Integrating Security with a Unified Policy	1
5.4	Elevating Security with Autonomous	1
5.5	Threat Prevention	1
5.6	Configuring a Locally Managed Site- to-Site VPN	1
5.7	Elevating Traffic View - Monitoring System States	1
5.8	Maintaining the Security Environment.	2
	Total Hours:	**45**

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70 PMC E14	Game Programming	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Game Design Concepts
- To Apply Mathematical Concepts in Game Programming
- To Implement Game Mechanics and Physics
- To Design Game Architecture and Algorithms
- To Learn Programming Languages for Game Development

Prerequisite

- Basic knowledge of programming, mathematics, and computer fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the concepts and techniques used in game development.	Understand
CO2	Apply the mathematical concept for game development	Apply
CO3	Apply the mechanic's concepts for game development	Apply
CO4	Design and implement algorithms and techniques applied to game development.	Analyze
CO5	Analyse the various language and platforms of game development.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E14 - Game Programming								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Introduction to Game Programming Games- Designing and Developing Games-Genres- Understanding: Players, Machine-Game: Concepts, Worlds-Creative and Expressive Play- Character Development-Storytelling-Creating User Experience-Game play- Core Mechanics- Game Balancing- Level Design.	[9]
Math for Game Programming Cartesian Coordinate Systems-Vectors-Multiple Coordinate Spaces-Matrices and Linear – Transformations - Polar Coordinate Systems-3D Rotations-Geometric Primitives-Viewing in 3D	[9]
Mechanics for Game Programming Linear Kinematics and Calculus –Linear and Rotational Dynamics - Curves in 3D – Lighting - Intersection Testing - Rigid Body Dynamics - Animation System – Controller based animation-Sound – Cameras Details.	[9]
Architecture and Algorithms for Game Programming Foundation- Low-Level Engine System - Game Play - Path and Waypoints – Navigation – Behaviours - Collision Detection - Game Logic - Game Artificial Intelligence - Spatial Sorting - singleton - Object pooling.	[9]
Language for Game Programming Scripting Languages and Data Format – PyGame/Unity-Networked Games – Sample Game – iOS, Windows, Android-Developing 2D and 3D interactive games using Unity - DirectX – Isometric and Tile Based Games - Puzzle games - Single Player games - Multi Player game.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Sebastiano M.Cossu, “Beginning Game AI with Unity: Programming Artificial Intelligence with C#”, Apress, First Edition, 2020
2.	Jason Gregory, “Game Engine Architecture”, Third Edition, A K Press, 2015.
Reference(s):	
1.	Sanjay Madhav, “Game Programming Algorithms and Techniques: A Platform Agnostic Approach”, Addison Wesley, First Edition, 2013
2.	James M, Van Verth, Lars M.Bishop, “Essential Mathematics for Game anf Interactive Application”, Third Edition, CRC Press, 2015.
3.	Michael Dawson, “Beginning C++ Through Game Programming”, Fourth Edition, Cengage Learning PTR, 2015.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Game Programming**	
1.1	Games- Designing and Developing Games	1
1.2	Genres	1
1.3	Understanding: Players	1
1.4	Machine-Game: Concepts, Worlds	1
1.5	Creative and Expressive Play	1
1.6	Character Development	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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1.7	Storytelling- Creating User Experience	1
1.8	Game play- Core Mechanics	1
1.9	Game Balancing- Level Design.	1
2.0	**Math for Game Programming**	
2.1	Cartesian Coordinate Systems	1
2.2	Vectors	1
2.3	Multiple Coordinate Spaces	1
2.4	Matrices and Linear	1
2.5	Transformations	1
2.6	Polar Coordinate Systems	1
2.7	3D Rotations	1
2.8	Geometric Primitives	1
2.9	Viewing in 3D	1
3.0	**Mechanics for Game Programming**	
3.1	Linear Kinematics and Calculus	1
3.2	Linear and Rotational Dynamics	1
3.3	Curves in 3D- Lighting	1
3.4	Intersection Testing- Rigid Body Dynamics	1
3.5	Animation System	1
3.6	Controller based animation	2
3.7	Sound – Cameras Details.	2
4.0	**Architecture and Algorithms for Game Programming**	
4.1	Foundation- Low-Level Engine System	1
4.2	Game Play- Path and Waypoints	2
4.3	Navigation	1
4.4	Behaviours- Collision Detection	1
4.5	Game Logic - Game Artificial Intelligence	1
4.6	Spatial Sorting	2
4.7	Singleton - Object pooling	1
5.0	**Language for Game Programming**	
5.1	Scripting Languages and Data Format	1
5.2	PyGame/Unity-Networked Games	1
5.3	Sample Game- iOS, Windows	2
5.4	Android-Developing 2D and 3D interactive games using Unity	2
5.5	DirectX – Isometric and Tile Based Games	1
5.6	Puzzle games - Single Player games - Multi Player game.	2
	Total Hours:	**45**

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70 PMC E15	Computer Vision	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Feature Extraction Techniques
- To Learn and Apply Image Segmentation Approaches
- To Understand Image Properties and Histogram Analysis
- To Explore 3D Vision and Motion Analysis
- To Apply Computer Vision in Diverse Applications

Prerequisite

- Basic knowledge of programming, mathematics, and image processing concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the fundamentals of computer vision to the formation and transformation of images	Understand
CO2	Apply feature extraction Techniques in image and segmentation	Apply
CO3	Ability to perform smoothing and image equalization	Apply
CO4	Compare various projection and object recognition methods.	Analyze
CO5	Evaluate performance of computer vision algorithms in various applications	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E15 – Computer Vision								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Introduction Image Processing, Computer Vision - Low-level, Mid-level, High-level, Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.	[9]
Feature Extraction and Feature Segmentation Feature Extraction -Edges - Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT. Image Segmentation -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.	[9]
Images, Histograms, Binary Vision Simple pinhole camera model – Sampling – Quantization – Colour images – Noise – Smoothing –1D and 3D histograms - Histogram/Image Equalization - Histogram Comparison - Back-projection- k-means Clustering.	[9]
3D Vision and Motion Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shap from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction –introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion- optical flow – layered motion.	[9]
Applications Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Virtual Reality and Augmented Reality-Pretrained models- VGG-16-ResNet50.	[9]
Total Hours:	**45**

Text Book(s):	
1.	D. A. Forsyth, J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education.2nd Edition ,2015.
2.	Joseph Howse, Joe Minichino “Learning OpenCV 4 Computer Vision with Python 3: Get to grips with tools, techniques, and algorithms for computer vision and machine learning, Packt Publishing Limited 3rd Edition , 2020.
Reference(s):	
1.	Richard Szeliski, “Computer Vision: Algorithms and Applications”, Springer Verlag London Limited,2011.
2.	Sonka M, Hlavac V, Boyle R, Image processing, analysis, and machine vision, Cengage Learning; 2014.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Image Processing	1
1.2	Transformation	1
1.3	Convolution and Filtering	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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1.4	Image Enhancement	1
1.5	Histogram Processing	1
2.0	**Feature Extraction and Feature Segmentation**	
2.1	Feature Extraction - Edges- Corners	1
2.2	Harris and Hessian Affine	1
2.3	Orientation Histogram	1
2.4	SIFT, SURF, HOG, GLOH	1
2.5	Scale-Space Analysis	1
2.6	Image Pyramids and Gaussian derivative filters	1
2.7	Gabor Filters and DWT	1
2.8	Image Segmentation -Region Growing, Edge Based approaches to segmentation	1
2.9	Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.	1
3.0	**Images, Histograms, Binary Vision**	
3.1	Simple pinhole camera model	1
3.2	Sampling	1
3.3	Quantization	1
3.4	Colour images- Noise	1
3.5	Smoothing	1
3.6	1D and 3D histograms	1
3.7	Histogram/Image Equalization - Histogram Comparison	2
3.8	Back-projection- k-means Clustering.	1
4.0	**3D Vision and Motion**	
4.1	Methods For 3D Vision – Projection Schemes	1
4.2	Shape From Shading – Photometric Stereo	1
4.3	Shap From Texture – Shape From Focus	1
4.4	Active Range Finding – Surface Representations	1
4.5	Point-Based Representation – Volumetric Representations	1
4.6	3D Object Recognition – 3D Reconstruction	1
4.7	Introduction To Motion – Triangulation	1
4.8	Bundle Adjustment – Translational Alignment	1
4.9	Parametric Motion–Spline-Based Motion- Optical Flow – Layered Motion	1
5.0	**Applications**	
5.1	Overview of Diverse Computer Vision Applications: Document Image	1
5.2	Analysis, Biometrics, Object Recognition	1
5.3	Tracking, Medical Image Analysis	2
5.4	Content-Based Image Retrieval	2
5.5	Video Data Processing	1
5.6	Virtual Reality and Augmented Reality	1
5.7	Pretrained models- VGG-16- ResNet50	1
	Total Hours:	**45**

Course Designer

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70 PMC E16	IoT Systems Design	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand IoT Architectures
- To Analyse IoT Protocols
- To Implement Data Management and Analytics
- To Study IoT Integration and Standards
- To Explore Large-Scale IoT Systems

Prerequisite

- Basic knowledge of computer networks, programming, and data handling concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Choose relevant IoT reference architecture for providing a standardized framework for design and implementation of solutions.	Understand
CO2	Design and implement IoT systems by selecting appropriate communication protocols to enable seamless data exchange between devices	Apply
CO3	Demonstrate proficiency in managing and processing IoT data for real time scenarios.	Apply
CO4	Articulate the issues and challenges involved in integration of large scale IoT system.	Analyze
CO5	Analyze the opportunities and architectural considerations in designing scalable and secure large-scale IoT systems with insights from industrial IoT use cases	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Approved in Academic Council Meeting held on 03.01.2026

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Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E16 – IoT Systems Design

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

IoT Architecture Types of IOT Architecture - Three-Tier IoT Architecture, Five-Tier IoT Architecture, Hierarchical IoT Architecture - Mesh IoT Architecture, Microservices IoT Architecture, Serverless IoT Architecture.	[9]
IoT Protocols Application Layer Protocols-MQTT , CoAP , HTTP , AMQP . Network Layer Protocol- IPv6, 6LoWPAN, RPL. Data Link Layer Protocols-ZigBee, BLE. Physical Layer Technologies-RFID-LoRa	[9]
Data Management and Processing Data Management -Data Ingestion-Edge and Fog Computing in Large-Scale IoT-Big Data Technologies for IoT-IoT Analytics.	[9]
Integration and Standards IoT Network Topologies- Scalability, reliability, and latency requirements-IoT Middleware-Interoperability and Standards -API Design for IoT Integration -Case Studies and Industry Practices.	[9]
Integrating Large-Scale IoT Systems Overview of Large-Scale IoT Systems-Challenges and Opportunities, Architectural Considerations Scalable IoT Architectures-Distributed Systems and Microservices- IoT Security-Case Studies-Use cases in Industrial IoT.	[9]
Total Hours:	**45**

Text Book(s):

1.	Cirani, S., Ferrari, G., Picone, M., & Veltri, L., “Internet of Things Architectures, Protocols and Standards”, Wiley, 2018.
2.	Höller, J., Tsiatsis, V., Mulligan, C., Karnouskos, S., Avesand, S., & Boyle, D., “ From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, Springer, 2019.

Reference(s):

1.	Gravina, R. (Ed.), Palau, C. E. (Ed.), Manso, M. (Ed.), Liotta, A. (Ed.), Fortino, G. (Ed.), “Integration, Interconnection, and Interoperability of IoT Systems (Internet of Things)”, Springer, 2018.
2.	Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., Henry, J., “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Cisco Press,2017.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**IoT Architecture**	
1.1	Types of IOT Architecture	1
1.2	Three-Tier IoT Architecture	1
1.3	Five-Tier IoT Architecture	2
1.4	Hierarchical IoT Architecture	1
1.5	Mesh IoT Architecture	1
1.6	Microservices IoT Architecture	1
1.7	Serverless IoT Architecture.	2
2.0	**IoT Protocols**	
2.1	Application Layer Protocols-	1
2.2	MQTT, CoAP, HTTP, AMQP	1
2.3	Network Layer Protocol	1
2.4	IPv6, 6LoWPAN, RPL	1
2.5	Data Link Layer Protocols	1
2.6	ZigBee, BLE	1
2.7	Physical Layer Technologies	1
2.8	RFID-LoRa	2
3.0	**Data Management and Processing**	
3.1	Data Management	1
3.2	Data Ingestion	2
3.3	Edge and Fog Computing in Large	2
3.4	Scale IoT-Big Data Technologies for IoT	2
3.5	IoT Analytics	2
4.0	**Integration and Standards**	
4.1	IoT Network Topologies	1
4.2	Scalability- reliability and latency requirements	2
4.3	IoT Middleware	2
4.4	Interoperability and Standards	2
4.5	API Design for IoT Integration	1
4.6	Case Studies and Industry Practices	1
5.0	**Integrating Large-Scale IoT Systems**	
5.1	Overview of Large	1
5.2	Scale IoT Systems	1
5.3	Challenges and Opportunities	1
5.4	Architectural Considerations Scalable IoT Architectures	2
5.5	Distributed Systems and Microservices	1
5.6	- IoT Security- Case Studies	2
5.7	Use cases in Industrial IoT	1
	Total Hours:	**45**

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Passed in BoS Meeting held on 20.12.2025
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70 PMC E21	Secure Software Development	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Software Security Fundamentals
- To Implement Secure Software Design
- To Analyze Security Risk Management
- To Master Security Testing Techniques
- To Enhance Secure Project Management

Prerequisite

- Basic knowledge of programming, software development, and computer security concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate various vulnerabilities related to memory attacks	Understand
CO2	Apply security principles in software development	Apply
CO3	Evaluate the extent of risks	Apply
CO4	Apply security principles in the testing phase of software development	Analyze
CO5	Use tools for securing software	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E21 - Secure Software Development								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Need of Software Security and Low-Level Attacks Introduction - Software Assurance and Software Security –Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Secure SDLC- Memory-Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks	
Secure Software Design Requirements Engineering for secure software - SQUARE process Model – Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content – Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles	[9]
Security Risk Management Risk Management Life Cycle – Risk Profiling – Risk Exposure Factors – Risk Evaluation and Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management	[9]
Security Testing Traditional Software Testing – Comparison - Risk Based Security Testing – Prioritizing Security Testing with Threat Modelling – Penetration Testing – Planning and Scoping - Enumeration – Remote Exploitation – Web Application Exploitation - Exploits and Client Side Attacks – Post Exploitation – Bypassing Firewalls and Avoiding Detection - Tools for Penetration Testing	[9]
Secure Project Management Governance and security - Adopting an enterprise software security framework - Security and project management - Maturity of Practice.	[9]
Total Hours:	**45**
Text Book(s):	

1.	Julia H. Allen, “Software Security Engineering”, Pearson Education, 2009.
2.	Evan Wheeler, “Security Risk Management: Building an Information Security Risk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011.
Reference(s):	
1.	Chris Wysopal, Lucas Nelson, Dino Dai Zovi, and Elfriede Dustin, “The Art of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-Wesley Professional, 2006.
2.	Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”,Addison-Wesley Professional, 2005.
3.	Jon Erickson, “Hacking: The Art of Exploitation”, 2nd Edition, No Starch Press, 2008. Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Need of Software Security and Low-Level Attacks**	
1.1	Software Assurance and Software Security	1
1.2	Threats to software security	1
1.3	Sources of software insecurity	2
1.4	Properties of Secure Software	1
1.5	Secure SDLC	1
1.6	Low-Level Attacks Against Heap and Stack	1
1.7	Defense Against Memory-Based Attacks	2
2.0	**Secure Software Design**	
2.1	Requirements Engineering for secure software	1
2.2	SQUARE process Model	1
2.3	Isolating The Effects of Untrusted Executable Content	1
2.4	Stack Inspection	1
2.5	Policy Specification Languages	1
2.6	Buffer Overflow	1
2.7	Session Hijacking	1
2.8	Threat Modeling	2
3.0	**Security Risk Management**	
3.1	Risk Management Life Cycle	1
3.2	Risk Profiling	2
3.3	Risk Exposure Factors	2
3.4	Risk Assessment Techniques	2
3.5	Threat and Vulnerability Management	2
4.0	**Security Testing**	
4.1	Traditional Software Testing	1
4.2	Risk Based Security Testing	2
4.3	Prioritizing Security Testing With Threat Modeling	2
4.4	Penetration Testing	2
4.5	Remote Exploitation	1
4.6	Tools for Penetration Testing	1
5.0	**Secure Project Management**	
5.1	Governance and security	2
5.2	Adopting an enterprise software security framework	2
5.3	Security management	1
5.4	Project management	2
5.5	Maturity of Practice	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E22	Augmented Reality and Virtual Reality Application Development	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand the Fundamentals of Augmented and Virtual Reality
- To Explore AR and VR Technologies and Techniques
- To Master AR Core Concepts and Limitations
- To Study the Impact of Sensory Perception in VR
- To Examine VR System Components and Hardware

Prerequisite

- Basic knowledge of programming, computer graphics, and fundamentals of AR/VR concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Attain a foundational understanding and difference of Augmented and Virtual reality technologies	Understand
CO2	Develop skills in placing assets, managing scale, addressing occlusion, and implementing realistic lighting in AR and VR projects	Apply
CO3	Apply AR and VR in practical scenarios and conducting AR/VR based visualization case studies for product development.	Apply
CO4	Develop and design by addressing technical limitations, optimizing user interaction and integrating virtual elements with real-world environments on mobile platforms	Analyze
CO5	Understand and apply the principles of virtual world space, 3D visualization and realism techniques	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E22 **–** Augmented Reality and Virtual Reality Application Development

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Augmented and Virtual Reality Basics Introduction to Augmented Reality -MAR Market, Actors, and Value Chain - Application vs. Browser -MAR System Architecture- Difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, enhancing interactivity in AR environments, evaluating AR systems. Virtual Reality and Virtual Environment: Introduction, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark. .	[12]
AR and VR Technologies Placing and positioning assets - Scale and size of assets - Occlusion -Lighting for increased realism- Solid augmented assets – context awareness - tracking in AR - outside-in tracking - motion tracking- environmental understanding - feature points - plane finding – light estimation - anchors – interface issues and lack of UI metaphors -technical constraints – 3D barriers - computer vision limitations constraints of occlusion and shading. Levels of Immersion in VR Systems-Sensorimotor Contingency -Sensorimotor Contingency in VR-Introduction to the Three Illusions: Place Illusion (PI), Plausibility Illusion (Psi) – Necessary Conditions for Psi - Break of Presence - Presence, Immersion, PI, and Psi - The Pinocchio Illusion - The Rubber Hand Illusion - Psychological Effects of Embodiment Illusion - Visual-Tactile and Visual-Motor Synchrony	[12]
AR Core Android OS - limitations of low light conditions on AR on mobile -simple surfaces challenge AR – user flow - working with tech limitations - preparing your tools - design draft. surface detection and creating plane - user interaction - placing with anchor points - occlusion between virtual assets - light estimation - virtual light to real light - multiplane detection and spatial mapping – processing needs in mobile AR - breaking immersion - framing as a creative device.	[12]
VR Systems and Hardwares The Virtual world space-positioning the virtual observer- perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory. Illumination models- Reflection models- Shading algorithms, Radiosity, Hidden Surface Removal- Realism -Stereographic image. VR Hardware-sensor hardware, Head-coupled displays, Acoustic hardware. Properties.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Linowes, J., & Babilinski, K. (2017). Augmented Reality for Developers: Build Practical Augmented Reality Applications with Unity, ARCore, ARKit, and Vuforia. Packt Publishing Ltd.
2.	XR Development with Unity-A beginner's guide to creating virtual, augmented, and mixed reality experiences using Unity by Anna Braun, Raffael Rizzo(2022).
Reference(s):	
1.	Mastering Augmented Reality: A Comprehensive Guide to Learn Augmented Reality by Cybellium Ltd, Kris Hermans (2023)
2.	Peddie, J. (2017). Augmented Reality: where we will all live. Springer. “The VR Book: Human-Centered Design for Virtual Reality (ACM Books)”by Jason Jerald (2015).

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Chairman Bos

Course Contents and Lecture Schedule

S. No	Topics	No. of hours
1.0	**Augmented and Virtual Reality Basics**	
1.1	Introduction to Augmented Reality	1
1.2	Application vs. Browser	1
1.3	Difference between AR and VR	2
1.4	MAR System Architecture	1
1.5	AR systems and functionality	1
1.6	Augmented reality methods	1
1.7	Visualization techniques for augmented reality	2
1.8	Evaluating AR systems	1
1.9	Virtual environment requirement	2
2.0	**AR and VR Technologies**	
2.1	Placing and positioning assets	1
2.2	Solid augmented assets	1
2.3	tracking in AR	1
2.4	motion tracking	1
2.5	plane finding	2
2.6	3D barriers	1
2.7	Sensorimotor Contingency	1
2.8	Break of Presence	2
2.9	The Rubber Hand Illusion	2
3.0	**AR Core**	
3.1	Android OS	1
3.2	Simple surfaces challenge AR	2
3.3	Preparing your tools	1
3.4	Surface detection and creating plane	1
3.5	Placing with anchor points	2
3.6	Light estimation	1
3.7	Multiplane detection and spatial mapping	1
3.8	Processing needs in mobile AR	2
3.9	Framing as a creative device	1
4.0	**VR Systems and Hardwares**	
4.1	The Virtual world space	1
4.2	human vision	1
4.3	3D clipping	1
4.4	Illumination models	2
4.5	Hidden Surface Removal	1
4.6	VR Hardware	2
4.7	Acoustic hardware	1
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E23	Principles of Data Science	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Data Science Concepts and Frameworks
- To Perform Exploratory Data Analysis
- To Analyze Relationships Between Variables
- To Master Advanced Data Wrangling Techniques
- To Understand the Role of Big Data and Business Intelligence

Prerequisite

- Basic knowledge of programming, statistics, and data handling concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze the concepts of Data, Data Description, Relationship and Data Wrangling	Understand
CO2	Apply appropriate statistical tests to evaluate hypotheses related to means, proportions and variances	Apply
CO3	Apply the knowledge on relationships between data.	Apply
CO4	Apply the advanced Data Wrangling techniques for data.	Analyze
CO4	Master advanced data wrangling techniques for effective data analysis	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E23 - Principles of Data Science

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Introduction Overview of Data science–Research goals–Building the model– presenting findings and building applications - Data Mining - Data Warehousing -Retrieving data–Data preparation Big Data and Data Science - Big Data Analytics, Business intelligence vs Big data, big data frameworks, Current landscape of analytics.	[12]
Data Description Exploratory Data Analysis -statistical measures- Representation- Data Analytics Lifecycle-Developing Initial Hypotheses-Identifying Potential Data Sources- testing hypotheses on means, proportions and variances.	[12]
Describing Relationships Correlation – Scatterplots – 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.	[12]
Advanced Data wrangling Strings–Datetimes–Hierarchical Indexing–Visualizing data Frames – Pandas Profiling – Data Transformation - Handling Null values - Categorical values - Data Aggregation-Data Filtering handling Outliers .	[9]
Total Hours:	**45**

Text Book(s):

1.	David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016.
2.	Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.

Reference(s):

1.	Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016..
2.	Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press,2014.

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Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Overview of Data science	1
1.2	Research goals	1
1.3	Building the model	2
1.4	Data Mining	1
1.5	Data preparation Big Data and Data Science	1
1.6	Big Data Analytics	1
1.7	Business intelligence vs Big data	2
1.8	Big data frameworks	2
1.9	Current landscape of analytics	1
2.0	**Data Description**	
2.1	Exploratory Data Analysis	1
2.2	Statistical measures	1
2.3	Representation	1
2.4	Data Analytics Lifecycle	2
2.5	Developing Initial Hypotheses	1
2.6	Identifying Potential Data Sources	1
2.7	Testing hypotheses on means	1
2.8	Testing hypotheses on proportions	2
2.9	Testing hypotheses on variances	2
3.0	**Describing Relationships**	
3.1	Correlation	1
3.2	Scatterplots	2
3.3	Correlation coefficient for quantitative data	2
3.4	Computational formula for correlation coefficient	1
3.5	Regression	2
3.6	Regression line	1
3.7	Least squares regression line	1
3.8	Standard error of estimate	1
3.9	Regression towards the mean	1
4.0	**Advanced Data wrangling**	
4.1	Strings	1
4.2	Datetimes	1
4.3	Hierarchical Indexing	1
4.4	Visualizing data Frames	1
4.5	Pandas Profiling	1
4.6	Data Transformation	1
4.7	Handling Null values	1
4.8	Categorical values	1
4.9	Filtering handling Outliers	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E24	Embedded Systems for IoT	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Embedded Processor Architecture and Microcontrollers
- To Learn Embedded Communication Protocols
- To Understand Real-Time Operating Systems (RTOS) in Embedded Systems
- To Study the Internet of Things (IoT) Ecosystem and Technologies
- To Develop IoT Applications Using Hardware and Software Platforms

Prerequisite

- Basic knowledge of programming, microcontrollers, and computer networks

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Identify the internal architecture and programming of an embedded processor.	Understand
CO2	Utilize the basic architecture of Internet of Things based Devices	Apply
CO3	Make use of hardware platforms and AI Enabled Boards for application development.	Apply
CO4	Choose the software platforms to process the IoT Data.	Analyze
CO4	Build an embedded and IoT Solution for real world scenarios	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E24 – Embedded Systems for IoT								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Embedded and Microcontroller Concepts Introduction to embedded processors-Categories of embedded processors-Architecture-Introduction to PIC microcontrollers, architecture and memory organization, registers, I/O ports, interrupts, timer, instruction sets, Embedded Communication Protocols – UART, USART, I2C, SPI, Modbus-Introduction to Real-Time Operating Systems (RTOS)- RTOS Architecture: Layered Architecture of an RTOS -Kernel Components and Their Functions-Real-Time Operating System Services.	[9]
Internet of Things Introduction to Internet of Things (IoT), Functional Characteristics, IoT building blocks - Architecture and working - Elements of an IoT ecosystem-IOT Application Development Cycle Technology drivers, Business drivers, Trends and implications -Recent Trends in the Adoption of IoT, Role of cloud in IoT. IoT Enabling Technologies.	[9]
Hardware Platforms for IoT Development Boards -Arduino, Raspberry Pi, ESP8266, AI Enabled Boards (Jetson Boards for IoT development), Sensors and actuators -Types-Functions, and applications: Gateways-connectivity options for short range/Long range Communication- IoT device communication protocols Overview.	[9]
Software Development for IoT IDEs for IoT prototyping- Arduino Programming - Arduino functions- Interfacing with sensors and actuators-Libraries -Input/Output From Pins - Raspberry Pi platform -Environmental - Programming and interfacing with basic hardware components. Open Platforms-Platforms Overview- IBM Watson IoT—Bluemix, Eclipse IoT, AWS IoT, Microsoft Azure IoT Suite, Google Cloud IoT.	[9]
Application Development Development of IoT Applications - Cloud platforms for IoT, Cloud data logging and monitoring, Interfacing with web services. IOT Prototyping - Home Automation –Smart Agriculture – Smart Cities – Smart Healthcare.	[9]
Total Hours:	**45**
Text Book(s):	

1.	Perry Xiao, Designing Embedded Systems and the Internet of Things (IoT) with the ARM® MBED™, (Wiley-IEEE), First Edition, 2018.
2.	Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, CISCO Press, 2017.
Reference(s):	
1.	Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill.2nd edition June 2022.
2.	Arduino Programming in 24 hours, Richard Blum, 1st Edition, ISBN: 978-0672337123, Sams Tech Yourself Publishing.2014

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Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Embedded and Microcontroller Concepts**	
1.1	Introduction to embedded processors	1
1.2	Introduction to PIC microcontrollers	1
1.3	Architecture and Memory organization	2
1.4	Timer, Instruction sets	1
1.5	UART, USART, I2C	1
1.6	Layered Architecture of an RTOS	1
1.7	Real-Time Operating System Services	2
2.0	**Internet of Things**	
2.1	Introduction to Internet of Things (IoT)	1
2.2	Functional Characteristics	1
2.3	IoT building blocks	1
2.4	Elements of an IoT ecosystem	1
2.5	Business drivers	1
2.6	Trends and implications	1
2.7	Adoption of IoT	1
2.8	IoT Enabling Technologies	2
3.0	**Hardware Platforms for IoT**	
3.1	Development Boards	1
3.2	AI Enabled Boards	2
3.3	Sensors and actuators	2
3.4	Gateways	2
3.5	IoT device communication protocols	2
4.0	**Software Development for IoT**	
4.1	IDEs for IoT prototyping	1
4.2	Arduino functions	2
4.3	Input/Output from Pins	2
4.4	Open Platforms	2
4.5	IBM Watson IoT	1
4.6	Google Cloud IoT	1
5.0	**Application Development**	
5.1	Development of IoT Applications	1
5.2	Cloud platforms for IoT	1
5.3	Cloud data logging and monitoring	1
5.4	Interfacing with web services	2
5.5	IOT Prototyping	1
5.6	Home Automation	2
5.7	Smart Healthcare	1
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC E25	Data Modelling	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Advanced Data Modelling Concepts
- To Create Logical Data Models for Complex Systems
- To Explore Advanced Data Patterns and Entity Types
- To Graph and Temporal Data Modelling Techniques
- To Geospatial and Metadata Modelling for Data Security

Prerequisite

- Basic knowledge of databases, data modelling, and programming fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply MySQL Workbench to design database model	Understand
CO2	Apply logical Data model to design Patterns	Apply
CO3	Design Geospatial data models for applications involving location-based analytics	Apply
CO4	Analyze and choose appropriate NoSQL and NewSQL databases for specific modeling requirements	Analyze
CO4	Gain expertise in geospatial, metadata modelling and implementing security measures like encryption and access controls.	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E25 **–** Data Modelling

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Introduction to Advanced Data Modeling Overview of Data Modeling in Data science– Importance of Advanced data Modeling – Types of data Model– Dimensional modelling-Design-MySQL Workbench-Build Data model using MySQL workbench–Forward Engineering Feature-Converting Data model into Database schema, MySQL to reverse Engineering schema.	[9]
Logical Data Model Cross enterprise Analysis- Modern Driven analysis -Baseline data patterns-complex data Patterns Generation of Entity Types -Transition from meta data to data-static vs dynamic Entity types-data coupling -cohesion.	[9]
Advanced Data Patterns Advanced subtype variations-Multi recursive networks-conditional Recursions-Rules based entity types-state Transition rules-Meta patterns.	[9]
Graph and Temporal Data Modeling Graph Databases – Nodes – Edges – Properties– Graph query Languages – Understanding Temporal Databases–Valid time vs Transition Time–Temporal Datamining Techniques– Temporal query languages; No-SQL-New SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations.	[9]
Geospatial and Metadata Modeling Representing geospatial data in models-Geospatial Query Language-Applications in Mapping and Location-based Analytics-Metadata Definition and Importance-Encryption and Masking in Data Models-Access Controls and Authorization.	[9]
Total Hours:	**45**

Text Book(s):	
1.	The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling". Authors: Ralph Kimball and Margy Ross 2013 3rd Edition.
2.	Designing Data-Intensive Applications: The Big Ideas Behind Reliable, Scalable, and Maintainable Systems (Greyscale Indian Edition) 2017.
Reference(s):	
1.	Data Modeling Made Simple: A Practical Guide for Business & IT Professionals Authors: Steve Hoberman: 2nd Edition,2009.

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Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Advanced Data Modeling**	
1.1	Overview of Data Modeling in Data science	1
1.2	Types of data Model	1
1.3	Dimensional modelling	2
1.4	MySQL Workbench	1
1.5	Forward Engineering	1
1.6	Data model into Database schema	1
1.7	MySQL to reverse Engineering schema	2
2.0	**Logical Data Model**	
2.1	Cross enterprise Analysis	1
2.2	Modern Driven analysis	1
2.3	Baseline data patterns	1
2.4	Complex data Patterns	1
2.4	Transition from meta data to data	1
2.6	Static vs dynamic Entity types	1
2.7	Data coupling	1
2.8	Cohesion	2
3.0	**Advanced Data Patterns**	
3.1	Advanced subtype variations	1
3.2	Multi recursive networks	2
3.3	Conditional Recursions	2
3.4	Rules based entity types	2
3.5	State Transition rules	2
4.0	**Graph and Temporal Data Modeling**	
4.1	Graph Databases	1
4.2	Nodes	2
4.3	Properties	2
4.4	Understanding Temporal Database	2
4.5	CAP theorem	1
4.6	MongoDB data model and CRUD operations	1
5.0	**Geospatial and Metadata Modeling**	
5.1	Representing geospatial data in models	1
5.2	Geospatial Query Language	2
5.3	Mapping and Location-based Analytics	1
5.4	Metadata Definition and Importance	2
5.5	Encryption and Masking in Data Models	1
5.6	Access Controls and Authorization	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E26	Social Network Analysis	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To gain knowledge about the current Web development and emergence of Social Web.
- To study about the modeling, aggregating and knowledge representation of Semantic Web.
- To learn about the extraction and mining tools for Social networks.
- To understand and predict human behaviour for social communities
- To explore knowledge on research issues in social networks

Prerequisite

- Basic knowledge of programming, databases, and fundamentals of networks and social media concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand basic principles behind network analysis algorithms and develop practical skills in network analysis.	Understand
CO2	Model and represent knowledge for social semantic Web.	Apply
CO3	Apply data mining techniques on social networks.	Apply
CO4	Use extraction and mining tools for analysing Social networks.	Analyze
CO4	Develop secure social network applications	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E26 - Social Network Analysis

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Introduction to Social Network Analysis Introduction to Web - Limitations of current Web – Development of Semantic Web – Emergence of the Social Web - Network analysis - Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis - Electronic discussion networks, Blogs and online communities, Web-based networks - Applications of Social Network Analysis	[9]
Modelling, Aggregating and Knowledge Representation Ontology and their role in the Semantic Web - Ontology-based Knowledge Representation - Ontology languages for the Semantic Web – RDF and OWL - Modelling and aggregating social network data - State-of-the-art in network data representation, Ontological representation of social individuals, Ontological representation of social relationships, Aggregating and reasoning with social network data, Advanced Representations	[9]
Interfacing Concepts Extraction and Mining Communities In Web Social Networks 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 & Mining - Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks- Multi-Relational Characterization of Dynamic Social Network Communities	[9]
Predicting Human Behavior and Privacy Issues Understanding and Predicting Human Behaviour 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 - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons - Attack Spectrum and Countermeasures	[9]
Text Mining In Social Networks Introduction – Keyword Search – Query Semantics and Answer Ranking - Keyword search over XML and relational data - Keyword search over graph data - Classification Algorithms - Clustering Algorithms - Transfer Learning in Heterogeneous Networks - Application – Gephi Tool – Marketo Tool.	[9]
Total Hours:	**45**

Text Book(s):

1. Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson, “Analyzing Social Networks”, 2nd Edition, Sage Publications Ltd., 2018.

Reference(s):

1. Tanmoy Chakraborty, “Social Network Analysis”, Wiley, 2021.
2. Charu C. Aggarwal, “Social Network Data Analytics”, Springer; 2011
3. Song Yang, Franziska B. Keller, and Lu Zheng, “Social Network Analysis: Methods and Examples”, Sage Publications, 2016.
4. John Scott, “Social Network Analysis”, 4th Edition, Sage Publications Ltd., 2017

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Social Network Analysis**	
1.1	Introduction to Web	1
1.2	Development of Semantic Web	1
1.3	Network analysis	2
1.4	Key concepts and measures in network analysis	1
1.5	Electronic discussion networks	1
1.6	Blogs and online communities	1
1.7	Applications of Social Network Analysis	2
2.0	**Modelling, Aggregating and Knowledge Representation**	
2.1	Ontology and their role in the Semantic Web	1
2.2	Ontology languages for the Semantic Web	1
2.3	Modelling and aggregating social network data	1
2.4	State-of-the-art in network data representation	1
2.5	Ontological representation of social individuals	1
2.6	Ontological representation of social relationships	1
2.7	Aggregating and reasoning with social network data	1
2.8	Advanced Representations	2
3.0	**Interfacing Concepts Extraction and Mining Communities In Web Social Networks**	
3.1	Extracting evolution of Web Community from a Series of Web Archive	1
3.2	Definition of Community	2
3.3	Applications of Community Mining Algorithms	2
3.4	Decentralized Online Social Networks	2
3.5	Dynamic Social Network Communities	2
4.0	**Predicting Human Behavior and Privacy Issues**	
4.1	Understanding and Predicting Human Behavior for Social Communities	1
4.2	Enabling New Human Experiences	2
4.3	Context-Awareness	2
4.4	Trust in Online Environment	2
4.5	Trust Network Analysis	1
4.6	Attack Spectrum and Countermeasures	1
5.0	**Text Mining In Social Networks**	
5.1	Keyword Search	1
5.2	Query Semantics and Answer Ranking	1
5.3	Keyword search over XML and relational data	1
5.4	Keyword search over graph data	2
5.5	Clustering Algorithms	1
5.6	Transfer Learning in Heterogeneous Networks	2
5.7	Gephi Tool	1
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E31	3D Modelling and Game Design	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding 3D Modelling and Object Creation
- To Mastering Object and Surface Modelling Techniques
- To Game Object Design and Asset Creation
- To Implementing Physics and Lighting in Game Development
- To Navigating and Animating Game Environments

Prerequisite

- Basic knowledge of programming, computer graphics, and game development concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the foundational knowledge of 3D modelling and apply on a real time scenario in creating object and environment	Understand
CO2	Design and analyse the usage of Game objects and Assets using Physics and Lights	Apply
CO3	Apply Navigations, Particle systems and audio develop simple games	Apply
CO4	Implement game assets by utilizing physics systems, collision events, and lighting techniques to enhance realism and interactivity	Analyze
CO4	Design dynamic game environments by integrating animations, navigation systems, particle effects, and audio elements	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E31 - 3D Modelling and Game Design

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Building Blocks 3D space- 3D objects- viewports and Plane basics- selecting objects- solid object creation- outputting images- Boolean modelling and figured space- object snaps and transforms- Boolean modelling- Clipping plane.	[9]
Object and Surface Modelling Profile modelling – surface- cPlane- revolve- object modelling- project and pull- curves from objects-trimming surfaces- surface modelling – lofting- surface filleting and blending- surface from edge curves- patch surfaces.	[9]
Game Objects and Assets Native Game Objects -Manipulating Game Objects - Components in the Game engine – Fundamentals working concept - Materials- Defining the Role of the Prefab - Textures: UV Mapping and Texturing Techniques - Discovering the Standard Shader.	[9]
Implementation of Assets with Physics and Lighting Creating Hierarchies - Using Empty Game Objects as Pivots -Understanding the Physics System – Rigid body Components - Colliders - Scripting Collision Events - Lighting in Games- Analysing the Different Lights and Properties.	[9]
Navigation and Animations Animation in Game Development - Creating Animation in the Editor-Refining Animation- NavMesh - NavMesh Agent - NavMesh Obstacle-Creating the Player Controller Game Object- Particles in Video Games-Analysing Existing Particle Effects-Audio in Game Development -Audio Effects.	[9]
Total Hours:	**45**

Text Book(s):	
1.	"The Ultimate Guide to Game Development with Unity" by Unity Technologies,2023.
2.	The Art of Game Design: A Book Of Lenses, THIRD EDITION, Jesse Schell, CRC Press; 3rd edition , 2019.
Reference(s):	
1.	Paris Buttfield-Addison, Jon Manning, Tim Nugent, “Unity Game Development Cookbook”, O'Reilly Media, Inc. 2019.
2.	3D Modeling for Beginners: Learn Everything You Need to Know About 3d Modeling!, Danan Thilakanathan,2016.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No. of hours
1.0	**Building Blocks**	
1.1	3D space	1
1.2	Viewports and Plane basics	1
1.3	Selecting objects	1
1.4	Outputting images	1
1.4	Boolean modelling and figured space	1
1.6	Object snaps and transforms	1
1.7	Boolean modelling	1
1.8	Clipping plane	2
2.0	**Object and Surface Modelling**	
2.1	Profile modelling	1
2.2	Surface	1
2.3	Revolve	1
2.4	Object modelling	2
2.4	Trimming surfaces	1
2.6	Surface filleting and blending	1
2.7	Surface from edge curves	2
3.0	**Game Objects and Assets**	
3.1	Native Game Objects	1
3.2	Manipulating Game Objects	1
3.3	Components in the Game engine	1
3.4	Fundamentals working concept	1
3.4	Defining the Role of the Prefab	2
3.6	UV Mapping and Texturing Techniques	2
3.7	Discovering the Standard Shader	1
4.0	**Implementation of Assets with Physics and Lighting**	
4.1	Creating Hierarchies	1
4.2	Using Empty Game Objects as Pivots	1
4.3	Understanding the Physics System	2
4.4	Rigid body Components	1
4.4	Colliders	1
4.6	Scripting Collision Events	1
4.7	Lighting in Games	1
4.8	Analysing the Different Lights and Properties	1
5.0	**Navigation and Animations**	
5.1	Animation in Game Development	1
5.2	Creating Animation in the Editor-Refining Animation	1
5.3	NavMesh	2
5.4	NavMesh Agent	1
5.5	NavMesh Obstacle	1
5.6	Particles in Video Games	1
5.7	Audio Effects	2
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E32	Big Data Analytics	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To understand the fundamental concepts of big data and analytics
- To learn various data analysis patterns
- To perform mining on huge data
- To analyze the big data for useful business applications using analytics techniques
- To gain knowledge on various visualization techniques

Prerequisite

- Basic knowledge of programming, statistics, and data handling concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics of Big Data	Understand
CO2	Know about Hadoop and MapReduce	Apply
CO3	Know about Big Data Technology, Tools, and Algorithms	Apply
CO4	Analyze the stream data and Link analysis.	Analyze
CO4	Know about the role of big data in Recommender systems and social network analysis	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E32 - Big Data Analytics

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Big Data Analytics Analytics – Descriptive Analytics – Diagnostic Analytics – Predictive Analytics – Prescriptive Analytics – Big Data – Characteristics of Big Data – Examples of Big Data – Analytics Flow for Big Data – Big Data Stack – Analytics Patterns – Case Study – Data Acquisition.	[9]
Big Data Patterns & NOSQL Load Levelling with Queues - Load Balancing with Multiple Consumers - Leader Election - Sharding - Consistency, Availability & Partition Tolerance (CAP) - Bloom Filter - Materialized Views - Lambda Architecture Scheduler – Agent - Supervisor - Pipes & Filters - Web Service - Consensus in Distributed Systems – Map reduce Patterns – Document Databases - MongoDB.	[9]
Big Data Storage and Analysis HDFS – Architecture – Usage Examples – Map reduce Programming Model – Hadoop YARN – Hadoop Schedulers – Map reduce Examples – Pig – Data Types – Data Filtering & Analysis – Storing Results – Debugging Operators – Pig Examples.	[9]
Machine Learning Algorithm Analytics Algorithms – Clustering – k-means - Classification – Naïve Bayes – Decision Tree – Random Forest - Gradient Boosting Machine - Support Vector Machine – Deep Learning – Regression – Linear Model - Recommendation Systems	[9]
Case Study and Data Visualisation Case Study – Song Recommendation system – Genome Data Analysis – Classifying Handwritten Digits – Data Visualisation – Frameworks & Libraries – Types - Line Chart – Scatter Plot - Bar Chart - Box Plot - Pie Chart - Dot Chart - Map Chart - Gauge Chart - Radar Chart - Matrix Chart - Spatial Graph - Distribution Plot - Violin Plot - Count Plot - Heatmap - Pair Grid - Facet Grid	[9]
Total Hours:	**45**

Text Book(s):	
1.	Arshdeep Bahga, Vijay Madisettai, “Big Data Science & Analytics”, VPT Publisher, 2016 2. Tom White, “Hadoop: The Definitive Guide”, O’Reilly, 4th Edition, 2014
Reference(s):	
1.	Seema Acharya, Subhashini Chellappan, “Big Data and Analytics”, Wiley Publications, First Edition, 2014
2.	Bart Baesens, “Analytics in a Big Data World: The Essential Guide to Data Science and its Applications”, Wiley, 2014.
3	Jure Leskovec, Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Big Data Analytics**	
1.1	Analytics	1
1.2	Descriptive Analytics	2
1.3	Big Data	2
1.4	Analytics Flow for Big Data	2
1.4	Examples of Big Data	2
2.0	**Big Data Patterns & NOSQL**	
2.1	Load Levelling with Queues	1
2.2	Bloom Filter	2
2.3	Agent	2
2.4	Web Service	2
2.4	Map reduce Patterns	2
3.0	**Big Data Storage and Analysis**	
3.1	HDFS	1
3.2	Map reduce Programming Model	2
3.3	Hadoop YARN	2
3.4	Map reduce Examples	1
3.4	Data Types	2
3.6	Storing Results	1
4.0	**Machine Learning Algorithm**	
4.1	Analytics Algorithms	1
4.2	k-means	1
4.3	Naïve Bayes	1
4.4	Decision Tree	1
4.4	Random Forest	1
4.6	Gradient Boosting Machine	1
4.7	Support Vector Machine	1
4.8	Linear Model	1
4.9	Recommendation Systems	1
5.0	**Case Study and Data Visualisation**	
5.1	Song Recommendation system	1
5.2	Genome Data Analysis	1
5.3	Classifying Handwritten Digits	1
5.4	Data Visualisation	1
5.5	Line Chart	1
5.6	Bar Chart	1
5.7	Dot Chart	1
5.8	Spatial Graph	1
5.9	Facet Grid	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E33	Ethical Hacking and Network Defence	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding Ethical Hacking and Vulnerabilities
- To Learning Footprinting and Port Scanning Techniques
- To Mastering System Hacking and Security Breaches
- To Exploring Web Services Hacking and Session Hijacking
- To Hacking and Securing Wireless Networks

Prerequisite

- Basic knowledge of computer networks, operating systems, and fundamental security concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Illustrate the legal and ethical requirements related to ethical hacking	Understand
CO2	Interpret the vulnerabilities, mechanisms to identify vulnerabilities, threats, attacks	Apply
CO3	Perform penetration & security testing to identify the vulnerabilities in the application.	Apply
CO4	Examine the different tools and techniques that ethical hackers employ	Analyze
CO4	Understand wireless network vulnerabilities and apply tools and techniques for ethical	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E33 - Ethical Hacking and Network Defence

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Ethical Hacking Overview & Vulnerabilities Understanding the importance of security, Concept of ethical hacking and essential Terminologies-Threat, Attack, Vulnerabilities, Target of Evaluation, Exploit. Phases involved in hacking.	[9]
Foot printing & Port Scanning Foot printing - Introduction to foot printing, Understanding the information gathering methodology of the hackers, tools used for the reconnaissance phase. Port Scanning - Introduction, using port scanning tools, ping sweeps, Scripting enumeration-Introduction, enumerating windows OS & Linux OS.	[9]
System Hacking Aspect of remote password guessing, Role of eavesdropping, Various methods of password cracking, Keystroke Loggers, Understanding Sniffers, Comprehending Active and Passive Sniffing, ARP Spoofing and Redirection, DNS and IP Sniffing, HTTPS Sniffing. Side-channel Attacks on Cryptographic Hardware: Basic Idea, Current-measurement based Side-channel Attacks. Hardware Trojans: Hardware Trojan Nomenclature and Operating Modes, Countermeasures Such as Design and Manufacturing Techniques to Prevent/Detect Hardware Trojans.	[9]
Hacking Web Services & Session Hijacking Web application vulnerabilities, application coding errors, SQL injection into Back-end Databases, cross-site scripting, cross-site request forging, authentication bypass, web services and related flaws, protective http headers Understanding Session Hijacking, Phases involved in Session Hijacking, Types of Session Hijacking, Session Hijacking Tools	[9]
Hacking Wireless Networks Introduction to 802.11, Role of WEP, Cracking WEP Keys, Sniffing Traffic, Wireless DOS attacks, WLAN Scanners, WLAN Sniffers, Hacking Tools, Securing Wireless Networks.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Kimberly Graves, "Certified Ethical Hacker", Wiley India Pvt Ltd, 2013. Michael T. Simpson, "Hands-on Ethical Hacking & Network Defense", Course Technology,2016
2.	Rajat Khare, "Network Security and Ethical Hacking", Luniver Press, 2006. Ramachandran V, Backtrack 4 Wireless Penetration Testing Beginner's Guide (3rd ed.). Packt Publishing, 2011
Reference(s):	
1.	Thomas Mathew, "Ethical Hacking", OSB publishers, 2003
2.	Debdeep Mukhopadhyay and Rajat Subhra Chakraborty, "Hardware Security: Design, Threats, and Safeguards", CRC Press, 2014

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Ethical Hacking Overview & Vulnerabilities**	
1.1	Understanding the importance of security	1
1.2	Concept of ethical hacking and essential Terminologies	1
1.3	Threat	1
1.4	Attack	1
1.4	Vulnerabilities	1
1.6	Target of Evaluation	1
1.7	Exploit	1
1.8	Phases involved in hacking	2
2.0	**Foot printing & Port Scanning**	
2.1	Introduction to foot printing	1
2.2	Understanding the information gathering methodology of the hackers	2
2.3	Tools used for the reconnaissance phase	2
2.4	Port Scanning	1
2.4	Ping sweeps	2
2.6	Enumerating windows OS & Linux OS	1
3.0	**System Hacking**	
3.1	Aspect of remote password guessing	1
3.2	Various methods of password cracking	1
3.3	Understanding Sniffers	1
3.4	DNS and IP Sniffing	1
3.4	Measurement based Side	2
3.6	Hardware Trojan Nomenclature and Operating Modes	1
3.7	Detect Hardware Trojans	2
4.0	**Hacking Web Services & Session Hijacking**	
4.1	Web application vulnerabilities	1
4.2	application coding errors	1
4.3	SQL injection into Back-end Databases	1
4.4	cross-site request forging	1
4.4	web services and related flaws	1
4.6	protective http headers Understanding Session Hijacking	1
4.7	Phases involved in Session Hijacking	1
4.8	Session Hijacking Tools	2
5.0	**Hacking Wireless Networks**	
5.1	Introduction to 802.11	1
5.2	Role of WEP	1
5.3	Cracking WEP Keys	1
5.4	Sniffing Traffic	1
5.5	Wireless DOS attacks	1
5.6	WLAN Scanners	1
5.7	WLAN Sniffers	1
5.8	Securing Wireless Networks.	2
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E34	IoT Application Development	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding IoT Application Development Lifecycle
- To Learning User Interface Design for IoT Devices
- To Mastering Prototyping and Wireframing for IoT Applications
- To IoT Testing Techniques and Challenges
- To Exploring IoT Application Deployment and Management

Prerequisite

- Basic knowledge of programming, IoT concepts, and user interface design

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the concept of IoT for application development	Understand
CO2	Build context-aware and gestural interfaces for IoT applications	Apply
CO3	Construct prototype using wireframes for different device interfaces	Apply
CO4	Make use of different testing strategies for IoT applications	Analyze
CO4	Develop an appropriate deployment architecture for an IoT project	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E34 - IoT Application Development

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Overview of IOT Application Development - UI/UX Considerations -Feasibility Study- Architecture and Design- User Interface for Device Management - Testing and Quality Assurance-Deployment- Monitoring and Optimization- End-of-Life Planning.	[9]
User Interface Design User-centered design principles- Device Control Interfaces- Multi-Device Interaction - Responsive Design for Various Screens -Navigation design- Voice and Natural Language Interfaces-Grid systems and layout-Typography in UI design-Color theory and its application-Creating effective user flows- Error Handling and Feedback- Context-Aware Interfaces-Gestural Interfaces	[9]
Prototyping and Wire Framing Prototyping tools-Types of Prototypes- key elements of wireframes-creating basic wireframes- Device Interface Prototyping- Sensor Data Visualization- Interaction Flows-Mobile and Web Application Wire framing- Voice and Gesture Interaction Prototypes- Edge Computing Integration- Error Handling and Feedback Prototypes- Remote Monitoring Interfaces.	[9]
IoT Testing Challenges -Unit Testing for IoT Components- Integration Testing for IoT Device -Security Testing for IoT Devices and networks- End to End Testing - Automation Framework and Tools -Metrics of Performance testing- Device and Power Management.	[9]
Application Deployment IoT Deployment Strategies and Project Planning-Deployment Considerations- Challenges and Risks-Deployment Architecture-Configure and set up edge devices - Cloud Platform - Connectivity and Communication-Data Handling and Storage-Deployment Testing-Monitoring and Management.	[9]
Total Hours:	**45**

Text Book(s):

1. Cirani, S., Ferrari, G., Picone, M., & Veltri, L., “Internet of Things Architectures, Protocols and Standards”, Wiley, 2018.
2. Höller, J., Tsiatsis, V., Mulligan, C., Karnouskos, S., Avesand, S., & Boyle, D., “ From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, Springer, 2019.

Reference(s):

1. Gravina, R. (Ed.), Palau, C. E. (Ed.), Manso, M. (Ed.), Liotta, A. (Ed.), Fortino, G. (Ed.), “Integration, Interconnection, and Interoperability of IoT Systems (Internet of Things)”, Springer, 2018.
2. Hanes, D., Salgueiro, G., Grossetete, P., Barton, R., Henry, J., “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Cisco Press,2017.

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Overview of IOT Application Development	1
1.2	UI/UX Considerations	1
1.3	Feasibility Study	1
1.4	Architecture and Design	1
1.5	User Interface for Device Management	1
1.6	Testing and Quality Assurance	1
1.7	Deployment	1
1.8	Monitoring and Optimization	1
1.9	End-of-Life Planning	1
2.0	**User Interface Design**	
2.1	User-centered design principles	1
2.2	Device Control Interfaces	1
2.3	Multi-Device Interaction	1
2.4	Responsive Design for Various Screens	1
2.5	Navigation design	1
2.6	Voice and Natural Language Interfaces	1
2.7	Creating effective user flows	1
2.8	Error Handling and Feedback	1
2.9	Gestural Interfaces	1
3.0	**Prototyping and Wire Framing**	
3.1	Prototyping tools	1
3.2	Types of Prototypes	1
3.3	Key elements of wireframes	1
3.4	Creating basic wireframes	1
3.5	Device Interface Prototyping	1
3.6	Edge Computing Integration	2
3.7	Remote Monitoring Interfaces	2
4.0	**IoT Testing**	
4.1	Challenges	1
4.2	Unit Testing for IoT Components	2
4.3	Integration Testing for IoT Device	1
4.4	Security Testing for IoT Devices and networks	1
4.5	End to End Testing	1
4.6	Metrics of Performance testing	2
4.7	Device and Power Management	1
5.0	**Application Deployment**	
5.1	IoT Deployment Strategies and Project Planning	1
5.2	Deployment Considerations	1
5.3	Challenges and Risks	2
5.4	Deployment Architecture	2
5.5	Cloud Platform	1
5.6	Monitoring and Management	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E35	Blockchain Technologies	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To decompose a blockchain system's fundamental components, how they fit together and examine a decentralization using blockchain
- To explain how Cryptocurrency works, from when a transaction is created to when it is considered part of the blockchain
- To explain the components of Ethereum and programming languages for Ethereum
- To study the basics Hyperledger and Web3
- To provide details of alternative blockchain and blockchain projects in different perspective

Prerequisite

- Basic knowledge of programming, computer networks, and fundamentals of distributed systems

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the technology components of Blockchain and how it works behind-the scenes.	Understand
CO2	Aware of different approaches to developing decentralized applications.	Apply
CO3	Understand the Bitcoin and its limitations by comparing with other alternative coins.	Apply
CO4	Establish deep understanding of the Ethereum model, its consensus model, code execution	Analyze
CO4	Understand the architectural components of a Hyperledger and its development framework	Apply

Mapping with Programme Outcomes

Cos	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 - Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E35 – Blockchain Technologies								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Blockchain History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain –Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization.	[9]
Introduction to Cryptocurrency Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin limitations – Name coin – Prime coin – Zcash – Smart Contracts – Ricardian Contracts.	[9]
Ethereum The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language	[9]
Web3 and Hyperledger Introduction to Web3 – Contract Deployment – POST Requests – Development Frameworks – Hyperledger as a Protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda	[9]
Alternative Blockchains and Next Emerging Trends Kadena – Ripple – Rootstock – Quorum – Tendermint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous Tool	[9]
Total Hours:	**45**

Text Book(s):	
1.	Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained”, Second Edition, Packt Publishing, 2018.
Reference(s):	
1.	Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands on Approach”, 2017.
2.	Andreas Antonopoulos, Satoshi Nakamoto, “Mastering Bitcoin”, O’Reilly, 2014.
3	Tiana Laurence, “Blockchain for Dummies”, 2nd edition, Wiley, 2019

Passed in BoS Meeting held on 20.12.2025
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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Blockchain**	
1.1	History of Blockchain	1
1.2	Types of Blockchain	2
1.3	Blockchain and Full Ecosystem	2
1.4	Decentralization	2
1.5	Platforms for Decentralization.	2
2.0	**Introduction to Cryptocurrency**	
2.1	Bitcoin	1
2.2	Digital Keys and Addresses	1
2.3	Transactions	1
2.4	Mining	1
2.5	Bitcoin Networks and Payments	1
2.6	Wallets	1
2.7	Alternative Coins	1
2.8	Theoretical Limitations	1
2.9	Smart Contracts	1
3.0	**Ethereum**	
3.1	The Ethereum Network	1
3.2	Components of Ethereum Ecosystem	1
3.3	Ethereum Programming Languages	1
3.4	Runtime Byte Code	1
3.5	Blocks and Blockchain	1
3.6	Fee Schedule	1
3.7	Supporting Protocols	2
3.8	Solidity Language	1
4.0	**Web3 and Hyperledger**	
4.1	Introduction to Web3	1
4.2	Contract Deployment	1
4.3	POST Requests	1
4.4	Development Framework	1
4.5	Hyperledger as a Protocol	1
4.6	The Reference Architecture	1
4.7	Hyperledger Fabric	1
4.8	Distributed Ledger	1
4.9	Corda	1
5.0	**Alternative Blockchains and Next Emerging Trends**	
5.1	Kadena	1
5.2	Ripple	1
5.3	Rootstock	2
5.4	Quorum	2
5.5	Blockchain Research	1
5.6	Notable Projects	1
5.7	Miscellaneous Tool	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E36	Next Generation Networks	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To decompose a blockchain system's fundamental components, how they fit together and examine a decentralization using blockchain
- To explain how Cryptocurrency works, from when a transaction is created to when it is considered part of the blockchain
- To explain the components of Ethereum and programming languages for Ethereum
- To study the basics Hyperledger and Web3
- To provide details of alternative blockchain and blockchain projects in different perspective

Prerequisite

- Basic knowledge of computer networks, wireless communication, and programming fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Compare the 4G network with older generations of networks.	Understand
CO2	Identify suitable small cells for different applications in 4G networks.	Apply
CO3	Simulate 4G network scenarios.	Apply
CO4	Connect applications of FOG Computing	Analyze
CO4	Design applications with 4G network support	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E36 – Next Generation Networks								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

4G Internet and Leap To 6G Vision Historical Trend of Wireless Communications – Evolution of LTE Technology to Beyond 4G – 4G Roadmap – Ten Pillars of 4G – The 6G Vision -6G Vertical Industries-Technologies enabling 6G-Other 6G Considerations.	[9]
Small Cells for 4G Mobile Networks Introduction to Small Cells – Capacity Limits and Achievable Gains with Densification – Mobile Data Demand – Demand vs. Capacity – Small Cell Challenges.	[9]
Cooperation for Next Generation Wireless Networks Cooperative Diversity and Relaying Strategies: Cooperation and Network Coding, Cooperative ARQ MAC Protocols – PHY Layer Impact on MAC Protocol Analysis-Introduction – The Mobile Cloud – Mobile Cloud Enablers – Network Coding – Overview of Cognitive Radio Technology in 4G Wireless – Spectrum Optimization using Cognitive Radio – Relevant Spectrum Optimization Literature in 4G.	[9]
Networking Techniques and Applications for 4G Networks 4G RAN Architecture: C-RAN with NGFI- User-Centric Wireless Network for 4G - Energy Harvesting Based Green Heterogeneous Wireless Access for 4G -Resource Allocation for Cooperative D2D Communication Networks- Fog Computing and Its Applications in 4G -A Conceptual 4G Vehicular Networking -Communications Protocol Design for 4G Vehicular Networks -Next-Generation High-Efficiency WLAN -Shaping 4G for the Tactile Internet	[9]
Futuristic Technological Aspects of 6G 6G Beamforming Techniques-Aerial and Satellite Components of 6G Networks-Underwater Communication Components of 6G Networks-6G Networks-Radar Sensing-Imaging and Sensing-Localization-Other verticals.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Mobile Communication Networks: 4G and a Vision of 6G springer Božanić, Mladen, and Saurabh Sinha. Mobile Communication Networks: 4G and a Vision of 6G. Springer, First Edition, 2021.
Reference(s):	
1.	Jonathan Rodriguez, “Fundamentals of 4G Mobile Networks”, Wiley, 2014.
2.	Wireless Communications: Principles and Practice, by Theodore S. Rappaport, Prentice Hall., First Edition, 2014
3	4G Mobile Communications: Concepts and Technologies First Edition

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**4G Internet and Leap To 6G Vision**	
1.1	Historical Trend of Wireless Communications	1
1.2	Evolution of LTE Technology to Beyond 4G	1
1.3	4G Roadmap	2
1.4	Ten Pillars of 4G	1
1.5	The 6G Vision	1
1.6	6G Vertical Industries	1
1.7	Other 6G Considerations	2
2.0	**Small Cells for 4G Mobile Networks**	

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Approved in Academic Council Meeting held on 03.01.2026

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2.1	Introduction to Small Cells	1
2.2	Capacity Limits and Achievable Gains with Densification	2
2.3	Mobile Data Demand	2
2.4	Demand vs. Capacity	2
2.5	Small Cell Challenges	2
3.0	**Cooperation for Next Generation Wireless Networks**	
3.1	Cooperation and Network Coding	1
3.2	PHY Layer Impact on MAC Protocol Analysis	2
3.3	Mobile Cloud Enablers	2
3.4	Network Coding	2
3.5	Relevant Spectrum Optimization Literature in 4G	2
4.0	**Networking Techniques and Applications for 4G Networks**	
4.1	C-RAN with NGFI	1
4.2	User-Centric Wireless Network for 4G	2
4.3	Fog Computing and Its Applications in 4G	2
4.4	Conceptual 4G Vehicular Networking	2
4.5	Communications Protocol Design for 4G Vehicular Network	1
4.6	Shaping 4G for the Tactile Internet	1
5.0	**Futuristic Technological Aspects of 6G**	
5.1	6G Beamforming Techniques	1
5.2	Aerial and Satellite Components of 6G Networks	1
5.3	Underwater Communication Components of 6G Networks	2
5.4	6G Networks	2
5.5	Radar Sensing-Imaging and Sensing-Localization	1
5.6	Other verticals	2
	Total Hours:	**45**

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC E41	Responsible AI	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding Ethics in AI and the Role of Fairness
- To Learning Ethical Decision-Making in AI
- To Mastering Interpretability and Explainability in AI
- To Exploring Privacy Preservation Techniques in AI
- To Ensuring Responsible AI through Ethical Governance

Prerequisite

- Basic knowledge of programming, artificial intelligence concepts, and data ethics

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Comprehend the fundamental concepts of AI, recognize ethical considerations, and analyze biases and limitations through real-world case studies.	Understand
CO2	Apply ethical theories and principles to implement responsible AI practices, emphasizing accountability, responsibility, and transparency	Apply
CO3	Evaluate the importance of interpretability, categorize methods, and apply them to models, ensuring effective communication of results	Apply
CO4	Attain a comprehensive understanding of data privacy principles, employ effective privacy preserving techniques in AI applications, and critically assess real-world instances emphasizing the equilibrium between privacy and utility	Analyze
CO5	Assess ethical reasoning approaches, design moral agents, and implement ethical deliberation, governance, and inclusion for responsible AI practices	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E41 – Responsible AI								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Autonomy – Adaptability – Interaction – Need for Ethics in AI - Fairness and Bias: Sources of Biases – Exploratory data analysis, limitations of a dataset – Group fairness and individual fairness– Counterfactual fairness - AI harms – AI risks : Case Study.	[9]
Ethical Decision Making Seven Principles of Responsible AI - Ethical theories – Values - Ethics in practice – Implementing Ethical Reasoning – The ART of AI: Accountability, Responsibility, Transparency.	[9]
Interpretability and Explainability Importance of Interpretability – Taxonomy of Interpretability Methods – Scope of Interpretability – Evaluation of Interpretability – Interpretable Models: Linear Regression – Logistic Regression –Decision Tree.	[9]
Privacy Preservation Introduction to data privacy - Methods of protecting data - Importance of balancing data privacy and utility - Attack model – Privacy Preserving Learning - Differential Privacy – Federated Learning – Case Study.	[9]
Ensuring Responsible AI Approaches to Ethical Reasoning by AI – Designing Artificial Moral Agents – Implementing Ethical Deliberation – Levels of Ethical Behavior – The ethical status of AI system – Governance for Responsible AI – Codes of Conduct – Inclusion and Diversity.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Virginia Dignum, “Responsible Artificial Intelligence: How to Develop and Use AI in a Responsible Way” Springer Nature, 2019.
2.	Christoph Molnar “Interpretable Machine Learning”, Lulu, 1st edition, 2019
Reference(s):	
1.	Beena Ammanath, “Trustworthy AI”, Wiley, 2022.
2.	Adnan Masood, Heather Dawe, Dr. Ehsan Adeli, “Responsible AI in the Enterprise”, Packt Publishing, 2023.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Autonomy	1
1.2	Interaction	1
1.3	Fairness and Bias	2
1.4	Sources of Biases	1
1.4	limitations of a dataset	1
1.6	Counterfactual fairness	1
1.7	AI risks	2
2.0	**Ethical Decision Making**	
2.1	Seven Principles of Responsible AI	1
2.2	Ethical theories	1
2.3	Values	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

2.4	Ethics in practice	1
2.4	Implementing Ethical Reasoning	1
2.6	Accountability	1
2.7	Responsibility	1
2.8	Transparency	2
3.0	**Interpretability and Explainability**	
3.1	Importance of Interpretability	1
3.2	Taxonomy of Interpretability Methods	2
3.3	Scope of Interpretability	2
3.4	Linear Regression	2
3.4	Decision Tree	2
4.0	**Privacy Preservation**	
4.1	Introduction to data privacy	1
4.2	Methods of protecting data	2
4.3	Importance of balancing data privacy and utility	2
4.4	Attack model	2
4.5	Differential Privacy	1
4.6	Federated Learning	1
4.0	**Ensuring Responsible AI**	
4.1	Approaches to Ethical Reasoning by AI	1
4.2	Designing Artificial Moral Agents	1
4.3	Implementing Ethical Deliberation	1
4.4	Levels of Ethical Behavior	2
4.5	The ethical status of AI system	1
4.6	Codes of Conduct	2
4.7	Inclusion and Diversity	1
	Total Hours:	**45**

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC E42	Advanced Metaverse Technologies	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Comprehending the Foundation of XR and Metaverse
- To Exploring Experiences and Interoperability in the Metaverse
- To Analysing Applications of the Metaverse
- To Understanding Technologies Driving the Metaverse
- To Developing Interaction and Asset Creation in the Metaverse

Prerequisite

- Basic knowledge of programming, computer graphics, and fundamentals of AR/VR and Metaverse technologies

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Acquire knowledge to differentiate various Extended reality technologies in Metaverse	Understand
CO2	Apply Metaverse Experiences with depth understanding on devices and interoperability	Apply
CO3	Analyze Metaverse in various application domains	Apply
CO4	Develop the Metaverse environment with the integration of other technologies	Analyze
CO5	Acquire proficiency in AR/VR application deployment using various tools and methods for immersive experiences	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E42 – Advanced Metaverse Technologies								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

The Foundation of XR & Metaverse The Brain Science behind VR - Understanding Augmented Reality (AR), Virtual Reality (VR), Mixed Reality (MR), Web XR - Differences & Similarities of VR/AR/MR-XR in Metaverse.	[9]
Experience with Metaverse Metaverse-Experiences in metaverse-Avatars in metaverse-Interoperability in the metaverse connections and communications-Devices to access the metaverse.	[9]
Applications of Metaverse Educational potential in metaverse-Learning in the metaverse-Health and architecture in metaverse- Arts, entertainment, and Sports in the metaverse-Building a safe metaverse.	[9]
Technologies in Metaverse Web 3.0-Artificial Intelligence (AI) in Metaverse- Cyber Security aspects / How safe is Metaverse - Blockchain, NFT (non-fungible token) and crypto currency -Metaverse and NFTs - Metaverse Use Cases - Top Metaverse platforms - Current Challenges in Mass adoption of XR - Impact of 4G in XR - Role of Microsoft, Apple and Facebook in Metaverse	[9]
Interacting in Metaverse On-premise/Local hosting - Cloud Hosting & Streaming services - Distribution via Application Stores - Understanding UI & UX Design Essentials for AR/VR - Types of Navigation - Types of interaction (Understanding Hand controllers, gesture, gaze and voice controls) - Avatar implementations in VR (Torso/Full body) - AR/VR/Metaverse 3D Assets creation Tools Overview - 3D assets creation for VR/AR (Native polygonal modeling, Converting CAD models, 3D Scanning, Photogrammetry)	[9]
Total Hours:	**45**

Text Book(s):	
1.	"The Metaverse: And How it Will Revolutionize Everything" by Matthew Ball. published in 2022.
2.	Metaverse for Beginners: The Ultimate Guide to Understanding and Investing in Web 3.0, NFTs, Crypto Gaming, and Virtual Reality by Donn Newman in 2022
Reference(s):	
1.	The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything by Robert Scoble, Shel Israel published in 2016

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**The Foundation of XR & Metaverse**	
1.1	The Brain Science behind VR	1
1.2	Understanding Augmented Reality (AR)	1
1.3	Virtual Reality (VR)	2
1.4	Mixed Reality (MR)	1
1.5	Web XR	2
1.6	Differences & Similarities of VR/AR/MR-XR in Metaverse.	2
2.0	**Experience with Metaverse**	
2.1	Metaverse	1
2.2	Experiences in metaverse	2
2.3	Avatars in metaverse	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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2.4	Interoperability in the metaverse connections and communications	2
2.5	Devices to access the metaverse	2
3.0	**Applications of Metaverse**	
3.1	Educational potential in metaverse	1
3.2	Learning in the metaverse	2
3.3	Health and architecture in metaverse	2
3.4	Arts, entertainment, and Sports in the metaverse	2
3.5	Building a safe metaverse	2
4.0	**Technologies in Metaverse**	
4.1	Web 3.0	1
4.2	Artificial Intelligence (AI) in Metaverse	2
4.3	Cyber Security aspects	2
4.4	Blockchain, NFT (non-fungible token) and crypto currency	2
4.5	Top Metaverse platforms	1
4.6	Impact of 4G in XR	1
5.0	**Interacting in Metaverse**	
5.1	Cloud Hosting & Streaming services	1
5.2	Understanding UI & UX Design Essentials for AR/VR	1
5.3	Types of Navigation	1
5.4	Avatar implementations in VR (Torso/Full body)	2
5.5	AR/VR/Metaverse 3D Assets creation Tools Overview	1
5.6	3D assets creation for VR/AR	2
	Total Hours:	**45**

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC E43	Wireless Sensor Networks and Body Area Networks	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding the Fundamentals of Wireless Sensor Networks
- To Exploring MAC Layer Protocols and ZigBee Standards
- To Implementing Data-Centric Computing in WSNs
- To Developing Synchronization, Localization, and Tracking Mechanisms
- To Designing and Applying BAN and WBAN Architectures

Prerequisite

- Basic knowledge of wireless networks, sensors and programming fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand different types of sensors, their actuators and the architecture of motes.	Understand
CO2	Design a WBAN using different networking concepts and hardware interfaces.	Apply
CO3	Understand and apply data centric computing in wireless sensor networks.	Apply
CO4	Apply appropriate localization techniques for different scenarios.	Analyze
CO5	Manage sensor networks by synchronizing the time, locating and tracking objects	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E43 – Wireless Sensor Networks and Body Area Networks

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Fundamentals of WSN Wireless Adhoc Networks – Distributed Sensing – Sensors and Transducers – Types of Sensors – Accuracy, Resolution and Hysteresis – Architecture of a Sensor Node and WSN – Sensor Network Design Considerations – Energy Efficient Design Principles for WSNs – Applications of WSNs.	[9]
MAC Layer of WSN and Zigbee Standard Energy issues in Transceiver Design and Channel Access – PHY Frame Structure – Roles of Nodes – End device, Router and Coordinator – Full Function Device and Reduced Function Device – Star, Mesh and Tree topology – Medium Access Control – Duty cycle S– MAC protocol – IEEE 802.14.4 standard and ZigBee.	[9]
Data Centric Computing in WSN Data Gathering and Dissemination–Broadcasting and Geocasting from Sink – Data Aggregation – LMST based Aggregation – Power Efficient Data gathering and Aggregation (PEDAP) – In–Network Processing – Aggregate Queries – Routing Challenges and Strategies in WSNs – SPIN, Directed Diffusion, Energy Aware Routing, Gradient based Routing**.**	[9]
Synchronization, Localization and Tracking In WSNs Sensor Management – Topology Control Protocols and Sensing Mode Selection Protocols – Time Synchronization – Localization and Positioning – Ranging techniques – Range based localization algorithms – Location services – Scene analysis, GPS and RFID	[9]
Design Requirement of BAN And WBAN BAN Positioning- Architecture of BAN - Requirements of BAN - BAN Standardization - The Media Access Control (MAC) - Frame Processing- Physical Layer (PHY) - Design Requirement of WBAN - WBAN Reference architecture - Software frameworks for programming WBAN- Hardware Development and systems for WBAN. Application of BAN – Rational Routing-Cognitive Routing-Energy aware routing- Energy harvesting methods for WBAN	[9]
Total Hours:	**45**

Text Book(s):

1.	Mohammed A. Matin, “Wireless Sensor Networks: Technology and Protocols”, InTech, First Edition, 2012

Reference(s):

1.	Holger Karl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2011.
2.	Al-Turjman, Fadi. Internet of nano-things and wireless body area networks (WBAN). CRC Press, First Edition, 2019.
3.	Feng Zhao, Leonidas Guibas, “Wireless Sensor Networks”, Morgan Kaufmann, 2004 4. Bob Tucker, “Wireless Sensor Networks: Signals and Communication Technology”, NY Research Press, 2014

Passed in BoS Meeting held on 20.12.2025
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Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Fundamentals of WSN**	
1.1	Wireless Adhoc Networks	1
1.2	Distributed Sensing	1
1.3	Sensors and Transducers	2
1.4	Types of Sensors	1
1.5	Architecture of a Sensor Node and WSN	1
1.6	Energy Efficient Design Principles for WSNs	1
1.7	Applications of WSNs	2
2.0	**MAC Layer of WSN and Zigbee Standard**	
2.1	Energy issues in Transceiver Design and Channel Access	1
2.2	PHY Frame Structure	1
2.3	Roles of Nodes	1
2.4	End device, Router and Coordinator	1
2.5	Star, Mesh and Tree topology	1
2.6	Medium Access Control	1
2.7	Duty cycle S	1
2.8	IEEE 802.14.4 standard and ZigBee	2
3.0	**Data Centric Computing in WSN**	
3.1	Data Gathering and Dissemination	1
3.2	Broadcasting and Geocasting from Sink	2
3.3	Power Efficient Data gathering and Aggregation	2
3.4	Aggregate Queries	2
3.5	Gradient based Routing	2
4.0	**Synchronization, Localization and Tracking In WSNs**	
4.1	Sensor Management	1
4.2	Topology Control Protocols and Sensing Mode Selection Protocols	2
4.3	Time Synchronization	2
4.4	Localization and Positioning	2
4.5	Ranging techniques	1
4.6	Location services	1
5.0	**Design Requirement of BAN And WBAN**	
5.1	BAN Positioning	1
5.2	Requirements of BAN	1
5.3	The Media Access Control (MAC)	1
5.4	Physical Layer (PHY)	2
5.5	Software frameworks for programming WBAN	1
5.6	Cognitive Routing	2
5.7	Energy aware routing	1
	Total Hours:	**45**

Course Designer

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70 PMC E44	Data Analysis and Visualization	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding the Fundamentals of Exploratory Data Analysis
- To Developing Proficiency in Data Visualization
- To Building Interactive Dashboards with Power BI
- To Analysing Univariate and Bivariate Data
- To Exploring Multivariate and Time Series Data

Prerequisite

- Basic knowledge of programming, statistics, and data visualization concepts

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Use the Exploratory data analysis concepts over the data	Understand
CO2	Apply the data visualization using Matplotlib.	Apply
CO3	Illustrate univariate data exploration and analysis.	Apply
CO4	Apply bivariate data exploration and analysis.	Analyze
CO5	Use Data exploration and visualization techniques for multivariate and time series data.	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E44 – Data Analysis and Visualization								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Exploratory Data Analysis Fundamentals Overview – Significance of Exploratory Data Analysis (EDA) – Making sense of data– Comparing EDA with classical and Bayesian analysis –Software tools for EDA Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation Techniques-Grouping Datasets-data aggregation–Pivot tables and crosstabulations.	[9]
Visualizing using Matplotlib Importing Matplotlib – Simple line plots – Simple 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.	[9]
Dashboard Creation using PowerBI Creating Reports-table Visualization-Bar –Pie-column-donut –Navigation and accessibility-Bringing data to the user-Identifying Patterns and trends-case study.	[9]
Univariate & Bivariate Analysis Introduction to Single variable: Distributions and Variables – Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series. Relationships	[9]
Multivariate and Time Series Analysis Introducing a Third Variable-Causal Explanations-Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Suresh Kumar Mukhiya, Usman Ahmed, “Hands -On Exploratory Data Analysis with Python”, Packt Publishing, 2020
2.	Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016
Reference(s):	
1.	Catherine Marsh, Jane Elliott, “Exploring Data: An Introduction to Data Analysis for Social Scientists”, Wiley Publications, 2nd Edition, 2008

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Exploratory Data Analysis Fundamentals**	
1.1	Significance of Exploratory Data Analysis	1
1.2	Making sense of data	1
1.3	Software tools for EDA Visual Aids	2
1.4	Data transformation techniques	1
1.5	merging database, reshaping and pivoting	1
1.6	Transformation techniques	1
1.7	Pivot tables and crosstabulations	2
2.0	**Visualizing using Matplotlib**	
2.1	Importing Matplotlib	1
2.2	Simple line plots	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

2.3	Visualizing errors	1
2.4	Density and contour plots	1
2.5	Legends	1
2.6	Text and annotation	1
2.7	Three-dimensional plotting	1
2.8	Visualization with Seaborn	2
3.0	**Dashboard Creation using PowerBI**	
3.1	Creating Reports	1
3.2	Pie-column-donut	2
3.3	Navigation and accessibility	2
3.4	Bringing data to the user	2
3.5	Identifying Patterns and trends	2
4.0	**Univariate & Bivariate Analysis**	
4.1	Distributions and Variables	1
4.2	Numerical Summaries of Level and Spread	2
4.3	Scaling and Standardizing	2
4.4	Inequality	2
4.5	Smoothing Time Series	1
4.6	Relationships	1
5.0	**Multivariate and Time Series Analysis**	
5.1	Introducing a Third Variable	1
5.2	Causal Explanations	1
5.3	Three-Variable Contingency Tables and Beyond	1
5.4	Longitudinal Data	2
5.5	Fundamentals of TSA	1
5.6	Time-based indexing	2
5.7	Grouping	1
	Total Hours:	**45**

Course Designer

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Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E45	Cyber Ethics and Laws	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding E-Commerce and Electronic Business Models
- To Developing Awareness of Cyber Ethics
- To Learning the Fundamentals of Cyber Law
- To Understanding the Information Technology Act (IT Act)
- To Exploring Related Legislation and Dispute Resolution

Prerequisite

- Basic knowledge of computer networks, cybersecurity, and legal and ethical aspects of technology

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Demonstrate a comprehensive understanding of electronic business models, including e-commerce, mobile commerce and its legal issues	Understand
CO2	Interpret Cyber Ethics and its significance in the context of technology and information systems	Apply
CO3	Develop a solid foundation in the principles and concepts of cyber laws	Apply
CO4	Illustrate information Technology act and legislation addressing cybercrime, including laws pertaining to unauthorized access, hacking, identity theft, and online fraud solution	Analyze
CO5	Understand the legal framework governing cyber law, intellectual property with insights into relevant Indian laws and regulations	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous

MCA – Master of Computer Applications

70 PMC E45 – Cyber Ethics and Laws

Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Electronic Business and Legal Issues Evolution and development in E-commerce, paper vs paper less contracts E-Commerce models-B2B, B2C, E security. Business, taxation, electronic payments, supply chain, EDI, E-markets, Emerging Trends.	[9]
Cyber Ethics The Importance of Cyber Law, Significance of Cyber Ethics, Need for Cyber regulations and Ethics, Ethics in Information society, Introduction to Artificial Intelligence Ethics: Ethical Issues in AI and core Principles, Introduction to Blockchain Ethics.	[9]
Introduction to Cyber Law Evolution of computer Technology, emergence of cyber space. Cyber Jurisprudence, Jurisprudence and law, Doctrinal approach, Consensual approach, Real Approach, Cyber Ethics, Cyber Jurisdiction, Hierarchy of courts, Civil and criminal jurisdictions, Cyberspace-Webspace, Web hosting and web Development agreement, Legal and Technological Significance of domain Names, Internet as a tool for global access.	[9]
Information Technology Act Overview of IT Act, 2000, Amendments and Limitations of IT Act, Digital Signatures, Cryptographic Algorithm, Public Cryptography, Private Cryptography, Electronic Governance, Legal Recognition of Electronic Records, Legal Recognition of Digital Signature, Certifying Authorities, Cyber Crime and Offences, Network Service Providers Liability, Cyber Regulations Appellate Tribunal, Penalties and Adjudication	[9]
Cyber Law and Related Legislation Patent Law, Trademark Law, Copyright, Software Copyright or Patented, Domain Names and Copyright disputes, Electronic Data Base and its Protection, IT Act and Civil Procedure Code, IT Act and Criminal Procedural Code, Relevant Sections of Indian Evidence Act, Relevant Sections of Bankers Book Evidence Act, Relevant Sections of Indian Penal Code, Relevant Sections of Reserve Bank of India Act, Law Relating To Employees And Internet, Alternative Dispute Resolution, Online Dispute Resolution(ODR).	[9]
Total Hours:	**45**

Text Book(s):

1.	Cyber Laws: Intellectual property & ECommerce, Security-Kumar K, dominant Publisher, 2011.
2.	Cyber Ethics4.0, Christoph Stuckelberger, Pavan Duggal, by Globethics, 2018. Information Security policy& Implementation Issues, PHI, 2003.

Reference(s):

1.	Legal Dimensions of Cyber Space, Verma S,K ,Mittal Raman,Indian Law Institute, New Delhi, 2004. Cyber Law- The law of Internet, Jonthan Rosenoer, Springer,2011.
2.	The Right to Information Act 2004, S.R.Bhansali, Sudhir Naib,OUP India, 2011. Cyber Crimes and Law Enforcement, Vasu Deva, Commonwealth Publishers, New Delhi, 2017.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Electronic Business and Legal Issues**	
1.1	Evolution and development in E-commerce	1
1.2	Paper vs paper less contracts E-Commerce models	1

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

1.3	B2B, B2C	2
1.4	Business, taxation	1
1.5	Supply chain	1
1.6	EDI	1
1.7	Emerging Trends	2
2.0	**Cyber Ethics**	
2.1	The Importance of Cyber Law	1
2.2	Significance of Cyber Ethics	1
2.3	Need for Cyber regulations and Ethics	2
2.4	Ethics in Information society	1
2.4	Introduction to Artificial Intelligence Ethics	1
2.6	Ethical Issues in AI and core Principles	2
2.7	Introduction to Blockchain Ethics	1
3.0	**Introduction to Cyber Law**	
3.1	Evolution of computer Technology	1
3.2	Cyber Jurisprudence	2
3.3	Consensual approach	2
3.4	Civil and criminal jurisdictions	2
3.4	Web hosting and web Development agreement	2
4.0	**Information Technology Act**	
4.1	Overview of IT Act, 2000	1
4.2	Amendments and Limitations of IT Act	2
4.3	Public Cryptography	2
4.4	Legal Recognition of Electronic Records	2
4.4	Cyber Crime and Offences	1
4.6	Penalties and Adjudication	1
5.0	**Integrating Large-Scale IoT Systems**	
5.1	Patent Law	1
5.2	Software Copyright or Patented	1
5.3	Electronic Data Base and its Protection	1
5.4	Relevant Sections of Indian Evidence Act	2
5.5	Relevant Sections of Indian Penal Code	1
5.6	Alternative Dispute Resolution	2
5.7	Online Dispute Resolution	1
	Total Hours:	**45**

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Chairman Bos

70 PMC E46	3D Printing	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding the Fundamentals of 3D Printing
- To Mastering the 3D Printing Process Chain
- To Learning 3D Design and Model Preparation
- To Enhancing Troubleshooting and Calibration Skills
- To Exploring Advanced 3D Printing Techniques and Applications

Prerequisite

- Basic knowledge of 3D modelling, additive manufacturing, and design software

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Make use of 3D printing technologies and realize the applications	Understand
CO2	Identify 3D printing process chain in additive manufacturing.	Apply
CO3	Develop proficiency in using 3D modelling software.	Apply
CO4	Identify various issues involves in common 3D printing techniques	Analyze
CO5	Apply the concepts of advanced 3D printing techniques to develop applications	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E46 – 3D Printing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to 3D Printing Overview of 3D Printing technology - Historical background and advancements - Applications and real-world examples - Additive manufacturing techniques - Fused Deposition Modeling (FDM) -Stereolithography (SLA) - Digital Light Processing (DLP) - Selective Laser Sintering (SLS) – Direct Metal Laser Sintering (DMLS) - Other Types (MSLA, BJP, EBM, LOM) - Variations of FDM 3D Printing Machines.	[9]
3D Printing Process Chain & Photopolymerization Processes Steps in Additive manufacturing - Design for 3D printing - Software in 3D Printing - Materials for 3D Printing - Post-processing and finishing techniques; Introduction to Photopolymerization Processes - Photopolymerization Materials - Reaction Rates - Vector Scan SL - SL Resin Curing Process - SL Scan Patterns - Vector Scan Micro Stereolithography - Mask Projection Photopolymerization Technologies and Processes - Two-Photon SL	[9]
3D Designing Introduction to 3D modeling software - Creating 3D Models - Designing basic geometric shapes -CAD software and tools - Parametric modeling - Creating complex structures and assemblies; Preparing Models for 3D Printing - Design considerations for 3D printing - Mesh repair and optimization - File formats for 3D printing - Slicing software and its features - Layer height and resolution settings - Support structures; Print bed adhesion techniques – Orientation – Rafts.	[9]
Troubleshooting and Calibration Components of FDM & Stereolithography printers - Identifying and resolving common print issues- Adjusting print settings for optimal results- Materials Handling Issues - Hardware & Software Calibrations.	[9]
Advanced 3D Printing Techniques Multi-Material Unit (MMU) and Multi-Color Printing - Overview of 3D scanning technologies - Point cloud data and mesh generation - Reverse engineering and modification of existing models -High-resolution printing - Large-scale printing - Applications - Industrial applications - Medical and healthcare applications - Automotive and aerospace industries - Art, Architecture, Fashion &Food - Education and prototyping.	[9]
Total Hours:	**45**

Text Book(s):	
1.	”Mastering 3D Printing: A Guide to Modeling, Printing and Prototyping” by Joan Horvath, Rich Camerona, published in May 2020.
2.	3D Printing Failures: How to Diagnose and Repair ALL Desktop 3D Printing Issues" by Sean Aranda and David Feeney published in January 2020.
Reference(s):	
1.	“Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing” by Ian Gibson, David W Rosen, Brent Stucker published in 2010.
2.	“Rapid Prototyping: Principles & Applications” by Chua Chee Kai, Leong Kah Fai published in January 2010. Press,2017.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to 3D Printing**	
1.1	Overview of 3D Printing technology	1
1.2	Historical background and advancements	1
1.3	Additive manufacturing techniques	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

1.4	Stereolithography	1
1.5	Digital Light Processing	1
1.6	Direct Metal Laser Sintering	1
1.7	Variations of FDM 3D Printing Machines	2
2.0	**3D Printing Process Chain & Photopolymerization Processes**	
2.1	Steps in Additive manufacturing	1
2.2	Design for 3D printing	1
2.3	Post-processing and finishing techniques	1
2.4	Photopolymerization Processes	1
2.5	Reaction Rates	1
2.6	SL Resin Curing Process	1
2.7	Vector Scan Micro Stereolithography	1
2.8	Two-Photon SL	2
3.0	**3D Designing**	
3.1	Introduction to 3D modelling software	1
3.2	Designing basic geometric shapes	2
3.3	Parametric modelling	2
3.4	Design considerations for 3D printing	2
3.4	Support structures	2
4.0	**Troubleshooting and Calibration**	
4.1	Components of FDM & Stereolithography printers	1
4.2	Identifying and resolving common print issues	2
4.3	Adjusting print settings for optimal results	2
4.4	Materials Handling Issues	2
4.5	Hardware & Software Calibrations	2
5.0	**Advanced 3D Printing Techniques**	
5.1	Multi-Material Unit (MMU) and Multi-Color Printing	1
5.2	Overview of 3D scanning technologies	1
5.3	Point cloud data and mesh generation	1
5.4	High-resolution printing	2
5.5	Industrial applications	1
5.6	Automotive and aerospace industries	2
5.7	Education and prototyping	1
	Total Hours:	**45**

Course Designer

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70 PMC E51	Robotic Operating Systems	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understanding the Basics of ROS
- To Exploring ROS Tools and Development Environment
- To Mastering ROS Communication Mechanisms
- To Advancing in ROS Perception and Navigation
- To Interfacing Hardware with ROS

Prerequisite

- Basic knowledge of robotics, programming, and ROS (Robot Operating System) fundamentals

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Apply the concepts of ROS to enable the development of robotic system	Understand
CO2	Implement ROS topics and messages for efficient data transfer between nodes.	Apply
CO3	Utilize ROS visualization tools, such as RViz, to analyze and debug ROS applications.	Apply
CO4	Develop ROS perception packages for object detection, recognition, and tracking.	Analyze
CO5	Apply ROS drivers for tasks such as sensor data acquisition, robot navigation and object manipulation	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
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Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E51 - Robotic Operating Systems								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Introduction to ROS-Installation of ROS on different platforms-ROS basic concepts-Components: Nodes, topics, messages, and services- ROS communication architecture-ROS Packages and Ecosystem.	[9]
ROS Tools and Environment ROS Tools and Environment- command-line tools- ROSIDEs- ROS Integrated Development Environments (IDEs)- graphical tools for visualization and debugging- Rviz, Rqt, and Gazebo Creating and managing ROS workspaces-Version control with ROS	[9]
ROS Communication ROS nodes and communication - ROS Topics - Publishing and subscribing to topics-Working with ROS topics and messages-ROS services and parameters-ROS launch files for managing multiple nodes-ROS Middleware-ROS Libraries.	[9]
Advanced ROS Topics Perception in ROS- Perception libraries (OpenCV, PCL)- Integration of sensors: Cameras, Lidar, IMU - Basic computer vision techniques in ROS Robot Navigation and Control - ROS navigation stack-Path planning algorithms-Simulating and executing robot navigation- ROS control stack.	[9]
ROS and Robot Drivers ROS and Robot Drivers-Writing drivers to interface hardware with ROS-Interfacing Sensors and Actuators-Connecting sensors and actuators to the ROS ecosystem-Integration with Robot Platforms- Working with popular robot platforms.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Programming Robots with ROS: A Practical Introduction to the Robot Operating System, O'Reilly Media; by Morgan Quigley, Brian Gerkey, William D. Smart ,1st edition, 2014.
2.	Robot Operating System (ROS): The Complete Beginner's Guide" - Morgan Quigley, Apress; 1st edition, 2018.
Reference(s):	
1.	Robot Operating System (ROS) for Absolute Beginners: Robotics Programming Made Easy, Lentin Joseph, Apress, 1st edition ,2018
2.	ROS Robotics by Example, Carol Fairchild, Dr. Thomas L. Harman, Packt Publishing Limited, 2016.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Introduction to ROS	1
1.2	Installation of ROS on different platforms	1
1.3	ROS basic concepts	1
1.4	Nodes	1
1.4	Topics, Messages	1
1.6	Services	1
1.7	ROS Communication Architecture	1
1.8	ROS Packages and Ecosystem	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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2.0	**ROS Tools and Environment**	
2.1	ROS Tools and Environment	1
2.2	ROSIDEs	1
2.3	ROS Integrated Development Environments (IDEs)	1
2.4	Graphical tools for visualization and debugging	2
2.4	Rviz, Rqt	1
2.6	Managing ROS workspaces	1
2.7	Version control with ROS	2
3.0	**ROS Communication**	
3.1	ROS nodes and communication	1
3.2	ROS Topics	1
3.3	Publishing and subscribing to topics	1
3.4	Working with ROS topics and messages	1
3.5	ROS services and parameters	2
3.6	ROS launch files for managing multiple nodes	2
3.7	ROS Middleware	1
4.0	**Advanced ROS Topics**	
4.1	Perception in ROS	1
4.2	Perception libraries	1
4.3	Integration of sensors	2
4.4	Cameras, Lidar, IMU	1
4.5	Basic computer vision techniques in ROS Robot Navigation and Control	1
4.6	ROS navigation stack	1
4.7	Simulating and executing robot navigation	1
4.8	ROS control stack.	1
5.0	**ROS and Robot Drivers**	
5.1	ROS and Robot Drivers	1
5.2	Writing drivers to interface hardware with ROS	1
5.3	Interfacing Sensors and Actuators	2
5.4	Connecting sensors and actuators to the ROS ecosystem	1
5.5	Integration with Robot Platforms	2
5.6	Working with popular robot platforms	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

70 PMC E52	Application of Bio Python in Bioinformatics	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To impart knowledge on the fundamentals of Biopython for bioinformatics.
- To work with biological sequences using Biopython.
- To study the modules of the Biopython library.
- To explore advanced modules of Biopython.
- To develop real-world applications using Biopython

Prerequisite

- Basic knowledge of Python programming, Biopython library and bioinformatics applications

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the basics of Bio Python and Bioinformatics	Understand
CO2	Exploring Biological sequences using Bio Python	Apply
CO3	Learn the modules of Bio Python Library	Apply
CO4	Explore advanced modules of Bio Python	Analyze
CO5	Develop real world applications using Python	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E52 - Application of Bio Python in Bioinformatics								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Fundamentals of Bio Python Introduction to Bioinformatics - Python libraries: using standard modules and creating a new module- Biopython Introduction, working with sequences – parsing file formats - sequence objects – slicing sequence – concatenation- transcription-translation-comparing sequence objects- Finding sub-sequences-sequence annotation objects –creating, comparing, slicing SeqRecords	[9]
Sequence Input /Output and Alignments Parsing and reading sequences- -writing sequence files –Low level FASTA and FASTAQ – Sequence Alignment – Alignment object- Slicing and Indexing – operations on alignment-alignment class –formats- pairwise alignment – substitution scores –iterating over alignments-substitution matrices-multiple sequence alignment objects -tools	[9]
Biopython Library BLAST -Running –parsing BLAST output – other sequence search tools-Swiss-Prot and ExPASy- passing Swiss Prot-files – Parsing Prosite records-Parsing Enzyme records-Accessing ExPASy server- scanning prosite database-PDB Module –reading and writing crystal structure files – Analyzing structures	[9]
Advanced Topics in Biopython Bio.PopGen –Phylogentics with Bio.Phylo-view and export trees-.using tree and Clade objects –sequence motif analysis using Bio.motifs-motif objects –reading and writing motifs-position weight matrices –searching for instances	[9]
Python in Real-World Applications Accessing NCBIs Entrez databases – Specialized parsers –examples Graphics including Genome Diagram-KEGG records-Chromosomes – Cluster Analysis - Exploring real-world applications of Bio Python in genomics, proteomics, and structural biology.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Jeff Chang, Brad Chapman, Iddo Friedberg, Thomas Hamelryck, Michiel de Hoon, Peter Cock, Tiago Antao, Eric Talevich, Bartek Wilczyński, “Biopython Tutorial and Cookbook”, Packt publishers, 2024
Reference(s):	
1.	Tiago Antao , “Bioinformatics with Python Cookbook” , Packt publishers 2018
2.	BioPython : https://biopython.org/

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Fundamentals of Bio Python**	
1.1	Introduction to Bioinformatics	1
1.2	Python libraries	1
1.3	Biopython Introduction	1
1.4	Finding sub-sequences	2
1.5	Sequence annotation objects	2
1.6	Creating, comparing, slicing SeqRecords	2
2.0	**Sequence Input /Output and Alignments**	
2.1	Parsing and reading sequences	2
2.2	Low level FASTA and FASTAQ	2

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Approved in Academic Council Meeting held on 03.01.2026

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2.3	Alignment object	2
2.4	Substitution scores	2
2.5	Tools	1
3.0	**Biopython Library**	
3.1	BLAST	1
3.2	Swiss-Prot and ExPASy	2
3.3	Parsing Prosite records	2
3.4	Accessing ExPASy server	2
3.5	Analyzing structures	2
4.0	**Advanced Topics in Biopython**	
4.1	Bio.PopGen	1
4.2	Phylogentics with Bio.Phylo	1
4.3	View and Export trees	1
4.4	Sequence motif analysis using Bio.motifs	2
4.5	Reading and writing motifs	2
4.6	Searching for instances	2
5.0	**Python in Real-World Applications**	
5.1	Accessing NCBIs Entrez databases	1
5.2	Specialized parsers	1
5.3	KEGG records	2
5.4	Cluster Analysis	2
5.5	Proteomics	2
5.6	Structural biology	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E53	Generative AI	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Generative AI Fundamentals
- To Master Prompt Engineering Techniques
- To Study Generative AI Models
- To Explore Generative AI Platforms
- To Address Ethical Issues and Limitations

Prerequisite

- Basic knowledge of Generative AI, prompt engineering, AI models, platforms, and ethical considerations

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Acquire insights into the key technological trends driving generative AI models	Understand
CO2	Acquire the ability to apply effective prompt engineering techniques to enhance the performance and control the behavior of generative AI models	Apply
CO3	Build, train and apply generative models and develop familiarity with platforms	Apply
CO4	Ability to comprehend ethical issues and limitations of generative AI models	Analyze
CO5	Analyze the ethical issues, limitations, and social-economic implications of generative AI	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E53 - Generative AI								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Generative AI Capabilities - History and Evolution -Benefits- Challenges - Applications of Generative AI – Tools for Text, Image Code, Audio and Video generation– Economic Potential of Generative AI – Use cases.	[9]
Prompt Engineering Techniques and Approaches Prompt Creation -Writing effective prompts -Techniques for using text prompts: Zero shot and few shot prompt techniques – Prompt engineering approaches: Interview pattern, Chain-of Thought, Tree-of Thought - Benefits of using text prompts - Challenges in generating meaningful and coherent prompts.	[9]
Models for Generative AI Basics of Sequential data processing – Building blocks of Generative AI - Discriminative modelling – Generative modelling –Recurrent Neural Networks – Long Short-Term Memory (LSTM) Networks - Generative Adversarial Networks (GANs) - Variational Autoencoders (VAEs) –Transformer–based Models - Diffusion models- Applications.	[9]
Platforms for Generative AI Introduction to Platforms – Features of platforms – Capabilities -Applications - Pre-trained Models- Challenges – Generation of Text to Text – Generation of Text to Image – Text to Code Generation– Explainable AI – Benefits – Use cases.)	[9]
Ethical Issues and Limitations of Generative AI Limitations of Generative AI – Issues and concerns – Considerations for Responsible Generative AI – Economic Implications – Social Implications – Future and professional Growth of Generative AI.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Deep Learning: Teaching Machines to Paint, Write, Compose and Play, David Foster,2023. 2nd edition. O'Reilly Media, Inc.
2.	Deep Learning, Ian Goodfellow, Yoshua Bengio, Aaron Courville, MIT Press, 2016
Reference(s):	
1.	Hands-on Generative Adversarial Networks with Keras, Rafael Valle. Packt Publisher, 2019

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Generative AI**	
1.1	Capabilities	1
1.2	History and Evolution -Benefits	1
1.3	Benefits	1
1.4	Challenges	1
1.5	Applications of Generative AI	1
1.6	Tools for Text, Image Code, Audio and Video generation	3
1.7	Economic Potential of Generative AI	1
2.0	**Prompt Engineering Techniques and Approaches**	
2.1	Prompt Creation	1

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Approved in Academic Council Meeting held on 03.01.2026

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2.2	Writing effective prompts	2
2.3	Zero shot and few shot prompt techniques	2
2.4	Interview pattern	1
2.5	Chain-of Thought	2
2.6	Challenges in generating meaningful and coherent prompts	1
3.0	**Models for Generative AI**	
3.1	Basics of Sequential data processing	1
3.2	Building blocks of Generative AI	1
3.3	Discriminative modelling	1
3.4	Generative modelling	1
3.5	Recurrent Neural Networks	2
3.6	Generative Adversarial Networks (GANs)	1
3.7	Diffusion models	2
4.0	**Platforms for Generative AI**	
4.1	Introduction to Platforms	1
4.2	Capabilities	1
4.3	Generation of Text to Text	1
4.4	Generation of Text to Image	1
4.5	Text to Code Generation	1
4.6	Explainable AI	1
4.7	Benefits	1
4.8	Use cases	2
5.0	**Ethical Issues and Limitations of Generative AI**	
5.1	Limitations of Generative AI	1
5.2	Issues and concerns	2
5.3	Considerations for Responsible Generative AI	2
5.4	Economic Implications	2
5.5	Social Implications	1
5.6	Future and professional Growth of Generative AI.	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E54	Business Intelligence for Decision Making	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To Understand Business Analytics Fundamentals
- To Utilize Business Intelligence Tools
- To Implement Business Forecasting and Competitive Analysis
- To Apply HR Analytics
- To Leverage Marketing and Sales Analytics

Prerequisite

- Basic knowledge of business analytics, data-driven decision making, BI tools, forecasting, HR analytics, and marketing/sales analytics

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Analyze the real-world business problems and model with analytical solutions.	Understand
CO2	Evaluate the business processes for extracting Business Intelligence	Apply
CO3	Apply predictive analytics for business fore-casting.	Apply
CO4	Apply analytics for supply chain and logistics management	Analyze
CO5	Use analytics for marketing and sales	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E54 - Business Intelligence for Decision Making								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction to Business Analytics Analytics and Data Science – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modelling – Validation and Evaluation – Interpretation – Deployment and Iteration	[9]
Business Intelligence Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions.	[9]
Business Forecasting and Competitive Analysis Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models–Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics-Industry analysis- Profit Frontier, Risk vs Return, Competition Positioning-Enterprise Diagnosis.	[9]
HR Analytics Human Resources – Planning and Recruitment – Training and Development - Supply chain network-Planning, Demand, Inventory and Supply–Logistics–Analytics applications in HR-Applying HR Analytics to make a prediction of the demand for talent.	[9]
Marketing &Sales Analytics Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process –Sales Planning–Analytics applications in Marketing and Sales - predictive analytics for customers' behaviour in marketing and sales.	[9]
Total Hours:	**45**

Text Book(s):	
1.	R.Evans James,BusinessAnalytics,2ndEdition,Pearson,2017.
2.	RN Prasad, Seema Acharya, Fundamentals of Business Analytics,2nd Edition, Wiley,2016.
Reference(s):	
1.	Philip Kotler and Kevin Keller, Marketing Management,14th edition, PHI,2016.
2.	VSP Rao, Human Resource Management,3rd Edition, Excel Books,2010
3.	Mahadevan B, “Operations Management -Theory and Practice”, 3rd Edition Pearson Education, 2018.

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction to Business Analytics**	
1.1	Analytics and Data Science	1
1.2	Types of Analytics	1
1.3	Business Problem Definition	1
1.4	Data Collection	1
1.5	Data Preparation	1
1.6	Hypothesis Generation	1
1.7	Modelling	1
1.8	Validation and Evaluation	1
1.9	Deployment and Iteration	1
2.0	**Business Intelligence**	
2.1	Data Warehouses and Data Mart	1

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2.2	Knowledge Management	1
2.3	Types of Decisions	1
2.4	Decision Making Process	1
2.4	Decision Support Systems	1
2.6	Business Intelligence	1
2.7	OLAP	1
2.8	Analytic functions.	2
3.0	**Business Forecasting and Competitive Analysis**	
3.1	Introduction to Business Forecasting and Predictive analytics	1
3.2	Logic and Data Driven Models	1
3.3	Data Mining and Predictive Analysis Modelling	1
3.4	Machine Learning for Predictive analytics	1
3.5	Industry analysis	1
3.6	Risk vs Return	2
3.7	Enterprise Diagnosis	2
4.0	**HR Analytics**	
4.1	Human Resources	1
4.2	Planning and Recruitment	2
4.3	Training and Development	1
4.4	Supply chain network	1
4.5	Planning, Demand, Inventory and Supply	1
4.6	Logistics	2
4.7	Applying HR Analytics	1
5.0	**Marketing &Sales Analytics**	
5.1	Marketing Strategy	1
5.2	Marketing Mix	2
5.3	selling Process	2
5.4	Analytics applications in Marketing and Sales	1
5.5	predictive analytics	2
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
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Chairman Bos

70 PMC E55	Natural Language Processing	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To learn the fundamentals of natural language processing.
- To learn and understand the word level analysis methods.
- To explore the syntactic analysis concepts of grammar, parsing and probabilistic.
- To learn and understand the semantics and pragmatics.
- To learn the design and implementation of discourses and lexical resources

Prerequisite

- Basic knowledge of NLP, language modelling, word-level and syntactic analysis, semantics, and discourse processing

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the use of regular expression and tokenization for the basic language features	Understand
CO2	Interpret the tags for the word level analysis	Apply
CO3	Examine the real time system to tackle morphology and syntax of a language	Apply
CO4	Design a tag set to be used for statistical processing for real-time applications	Analyze
CO5	Analyze and compare the use of various statistical approaches for different types of NLP applications	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

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Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E55 – Natural Language Processing								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Origins and Challenges of NLP – Language Modelling: Grammar-Based LM, Statistical LM – Regular Expressions, Finite-State Automata – English Morphology, Transducers for Lexicon and Rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance.	[9]
Word Level Analysis Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-Based, Stochastic and Transformation –Based Tagging, Issues in PoS Tagging – Hidden Markov and Maximum Entropy Models.	[9]
Syntactic Analysis Context-Free Grammars, Grammar Rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming Parsing – Shallow Parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature Structures, Unification of Feature Structures.	[9]
Semantics and Pragmatics Requirements for Representation, First-Order Logic, Description Logics – Syntax-Driven Semantic Analysis, Semantic Attachments – Word Senses, Relations Between Senses, Thematic Roles, Selectional Restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary and Thesaurus, Bootstrapping Methods – Word Similarity using Thesaurus and Distributional methods	[9]
Discourse Analysis and Lexical Resources Discourse Segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, Brown Corpus, British National Corpus (BNC).	[9]
Total Hours:	**45**

Text Book(s):	
1.	Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Pearson Publication, First Edition, 2023
2.	Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python: Analyzing Text with the Natural Language Toolkit”, O‘Reilly Media, First Edition, 2009
Reference(s):	
1.	Breck Baldwin and Krishna Dayanidhi, “Language Processing with Java and LingPipe Cookbook”, Atlantic Publisher, 2014.
2.	Richard M Reese and AshishSingh Bhatia, “Natural Language Processing with Java”, Packt Publishing, Second Edition, 2018

Course Contents and Lecture Schedule

S. No	Topics	No. of hours
1.0	**Introduction**	
1.1	Origins and Challenges of NLP	1
1.2	Language Modelling	2
1.3	Statistical LM	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

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1.4	Transducers for Lexicon and Rules	2
1.5	Minimum Edit Distance	2
2.0	**Word Level Analysis**	
2.1	Unsmoothed N-grams	1
2.2	Evaluating N-grams	1
2.3	Smoothing	1
2.4	Part-of-Speech Tagging	1
2.5	Rule-Based	1
2.6	Stochastic and Transformation	1
2.7	Based Tagging, Issues in PoS Tagging	1
2.8	Hidden Markov and Maximum Entropy Models	2
3.0	**Syntactic Analysis**	
3.1	Context-Free Grammars	1
3.2	Grammar Rules for English	1
3.3	Treebanks	1
3.4	Syntactic Parsing, Ambiguity, Dynamic Programming Parsing	1
3.5	Shallow Parsing	1
3.6	Probabilistic CFG, Probabilistic CYK	1
3.7	Probabilistic Lexicalized CFGs	2
3.8	Unification of Feature Structures	1
4.0	**Semantics and Pragmatics**	
4.1	Requirements for Representation	1
4.2	First-Order Logic	1
4.3	Syntax-Driven Semantic Analysis	1
4.4	Semantic Attachments	1
4.5	Relations Between Senses	1
4.6	Selectional Restrictions	1
4.7	WSD using Supervised	1
4.8	Bootstrapping Methods	1
4.9	Word Similarity using Thesaurus and Distributional methods	1
5.0	**Discourse Analysis and Lexical Resources**	
5.1	Discourse Segmentation	1
5.2	Reference Phenomena	1
5.3	Anaphora Resolution using Hobbs and Centering Algorithm	2
5.4	Coreference Resolution	2
5.5	Porter Stemmer	1
5.6	Brill's Tagger	1
5.7	British National Corpus	1
	Total Hours:	**45**

Course Designer

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Chairman Bos

70 PMC E56	Visualization Techniques	Category	L	T	P	Credit
		PE	3	0	0	3

Objectives

- To explore foundations of Visualization
- To understand Visual Representation Techniques
- To analyse Multimodal Presentation Methods
- To Implement Interaction Techniques
- To Advance Design Techniques for Visualization

Prerequisite

- Basic knowledge of data visualization, visual representation techniques, multimodal presentation, interaction types, and advanced visualization design

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Understand the concepts and techniques used in Visualization Techniques.	Understand
CO2	Implement different techniques of information representation.	Apply
CO3	Implement various presentations of information.	Apply
CO4	Apply different interaction types used to present information.	Analyze
CO5	Design and implement effective Visualization	Apply

Mapping with Programme Outcomes

COs	POs							
	1	2	3	4	5	6	7	8
CO1	3	3	3	3	3	-	2	2
CO2	3	3	3	2	3	-	2	2
CO3	3	3	3	3	3	-	2	2
CO4	3	3	3	3	3	-	2	2
CO5	3	3	3	3	3	-	2	2
3 - High; 2 - Medium; 1 – Low								

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
Total	60	60	100

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

Syllabus

K.S. Rangasamy College of Technology – Autonomous								
MCA – Master of Computer Applications								
70 PMC E56 – Visualization Techniques								
Semester	**Hours/Week**			**Total Hours**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Introduction Presentation-Explorative Analysis-Confirmative Analysis-Mental Model-Scientific Visualization- Reference Model-Designing a Visual Application-Linear Data Representation-Perception-Issues.	[9]
Visual Representation Information Visualization Process - Representation Techniques - Human Factor and Interaction- Relation and Connection-Multivariate Analysis – Trees – Graphs -Network and Hierarchies - World Wide Web Manipulable and Transformable Representation	[9]
Multimodal Presentation Human Vision – Presentation in Space- Temporal Consideration- Space and Time – Techniques for Spatial Data, Geospatial Data, Time-oriented Data- Text Document- Data Analysis using Tableau and R language	[9]
Interaction Types Interaction Concepts and Techniques – Problem of Information overload – Interaction Types- Human Computer Interaction-Norman's Action Cycle-Interaction for: Information Visualization, Navigation, Models, Involuntary, Interactive Medical Application- Tactile Maps for Visually Challenged People	[9]
Advance Design Techniques Designing Effective Visualization, Comparing and Evaluating- Research Directions – Systems- Personal view –Attitude-Idea Generation- Convergence- Sketching- Evaluation Criteria – Analytic and Empirical Method – Case Study – Interactive Calendars –Selecting one from many- Animation Design for Simulation.	[9]
Total Hours:	**45**

Text Book(s):	
1.	Jurafsky Daniel, Martin James, "Speech and Language Processing", Second Edition, Tenth Impression, Pearson Education, 2018.
2.	Christopher Manning, Schutze Heinrich, "Foundations of Statistical Natural Language Processing", MIT Press, 1999.
Reference(s):	
1.	O.Ward, Georges Grinstein and Daniel Keim," Interactive Data Visualization Foundations, Techniques, and Applications", Second Edition, A K Peters,2021.
2.	Robert Spence, "Information Visualization An Introduction", Third Edition, Pearson Education, 2014.
3.	Colin Ware, "Information Visualization Perception for Design", Third Edition, Morgan Kaufmann Publishers, 2012
4.	Jason Gregory, "Game Engine Architecture", Third Edition, A K Press, 2014.
4.	Riccardo Mazza, "Introduction to Information Visualization", Springer.
6.	Joerg Osarek, "Virtual Reality Analytics", Gordon's Arcade, 2016

Course Contents and Lecture Schedule

S.No	Topics	No.of hours
1.0	**Introduction**	
1.1	Presentation	1
1.2	Confirmative Analysis	1
1.3	Scientific Visualization	2

Passed in BoS Meeting held on 20.12.2025
Approved in Academic Council Meeting held on 03.01.2026

Chairman Bos

1.4	Reference Model	1
1.5	Designing a Visual Application	1
1.6	Linear Data Representation	1
1.7	Perception	2
2.0	**Visual Representation**	
2.1	Information Visualization Process	1
2.2	Representation Techniques	1
2.3	Human Factor and Interaction	1
2.4	Relation and Connection	1
2.5	Multivariate Analysis	1
2.6	Trees – Graphs	1
2.7	Network and Hierarchies	1
2.8	Transformable Representation	2
3.0	**Multimodal Presentation**	
3.1	Human Vision	1
3.2	Presentation in Space	2
3.3	Space and Time	2
3.4	Geospatial Data	2
3.5	Data Analysis using Tableau and R language	2
4.0	**Interaction Types**	
4.1	Interaction Concepts and Techniques	1
4.2	Problem of Information overload	2
4.3	Human Computer Interaction	2
4.4	Information Visualization	2
4.5	Involuntary	1
4.6	Tactile Maps for Visually Challenged People	1
5.0	**Advance Design Techniques**	
5.1	Designing Effective Visualization	1
5.2	Research Directions	1
5.3	Personal view	1
5.4	Convergence	2
5.5	Analytic and Empirical Method	1
5.6	Interactive Calendars	2
5.7	Animation Design for Simulation	1
	Total Hours:	**45**

Course Designer

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Passed in BoS Meeting held on 20.12.2025
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