

**K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215****(Autonomous)****DEPARTMENT OF INFORMATION TECHNOLOGY****M.Tech. - Information Technology****(REGULATIONS 2024)****Vision of the Institution**

IV	To become a globally renowned institution in engineering and management, committed to providing holistic education that fosters research, innovation and sustainable development.
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Mission of the Institution

IM1	Deliver value-based quality education through modern pedagogy and experiential learning.
IM 2	Enrich engineering and managerial skills through cutting-edge laboratories to meet evolving global demands.
IM3	Empower research and innovation by integrating collaboration, social responsibility, and commitment to sustainable development.

Vision of the Department / Programme: Information Technology

DV	To nurture a generation of IT professionals empowered with technological expertise, innovation mindset, and commitment to global sustainability.
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Mission of the Department / Programme: Information Technology

DM1	To deliver industry-ready curriculum enriched with emerging technologies, hands-on learning, and interdisciplinary exposure.
DM 2	To provide modern infrastructure and a collaborative environment that supports innovation, research and continuous learning
DM3	To empower ethical digital citizens contributing to inclusive and sustainable technological solutions.

Programme Educational Objectives (PEOs) of M.Tech. - Information Technology

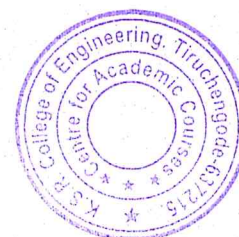
PEO 1	Evaluate Solutions: Incorporate with necessary background and significantly contribute to contemporary research in information technology to investigate complex problems.
PEO 2	Novelty in Technology: Apply and disseminate intellectual ideas related to IT field and advance in their profession.
PEO 3	Successful Career: Enhancing the abilities for successful teaching/research careers in industry or academia.

Programme Outcomes (POs) of M.Tech.-Information Technology (Regulations 2024)**M.Tech. - Information Technology graduates will be able to:**

PO1	An ability to independently carry out research /investigation and development work to solve practical problems.
PO2	An ability to write and present a substantial technical report/document.
PO3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.
PO4	Collaborate effectively in diverse teams, taking on leadership and contributory roles, to produce solutions using advanced technologies in multidisciplinary environments.
PO5	Engage in life-long learning for continuing education in doctoral level studies and professional development.

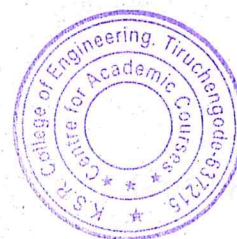
				K. S. R COLLEGE OF ENGINEERING An Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai Accredited by NAAC ('A++' Grade)							Curriculum PG R - 2024		
Department				Department of Information Technology									
Programme				M.Tech.- Information Technology									
SEMESTER I													
S. No.	Course Code	Course Title	Category	Periods / Semester					Credit C = T/30	Max. Marks			
				L	T	P	SL	Tot		CA	ES	Tot	
THEORY COURSES													
1	MA24T16	Operations Research	FC	45	0	0	45	90	3	40	60	100	
2	IT24T11	Advanced Data Structures	PCC	45	0	0	45	90	3	40	60	100	
3	RM24T09	Research Methodology and IPR	RMC	45	0	0	45	90	3	40	60	100	
4	IT24T12	Software Engineering Methodologies	PCC	45	0	0	45	90	3	40	60	100	
5		Professional Elective - I	PEC	45	0	0	45	90	3	40	60	100	
6		Professional Elective - II	PEC	45	0	0	45	90	3	40	60	100	
LABORATORY COURSE													
7	IT24P11	Advanced Data Structures Laboratory	PCC	0	0	60	0	60	2	60	40	100	
8	IT24P12	XML and Web Services Laboratory	PCC	0	0	60	0	60	2	60	40	100	
TOTAL				270	0	120	270	660	22	800			

 **Chairman (BoS)**



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Department		Department of Information Technology											
Programme		M.Tech.- Information Technology											
SEMESTER II													
S. No.	Course Code	Course Title	Category	Periods / Semester					Credit C = T/30	Max. Marks			
				L	T	P	SL	Tot		CA	ES	Tot	
THEORY COURSES													
1	IT24T21	AI and ML Learning Techniques	PCC	45	0	0	45	90	3	40	60	100	
2	IT24T22	Advanced Algorithm	PCC	45	0	0	45	90	3	40	60	100	
3	IT24T23	Soft Computing	PCC	45	0	0	45	90	3	40	60	100	
4	IT24T24	Full Stack Web Application Development	PCC	45	0	0	45	90	3	40	60	100	
5		Professional Elective - III	PEC	45	0	0	45	90	3	40	60	100	
6		Professional Elective - IV	PEC	45	0	0	45	90	3	40	60	100	
LABORATORY COURSES													
7	IT24P21	AI and ML Learning Techniques Laboratory	PCC	0	0	60	0	60	2	60	40	100	
8	IT24P22	Advanced Algorithm Laboratory	PCC	0	0	60	0	60	2	60	40	100	
9	IT24P23	Mini Project with Seminar	EEC	0	0	60	0	60	2	60	40	100	
TOTAL				270	0	180	270	720	24	900			


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Department		Department of Information Technology											
Programme		M.Tech.- Information Technology											
SEMESTER III													
S.	Course Code	Course Title	Category	Periods / Semester					Credit	Max. Marks			
No.				L	T	P	SL	Tot	C = T/30	CA	ES	Tot	
THEORY COURSES													
1	IT24T31	Advanced Computer Networks	PCC	45	0	0	45	90	3	40	60	100	
2	IT24T32	Cloud Computing Technologies	PCC	45	0	0	45	90	3	40	60	100	
3		Professional Elective - V	PEC	45	0	0	45	90	3	40	60	100	
4		Professional Elective - VI	PEC	45	0	0	45	90	3	40	60	100	
5		Audit course	AC	30	0	0	0	0	0	100	-	100	
LABORATORY COURSE													
6	IT24P31	Project Phase – I	EEC	0	0	180	0	180	6	60	40	100	
TOTAL				210	0	180	180	540	18	600			

SEMESTER IV												
S. No.	Course Code	Course Title	Category	Periods / Semester					Credit	Max. Marks		
				L	T	P	SL	Tot	C = T/30	CA	ES	Tot
LABORATORY COURSE												
1	IT24P41	Project Phase – II	EEC	0	0	360	0	360	12	60	40	100
TOTAL				0	0	360	0	360	12	100		
TOTAL CREDITS									76			
TOTAL NUMBER OF CREDITS TO BE EARNED FORAWARD OF THE DEGREE = 76												
Note: FC - Foundation Courses, RMC- Research Methodology Courses, PCC - Professional core courses, PEC - Professional Elective courses, EEC - Employability Enhancement Courses and AC - Audit courses.												

S. G. Jeyaraj
Chairman (BoS)



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Department		Department of Information Technology											
Programme		M.Tech.- Information Technology											
S. No.	Course Code	Course Title	Semester	Periods / Semester					Credit C = T/30	Max. Marks			
				L	T	P	SL	Tot		CA	ES	Tot	
FOUNDATION COURSES (FC)													
1	MA24T16	Operations Research	I	45	0	0	45	90	3	40	60	100	
TOTAL				45	0	0	45	90	3	-	-	-	
EMPLOYABILITY ENHANCEMENT COURSES (EEC)													
1	IT24P23	Mini Project with Seminar	II	0	0	60	0	60	2	60	40	100	
2	IT24P31	Project Phase – I	III	0	0	180	0	180	6	60	40	100	
3	IT24P41	Project Phase – II	IV	0	0	360	0	360	12	60	40	100	
TOTAL				0	0	600	0	600	20	-	-	-	
RESEARCH METHODOLOGY COURSES(RMC)													
1	RM24T09	Research Methodology and IPR	I	45	0	0	45	90	3	40	60	100	
				45	0	0	45	90	3	-	-	-	
PROFESSIONAL CORE COURSES (PCC)													
1	IT24T11	Advanced Data Structures	I	45	0	0	45	90	3	40	60	100	
2	IT24T12	Software Engineering Methodologies	I	45	0	0	45	90	3	40	60	100	
3	IT24P11	Advanced Data Structures Laboratory	I	0	0	60	0	60	2	60	40	100	
4	IT24P12	XML and Web Services Laboratory	I	0	0	60	0	60	2	60	40	100	
5	IT24T21	AI and ML Learning Techniques	II	45	0	0	45	90	3	40	60	100	
6	IT24T22	Advanced Algorithm	II	45	0	0	45	90	3	40	60	100	
7	IT24T23	Soft Computing	II	45	0	0	45	90	3	40	60	100	
8	IT24T24	Full Stack Web Application Development	II	45	0	0	45	90	3	40	60	100	
9	IT24P21	AI and ML Learning Techniques Laboratory	II	0	0	60	0	60	2	60	40	100	

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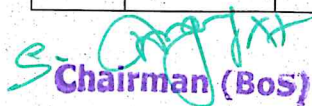
10	IT24P22	Advanced Algorithm Laboratory	II	0	0	60	0	60	2	60	40	100
11	IT24T31	Advanced Computer Networks	III	45	0	0	45	90	3	40	60	100
12	IT24T32	Cloud Computing Technologies	III	45	0	0	45	90	3	40	60	100
TOTAL				360	0	240	360	960	32	-	-	-

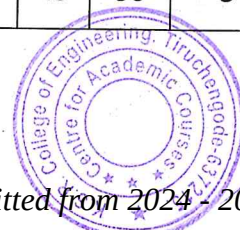
PROFESSIONAL ELECTIVE COURSES (PEC)**PROFESSIONAL ELECTIVES – I and II (SEMESTER – I)**

1	IT24E01	Advanced Computer Architecture	I	45	0	0	45	90	3	40	60	100
2	IT24E02	Ad-Hoc and Sensor Networks	I	45	0	0	45	90	3	40	60	100
3	IT24E03	Computer Vision	I	45	0	0	45	90	3	40	60	100
4	IT24E04	Data Science	I	45	0	0	45	90	3	40	60	100
5	IT24E05	Scientific Computing	I	45	0	0	45	90	3	40	60	100
6	IT24E06	Digital Image Processing	I	45	0	0	45	90	3	40	60	100
7	IT24E07	XML and Web Services	I	45	0	0	45	90	3	40	60	100
8	IT24E08	Distributed Systems	I	45	0	0	45	90	3	40	60	100
9	IT24E09	Multimedia Communications	I	45	0	0	45	90	3	40	60	100
10	IT24E10	Information Retrieval Techniques	I	45	0	0	45	90	3	40	60	100

PROFESSIONAL ELECTIVES – III and IV (SEMESTER – II)

1	IT24E11	Data Warehousing and Data Mining	II	45	0	0	45	90	3	40	60	100
2	IT24E12	Network Management System	II	45	0	0	45	90	3	40	60	100
3	IT24E13	Object Oriented Programming in Python	II	45	0	0	45	90	3	40	60	100
4	IT24E14	Quantum Computing	II	45	0	0	45	90	3	40	60	100
5	IT24E15	Block chain Technology and Applications	II	45	0	0	45	90	3	40	60	100
6	IT24E16	Digital Forensics	II	45	0	0	45	90	3	40	60	100
7	IT24E17	Social Network Analysis	II	45	0	0	45	90	3	40	60	100
8	IT24E18	Big Data and Analytics	II	45	0	0	45	90	3	40	60	100
9	IT24E19	Ontology and Semantic Web	II	45	0	0	45	90	3	40	60	100


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10	IT24E20	Augmented Reality and Virtual Reality	II	45	0	0	45	90	3	40	60	100
PROFESSIONAL ELECTIVES – V and VI (SEMESTER – III)												
1	IT24E21	Applied Cyber security Analytics and Risk Management	III	45	0	0	45	90	3	40	60	100
2	IT24E22	Deep Learning and Applications	III	45	0	0	45	90	3	40	60	100
3	IT24E23	Human Computer Interaction Techniques	III	45	0	0	45	90	3	40	60	100
4	IT24E24	AWS Cloud Solution Architecture	III	45	0	0	45	90	3	40	60	100
5	IT24E25	Internet of Things	III	45	0	0	45	90	3	40	60	100
6	IT24E26	GPU Computing	III	45	0	0	45	90	3	40	60	100
7	IT24E27	Interactive and Digital Marketing	III	45	0	0	45	90	3	40	60	100
8	IT24E28	Cognitive Science	III	45	0	0	45	90	3	40	60	100
9	IT24E29	Data Visualization	III	45	0	0	45	90	3	40	60	100
10	IT24E30	Advanced Business Analytics with R	III	45	0	0	45	90	3	40	60	100
OPEN ELECTIVE COURSES OFFERED BY THE DEPARTMENT												
1	IT24O01	IoT for Smart System	III	45	0	0	45	90	3	40	60	100
2	IT24O02	Machine Learning for Intelligent Multimedia Analytics	III	45	0	0	45	90	3	40	60	100
3	IT24O03	DevOps and Micro services	III	45	0	0	45	90	3	40	60	100
4	IT24O04	Cyber security and Digital Awareness	III	45	0	0	45	90	3	40	60	100
AUDIT COURSE (SEMESTER – III)												
1	AX24A01	Disaster Management	III	30	0	0	0	60	0	100	-	100
2	AX24A02	Value Education	III	30	0	0	0	60	0	100	-	100
3	AX24A03	Constitution of India	III	30	0	0	0	60	0	100	-	100
4	AX24A04	Indian Knowledge System	III	30	0	0	0	60	0	100	-	100

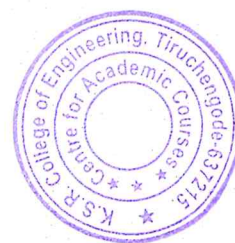

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TOTAL NUMBER OF CREDITS=76



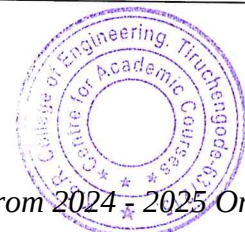
Summary						
Name of the Programme: M.Tech. - Information Technology						
CATEGORY	I	II	III	IV	TOTAL CREDITS	%
FC	3	-	-	-	3	3.94
EEC	-	2	6	-	8	10.52
RMC	3	-	-	-	3	3.94
PCC	10	16	6	-	32	42.10
PEC	6	6	6	-	18	23.68
OEC	-	-	-	12	12	15.78
AC	-	-	✓	-	-	-
Total	22	24	18	12	76	100


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MA24T16	OPERATIONS RESEARCH	Category	L	T	P	SL	C
		FC	45	0	0	45	3
SEMESTER - I (M.E. : Common to CSE, BDA and M.Tech IT)							
PREREQUISITE : For Effective learning and applying resource management technique students must have a foundational understanding of optimization technique like linear programming and integer programming, basic knowledge of network programming, Queuing model.							
OBJECTIVES : To determine the most effective way to allocate the best value of linear programming, minimize the total transportation cost and to find the optimal way to assign a set of tasks, the optimal quantity of inventory to hold the balancing between excess and shortage , analyze the basic components and behavior of queuing systems , shortest path in PERT/CPM , Network design.							
UNIT - I	LINEAR PROGRAMMING						(9)
Formation of LPP – Graphical method – Simplex method – Big M Method – Dual simplex method.							
UNIT - II	TRANSPORTATION AND ASSIGNMENT PROBLEMS						(9)
Transportation Models (Minimizing and Maximizing Problems) – Balanced and unbalanced Problems – Initial Basic feasible solution by North West Corner Rule, Least cost and Vogel’s approximation methods – Optimum solution by MODI Method –Assignment Models (Minimizing and Maximizing Problems) – Hungarian method - Balanced and Unbalanced Problems.							
UNIT - III	INVENTORY MODELS						(9)
Types of Inventory - Deterministic inventory models: Purchasing problem with no shortage and with shortages - Production problem with and without shortages - Purchase problem with price breaks - Probabilistic inventory model (excluding proof).							
UNIT - IV	QUEUEING MODELS						(9)
Characteristics of Queueing Models – Kendall’s notations - Little’s formula - (M/M/1): (∞/FIFO) Single Server with infinite capacity – (M/M/C): (∞/FIFO) Multi Server with infinite capacity - (M/M/1): (N/FIFO) Single Server with finite capacity - (M/M/C): (N/FIFO) Multi server with finite capacity .							
UNIT - V	PERT/CPM						(9)
Network Construction-Critical Path Method – Computation of earliest start time, latest start time, Total, free and independent float time-PERT Analysis – Computation of optimistic, most likely Pessimistic and expected time.							
Lecture = 45, Tutorial = 0 , Self Learning = 45 ; Total = 90 Periods							
COURSE OUTCOMES : At the end of the course, the students will be able to							
COs	Course Outcome					Cognitive Level	
CO1	Apply the concepts of linear programming approach to solve the uncertain situations.					Apply	
CO2	Analyze the transportation models and solve Assignment problems to minimize the costs.					Analyze	
CO3	Apply the inventory models using EOQ and EBQ with and without shortage.					Apply	
CO4	Analyze and interpret the key features of various queuing systems					Analyze	
CO5	Perform optimistic and pessimistic analysis using PERT/CPM networks.					Apply	

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TEXT BOOKS :

1. Taha H.A, "Operation Research", Pearson Education, Noida , 9th Edition, 2013
2. Vohra N D, "Quantitative Techniques in Management", Tata Mc Graw Hill, New Delhi, 6th Edition, 2021.

REFERENCES :

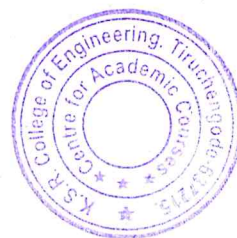
1. P.K.Gupta and Man Mohan, "Problems in Operations Research", S.Chand and Co, New Delhi, 12th Edition, 2014
2. Wayne. L. Winston, "Operations research applications and algorithms", Thomson learning, United States, 4th Edition, 2016.
3. Kalavathy S, "Operations Research", Vikas Publishing House, Ahmedabad, 6th Edition, 2019.
4. Hira and Gupta, "Problems in Operations Research", S.Chand and Co, New Delhi, 2nd Edition, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	2
CO2	3	-	2	-	2
CO3	3	-	2	-	2
CO4	3	-	2	-	2
CO5	3	-	2	-	2

1 - Low, 2 - Medium, 3- High .


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IT24T11	ADVANCED DATA STRUCTURES	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Basic Knowledge in Data Structures, Arrays ,Linked Lists, Stacks ,Queue, Tree, Hash Tables, Heap, Mathematics, Discrete Mathematics, Graph Theory, Probability and Statistics, Algorithm Analysis, Sorting and Searching Algorithms, Problem-Solving Techniques, Divide and Conquer, Greedy Algorithms, Dynamic Programming, Proficiency in a Programming Language and Dynamic Memory Management.							
OBJECTIVES: This course aims to provide a fundamental understanding of advanced data structures and their implementations using hashing, skip list and priority queues and trees. Also it covers pattern matching, text compression text processing .							
UNIT - I	HASHING					(9)	
General Idea – Hash Function – Separate Chaining – Hash Tables without linked lists: Linear Probing – Quadratic Probing – Double Hashing – Rehashing – Hash Tables in the Standard Library – Universal Hashing – Extendible Hashing.							
UNIT - II	SKIP LISTS AND PRIORITY QUEUES (HEAPS)					(9)	
Skip Lists: Need for Randomizing Data Structures and Algorithms – Search and Update Operations on Skip Lists – Probabilistic Analysis of Skip Lists – Deterministic Skip Lists – Heap: Model – Simple implementations – Binary Heap: Structure Property – Heap Order Property – Basic Heap Operations: insert, delete, and Percolate down - Other Heap Operations.							
UNIT - III	TREES					(9)	
AVL Trees – Red Black Trees: Properties of red-black trees, Rotations, Insertion, and Deletion – 2-3 Trees - Searching for an Element in a 2-3 Tree - inserting a New Element in a 2-3 Tree - Deleting an Element from a 2-3 Tree – B-Trees – Splay Tree.							
UNIT - IV	TEXT PROCESSING					(9)	
Text Processing: String Operations – Brute-Force Pattern Matching – The Boyer-Moore Algorithm – The Knuth-MorrisPratt Algorithm – Standard Tries – Compressed Tries – Suffix Tries – The Huffman Coding Algorithm – The Longest Common Subsequence Problem (LCS) – Applying Dynamic Programming to the LCS Problem.							
UNIT - V	COMPUTATIONAL GEOMETRY					(9)	
Computational Geometry: One Dimensional Range Searching – Two Dimensional Range Searching – Constructing a Priority Search Tree – Searching a Priority Search Tree – Priority Range Trees – Quad trees – k-d Trees.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

COURSE OUTCOMES:**At the end of the course, the students will be able to:**

COs	Course Outcome	Cognitive Level
CO1	Apply various hashing techniques to resolve collisions and efficiently manage key-value data in hash tables.	Apply
CO2	Develop skip lists and heap structures to perform efficient insertion, deletion, and search operations in dynamic and priority-based data management.	Apply
CO3	Construct and manipulate balanced tree structures to support efficient searching, insertion, and deletion in hierarchical data.	Apply
CO4	Develop solutions for text and string processing using algorithms for example brute-force matching, Boyer-Moore, KMP, Huffman coding, and data structures like tries and suffix trees.	Apply
CO5	Deploy geometric structures to perform spatial data searches and multidimensional range queries effectively.	Apply

REFERENCES:

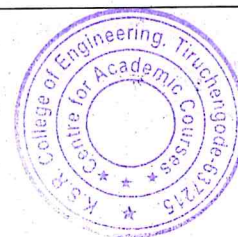
1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C++, 15th Edition, Pearson Education, 2023.
2. Thomas H Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, Introduction to Algorithms, 4th Edition, The MIT Press, 2022.
3. M T Goodrich, Roberto Tamassia, Algorithm Design and Applications, 1st edition, John Wiley, 2014.
4. Alfred V. Aho and John E. Hopcroft, Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

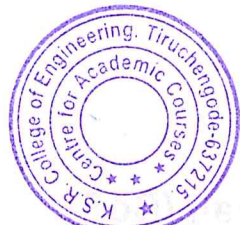
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	1
CO2	3	-	2	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

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RM24T09	RESEARCH METHODOLOGY AND IPR	Category	L	T	P	SL	C
		RMC	45	0	0	45	3
(Common to ALL)							
PREREQUISITE: Basic understanding of research methodology and general awareness of legal and innovation-related frameworks.							
OBJECTIVE: To equip learners with the knowledge and skills to design and conduct research, analyze data effectively, and understand the fundamentals of intellectual property rights and patent processes.							
UNIT - I	RESEARCH DESIGN						(9)
Overview of research process and design – Use of secondary and exploratory data to answer the research question, Qualitative research, Observation studies – Experiments and surveys.							
UNIT - II	DATA COLLECTION AND SOURCES						(9)
Measurements: Measurement scales – Questionnaires and instruments – Sampling and Methods. Data – Preparing, Exploring, Examining and Displaying.							
UNIT - III	DATA ANALYSIS AND REPORTING						(9)
Overview of multivariate analysis – Hypotheses testing and measures of association – Presenting insights and findings using written reports and oral presentation.							
UNIT - IV	INTELLECTUAL PROPERTY RIGHTS						(9)
Intellectual Property – The concept of IPR, Evolution and development of the concept of IPR, IPR development process, Trade secrets, Utility models, IPR & Biodiversity, 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.							
UNIT - V	PATENTS						(9)
Patents – objectives and benefits of patent – Concept, features of patent, Inventive step, Specification – Types of patent application, process E-filing – Examination of patent – Grant of patent, Revocation, Equitable Assignments. Licenses – Licensing of related patents – Patent agents – Registration of patent agents.							
LECTURE: 45, SELF LEARNING: 45, TOTAL: 90 PERIODS							
 Chairman (BoS) 							

COURSE OUTCOMES:					
At the end of the course, the students will be able to:					
COs	Course Outcome	Cognitive Level			
CO1	Develop a suitable research process to solve real-time problems.	Apply			
CO2	Apply appropriate methods to collect qualitative and quantitative data for analysis.	Apply			
CO3	Apply appropriate statistical tools to analyze data and solve research problems.	Apply			
CO4	Describe the types and features of intellectual property and its role in IPR establishment.	Understand			
CO5	Illustrate the patent procedures, E-filing, register of patents, and licensing of patents.	Understand			
TEXT BOOKS:					
1	Cooper Donald, R., Schindler Pamela, S., and Sharma, J.K., "Business Research Methods", Tata McGraw Hill Education, Eleventh Edition, 2012.				
2	Catherine J. Holland, Intellectual Property: Patents, Trademarks, Copyrights, Trade Secrets, Entrepreneur Press, 2007.				
REFERENCES:					
1	David Hunt, Long Nguyen, Matthew Rodgers, Patent Searching: Tools & Techniques, Wiley, 2007.				
2	The Institute of Company Secretaries of India, Statutory body under an Act of Parliament, Professional Programme Intellectual Property Rights, Law and Practice, September 2013.				
Mapping of COs with POs and PSOs					
COs/ POs	PO 1	PO 2	PO 3	PO 4	PO 5
CO1	3	3	-	-	3
CO2	3	3	-	-	3
CO3	3	3	-	-	3
CO4	3	3	-	-	3
CO5	3	3	-	-	3
1 - Low, 2 - Medium, 3 - High					


Chairman (BoS)



IT24T12	SOFTWARE ENGINEERING METHODOLOGIES	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE:							
Prerequisites for Software Engineering Methodologies include basic programming skills, knowledge of the software development life cycle							
OBJECTIVES:							
To provide students with a comprehensive understanding of software engineering principles, methodologies, and practices. It aims to familiarize learners with various software process models, including generic, prescriptive, and agile development approaches such as Extreme Programming, Scrum, and the Dynamic Systems Development Method.							
UNIT - I	INTRODUCTION						(9)
Software Engineering - Software Process - Generic process model – Prescriptive Process models - Agile development-Agile Process- Extreme Programming - Other Agile process models: Adaptive process models ,Scrum, Dynamic - Systems Development Method .							
UNIT - II	REQUIREMENT ANALYSIS						(9)
Functional and Non-Functional Requirements - User Requirements - System Requirements - Interface Specifications - Software Requirements Document - Requirements Engineering Processes - Feasibility Studies- Elicitation and Analysis - Validations - Management - System Models – Context - Behavioral - Data - Object - Structured.							
UNIT - III	OBJECT ORIENTED METHODOLOGIES						(9)
Rumbaugh Methodology - Booch Methodology - Jacobson Methodology - Patterns - Frameworks - Unified Approach - Unified Modeling Language - Use Case - Class Diagram - Interactive Diagram - Package Diagram - Collaboration Diagram-State Diagram - Activity Diagram.							
UNIT - IV	OBJECT ORIENTED ANALYSIS AND DESIGN						(9)
Identifying Use Cases - Object Analysis – Classification - Identifying Object Relationships - Attributes and Methods - Design Axioms - Designing Classes - Access Layer - Object Storage –View Layer .							
UNIT - V	SOFTWARE TESTING AND SOFTWARE QUALITY ASSURANCE						(9)
Software Testing Fundamentals - Test Case Design - White Box - Black Box - Testing for Specialized Environments, Architectures and Applications - Software Testing Strategies - Approach – Issues – Testing - Unit - Integration - Validation System - Art of Debugging. Software Quality Concepts - Quality Assurance - Software Technical Reviews - Formal Approach to Software Quality Assurance - Reliability - Quality Standards - Software Quality Assurance Plan - Software Maintenance - Software Configuration Management -SCM Standards.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							



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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Implement different software development life cycle models including prescriptive and agile methodologies to manage and execute software projects effectively.	Apply
CO2	Demonstrate the process of gathering, documenting, and validating functional and non-functional requirements using system models and structured analysis techniques.	Apply
CO3	Develop object-oriented methodologies and construct UML diagrams to represent software system structures and behaviours.	Apply
CO4	Construct object-oriented design models by identifying use cases, class relationships, attributes, and methods to support modular and reusable software architecture.	Apply
CO5	Apply testing techniques and quality assurance strategies to verify software functionality, ensure reliability, and manage configuration and maintenance activities.	Apply

REFERENCES:

1. Roger S Pressman, "Software Engineering – A Practitioner's Approach", 7th edition, McGraw Hill Education, 2014.
2. Ian Sommer ville, "Software engineering", Seventh Edition, Pearson Education Asia.
3. Wiegers, Karl, Joy Beatty, "Software requirements", Pearson Education, 2013.
4. Pankaj Jalote, - Software Engineering, A Precise Approach, Wiley India, 2010.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

Chairman (BoS)

IT24P11	ADVANCED DATA STRUCTURES LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	60	0	2
PREREQUISITE: Basic knowledge of data structures and algorithms, including trees, graphs, and recursion. Proficiency in a programming language such as C++, Java, or Python is required.							
OBJECTIVES: Students will learn to analyze and evaluate the time and space complexity associated with various data structures, enabling them to choose the most efficient solutions for different problems. The course aims to strengthen problem-solving skills by applying appropriate data structures to real-world challenges. In addition, it focuses on enhancing students coding and implementation abilities, including debugging and testing techniques.							
List of Exercise/Experiments: Implementation of 1. Depth-First Search (DFS) and Breadth-First Search (BFS). 2. Dijkstra’s Algorithm for shortest paths in weighted graphs. 3. Floyd-Warshall Algorithm for all-pairs shortest paths. 4. Minimum Spanning Tree using Prim’s algorithms. 5. Randomized quick sort algorithm. 6. Hash functions and associated algorithms. 7. Splay trees and its functions. 8. Find the solution for the knapsack problem using the greedy method. 9. Operations on Fibonacci heaps. 10. Operations on binary heaps. 11. Operations on B-Trees. 12. N Queen's problem using Back Tracking algorithm 0-1 knapsack problem using dynamic programming. 13. Single source shortest path for a given graph. 14. Find minimum cost spanning tree using Kruskal’s algorithm.							
L= 0, T=0, P=60, SL=0, TOTAL: 60 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Implement List ADTs and their operations.	Apply					
CO2	Develop programs for sorting, hash functions	Apply					
CO3	Apply Greedy, divide and conquer algorithms	Apply					
CO4	Apply dynamic programming concept in real time problems	Apply					
CO5	Analyze and Apply various advanced data structures algorithms in real time applications	Apply					

S. Gangaiah

Chairman (BoS)



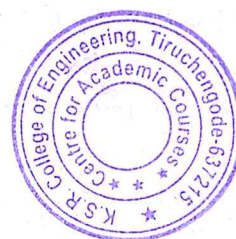
REFERENCES:

1. Thomas H. Cormen, Charles E "Introduction to Algorithms" 3rd Edition, MIT Press, 2009
2. Steven S. Skiena "The Algorithm Design Manual" 2nd Edition, Springer, 2008.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	1	2
CO2	3	-	2	1	2
CO3	3	-	2	1	2
CO4	3	-	2	1	2
CO5	3	-	2	1	2

1-low, 2-medium, 3-high


Chairman (BoS)

IT24P12	XML AND WEB SERVICES LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	60	0	2
PREREQUISITE:							
A Basic knowledge in programming languages Java, Python, or C#.Familiarity with Integrated Development Environments (IDEs) like Eclipse, IntelliJ, or Visual Studio.							
OBJECTIVES:							
This course aims to equip students with the skills to design and develop dynamic, data-driven web applications. Students will learn to create well-structured HTML pages enhanced with CSS for styling and JavaScript for client-side interactivity, including form validation and date handling. The course covers server-side programming using ASP/JSP and Servlets, enabling learners to build robust online applications that manage sessions, cookies, and database connectivity.							
List of Exercise/Experiments:							
1. Creation of HTML pages with frames links, tables and other tags 2. Usage of internal and external CSS along with HTML pages 3. Client side Programming i) JavaScript for displaying date and comparing two dates ii) Form Validation including text field, radio buttons, check boxes, list box and other controls. 4. Usage of ASP/JSP objects Response, Request, Application, Session, Server, ADO etc i) Writing online applications such as shopping, railway/air/bus ticket reservation system with set of ASP/JSP pages ii) Using sessions and cookies as part of the web application 5. Writing Servlet Program using HTTP Servlet 6. Any online application with database access 7. Creation of XML document for a specific domain 8. Writing DTD or XML schema for the domain specific XML document 9. Parsing an XML document using DOM and SAX Parsers 10. Connect an Xml web page to any database engine.							
L= 0, T=0, P=60, SL=0, TOTAL: 60 PERIODS							


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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Design and develop static web pages using HTML elements such as frames, links, tables, and other tags.	Apply
CO2	Apply internal and external CSS styles to enhance the layout and presentation of web pages.	Apply
CO3	Develop dynamic web applications using server-side scripting with ASP/JSP, utilizing objects such as Response, Request, Session, and Application.	Apply
CO4	Build interactive online applications (e.g., shopping cart or ticket booking system) using ASP/JSP with session handling and cookies.	Apply
CO5	Connect XML-based web pages with database systems to enable dynamic data-driven content.	Apply

REFERENCES:

1. Schmelzer, XML and Web Services Unleashed, Pearson India, January 2008.
2. Claudia Zentner , Dieter Koenig , Doug Davis , Glen Daniels , Building Web Services with Java: Making Sense of XML, SOAP, WSDL, and UDDI, Sams Publishing, June 2004.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	1	2
CO2	3	-	2	1	2
CO3	3	-	2	1	2
CO4	3	-	2	1	2
CO5	3	-	2	1	2

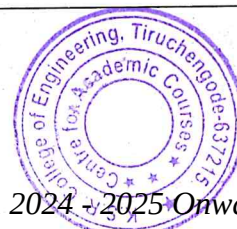
1-low, 2-medium, 3-high

S. Gargax
Chairman (BoS)



IT24T21	AI and ML LEARNING TECHNIQUES	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Proficiency in programming languages like Python and familiarity with libraries NumPy, Pandas, TensorFlow, and Scikit-learn are essential for implementation. Basic knowledge of machine learning concepts supervised and unsupervised learning, as well as algorithms like linear regression and clustering, is crucial.							
OBJECTIVES: This course aims to provide a foundational understanding of Artificial Intelligence (AI) and Machine Learning (ML), covering their historical evolution and key applications across various domains. Students will learn essential mathematical concepts including linear algebra, probability theory, and calculus needed for AI/ML algorithms.							
UNIT - I	FOUNDATIONS OF AI AND MACHINE LEARNING					(9)	
Introduction to AI and ML - Historical perspective and evolution - Key applications in various domains - Basic linear algebra: Vectors, matrices - Probability theory: Bayes' theorem- Basic calculus: Derivatives and integrals.							
UNIT - II	SUPERVISED LEARNING TECHNIQUES					(9)	
Introduction to Supervised Learning - Supervised vs. unsupervised learning - Basic terminology: Training, testing, validation - Linear regression - Logistic regression - k-Nearest Neighbors - Decision Trees and Random Forests - Support Vector Machines.							
UNIT - III	UNSUPERVISED LEARNING TECHNIQUES					(9)	
Clustering - k-Means clustering - Hierarchical clustering - Dimensionality Reduction - Principal Component Analysis - Applications of Principal Component Analysis in data visualization.							
UNIT - IV	NEURAL NETWORKS AND DEEP LEARNING					(9)	
Basic concepts of neural networks - perceptrons and multi layer perceptrons - Introduction to CNNs - Convolution and pooling operations - Data preprocessing and feature engineering - Model selection and hyper parameter tuning - Cross validation.							
UNIT - V	ADVANCED TOPICS AND ETHICAL CONSIDERATIONS					(9)	
Model Deployment and Monitoring - Saving and loading models - Model deployment basics - Ethics and Fairness in AI - Ethical implications of AI - Bias in machine learning algorithms.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							


Chairman (BoS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Apply foundational mathematical concepts and implement basic AI and ML techniques across real-world domains.	Apply
CO2	Implement supervised learning to solve classification and regression problems.	Apply
CO3	Prepare unsupervised learning techniques like k-means, hierarchical clustering, and principal component analysis to discover patterns and reduce dimensionality in data.	Apply
CO4	Construct and train neural network models including perceptrons and convolutional neural networks (CNNs), using feature engineering and hyper parameter tuning strategies.	Apply
CO5	Demonstrate the ability to deploy machine learning models while recognizing and addressing ethical concerns, such as bias and fairness in AI systems.	Apply

REFERENCES:

1. Stuart Russell and Peter Norvig , Artificial Intelligence: A Modern Approach" ,2024.
2. Christopher Bishop, "Pattern Recognition and Machine Learning", 2016.
3. Marc Peter Deisenroth, Mathematics for Machine Learning", 2020.
4. Good fellow, Yoshua Bengio, and Aaron Courville , "Deep Learning", 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	2
CO2	3	-	2	-	2
CO3	3	-	2	-	2
CO4	3	-	2	-	2
CO5	3	-	2	-	2

1-low, 2-medium, 3-high

S. Arjun
Chairman (BoS)



IT24T22	ADVANCED ALGORITHM	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Basic knowledge in data structure and algorithm concepts dynamic programming, tree traversal, string manipulation and string handling algorithms.							
OBJECTIVES: This course aims to provide an understanding of fundamental and advanced algorithms concepts and their implementations using dynamic programming, basic search and traversal, network flow theory, string matching, approximation and probabilistic and randomized algorithms.							
UNIT - I	OVERVIEW						(9)
Overview of Divide and Conquer - Greedy and Dynamic Programming strategies - Basic search and traversal techniques for graphs – Backtracking - Branch and Bound.							
UNIT - II	FLOWS IN NETWORK						(9)
Basic Concepts – Maxflow mincut theorem – Ford and Fulkerson augmenting path Method – integral flow theorem – maximum capacity augmentation - Edmond Karp method – Dinic’s method and its analysis - Strassen's algorithm.							
UNIT - III	STRING MATCHING ALGORITHM						(9)
Introduction to string-matching problem - Naïve or Brute force algorithm - String matching with finite automata - Rabin Karp algorithm - Knuth Morris Pratt Algorithm – BoyerMoore algorithms - Longest Common Substring/Subsequence - Shortest Common Superstring - Bipartite Matching - complexity analysis.							
UNIT - IV	APPROXIMATION ALGORITHMS						(9)
Introduction - Combinatorial Optimization - approximation factor - PTAS, FPTAS - Approximation algorithms for vertex cover, set cover, TSP, knapsack, bin packing, subset-sum problem - Analysis of the expected time complexity of the algorithms - Theory of NP- Hard and NP-Complete Problems.							
UNIT - V	PROBABILISTIC AND RANDOMIZED ALGORITHMS						(9)
Numerical probabilistic algorithms - Las Vegas and Monte Carlo algorithms – Randomized algorithm - Game-theoretic techniques - Circuit Satisfiability Problem - Approximation Algorithms - Randomized Algorithms - Multithreaded Algorithms - Parallel Algorithms - Amortized Analysis and Its Applications.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargax
Chairman (BoS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Implement divide and conquer, greedy, dynamic programming, backtracking, and branch-and-bound strategies to solve computational problems.	Apply
CO2	Implement network flow algorithms including Ford-Fulkerson, Edmond-Karp, and Dinic's methods to solve maximum flow problems.	Apply
CO3	Develop string matching solutions using algorithms like Rabin-Karp, KMP, and Boyer-Moore, and apply techniques for longest common subsequence, shortest common superstring, and bipartite matching.	Apply
CO4	Apply approximation techniques and heuristics to solve combinatorial optimization problems for vertex cover, set cover, TSP, and knapsack with known approximation bounds.	Apply
CO5	Deploy probabilistic, randomized, and parallel algorithm techniques including Las Vegas and Monte Carlo methods to solve problems like SAT, subset-sum, and bin packing with improved efficiency.	Apply

REFERENCES:

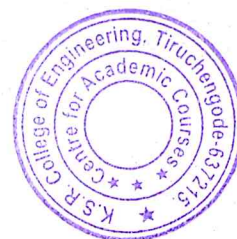
1. Ellis Horowitz, Sartaj Sahni, and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, University Press, 2018.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", 4th Edition, MIT Press, 2022.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Srinivasan
Chairman (BoS)



IT24T23	SOFT COMPUTING	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: A basic mathematics, particularly in areas like linear algebra, probability, and calculus, as these are essential for understanding algorithms in soft computing. Additionally knowledge in artificial intelligence (AI), neural networks, and optimization methods, including genetic algorithms and fuzzy logic.							
OBJECTIVES: This course aims to provide an understanding of the evolution of computing from conventional AI to modern computational intelligence techniques. It focuses on fuzzy logic, neural networks, and genetic algorithms, enabling students to apply these soft computing methods to real-world problems using tools like MATLAB or Python.							
UNIT - I	INTRODUCTION TO SOFT COMPUTING AND NEURAL NETWORKS					(9)	
Evolution of Computing: Soft Computing Constituents – From Conventional AI to Computational Intelligence: Machine Learning Basics.							
UNIT - II	FUZZY LOGIC					(9)	
Fuzzy Sets– Operations on Fuzzy Sets – Fuzzy Relations – Membership – Functions: Fuzzy Rules and Fuzzy Reasoning – Fuzzy Inference Systems – Fuzzy Expert Systems – Fuzzy Decision Making.							
UNIT - III	NEURAL NETWORKS					(9)	
Machine Learning Using Neural Network – Adaptive Networks – Feed forward Networks – Supervised Learning Neural Networks – Radial Basis Function Networks: Reinforcement Learning – Unsupervised Learning Neural – Networks – Adaptive Resonance architectures – Advances in Neural networks.							
UNIT - IV	GENETICAL ALGORITHM					(9)	
Introduction to Genetic Algorithms (GA) – Applications of GA in Machine Learning: Machine Learning Approach to Knowledge acquisition.							
UNIT - V	MATLAB/PYTHON LIB					(9)	
Introduction to Matlab / Python – Arrays and array operations – Functions and Files – Study of neural network toolbox and fuzzy logic toolbox – Simple implementation of Artificial Neural Network and Fuzzy Logic – Recent Trends in deep learning – various classifiers – Neural networks and genetic algorithm – Implementation of recently proposed soft computing techniques.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							



Chairman (BoS)


COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss soft computing techniques and their roles in overcoming the limitations of conventional AI, leading to advancements in computational intelligence.	Understand
CO2	Assess fuzzy logic and reasoning techniques to handle uncertainty and solve engineering problems, enhancing decision-making in complex environments.	Analyze
CO3	Apply neural network architectures feed forward, RBF, and adaptive networks to solve real-world problems using advanced neural computing techniques.	Apply
CO4	Demonstrate the genetic algorithms to machine learning tasks and utilize them for effective knowledge acquisition and problem-solving.	Apply
CO5	Implement fuzzy logic systems using MATLAB for decision-making in uncertain environments and use neural network toolboxes to solve classification problems.	Apply

REFERENCES:

1. Jyh Shing Roger Jang, Chuen Tsai Sun, Eiji Mizutani, Neuro:Fuzzy and Soft Computing, 2nd Edition, Prentice Hall of India, 2019.
2. George J. Klir and Bo Yuan, Fuzzy Sets and Fuzzy Logic: Theory and Applications, 4th Edition, Prentice Hall, 2015.
3. Prof. Prasun Chakraborty Kuntal Bara, Fundamentals of Soft Computing, BpB publication, January 2017.
4. Samir Roy, Soft Computing: Neuro-Fuzzy and Genetic Algorithms, Pearson publication, January 2013.

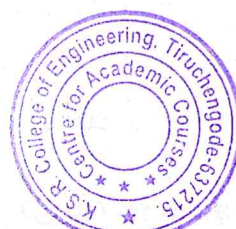
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gargi X+

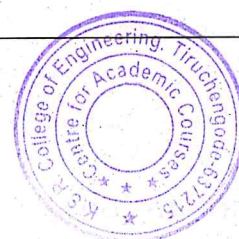
Chairman (BoS)



IT24T24	FULL STACK WEB APPLICATION DEVELOPMENT	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Students should have a foundational understanding of web development concepts, including the distinction between server-side and client-side web applications. Exposure to Object-Oriented Programming (OOP) concepts (e.g., classes, inheritance, interfaces, and generics) is beneficial, as these are integral to Type Script.							
OBJECTIVES: This course introduces full-stack web development using Type Script, Angular, Node.js, Express.js, and MongoDB. It enables students to build dynamic web applications with client-side and server-side integration, RESTful APIs, and NoSQL databases. Emphasis is placed on modern web technologies, asynchronous programming, and scalable application design.							
UNIT - I	FUNDAMENTALS & TYPESCRIPT LANGUAGE						(9)
Server-Side Web Applications - Client-Side Web Applications - Single Page Application - About TypeScript - Creating TypeScript Projects - TypeScript Data Types – Variables- Expression and Operators - Functions - OOP in Typescript – Interfaces - Generics. Modules – Enums – Decorators – Enums – Iterators - Generators.							
UNIT - II	ANGULAR						(9)
About Angular. Angular CLI - Creating an Angular Project – Components: Components Interaction - Dynamic Components - Angular Elements - Angular Forms - Template Driven Forms - Property, Style, Class and Event Binding - Two way Bindings - Reactive Forms - Form Group - Form Controls - About Angular Router: Router Configuration - Router State - Navigation Pages - Router Link - Query Parameters - URL matching - Matching Strategies – Services -Dependency Injection – HttpClient - Read Data from the Server - CRUD Operations - Http Header Operations - Intercepting requests and responses.							
UNIT - III	NODE.Js						(9)
Node.js Configuring - Node.js environment - Node Package Manager NPM – Modules - Asynchronous Programming - Call Stack and Event Loop - Callback functions - Callback errors - Abstracting callbacks - Chaining callbacks - File System - Synchronous vs. asynchronous I/O - Path and directory operations - File Handle - File Synchronous API - File Asynchronous API - File Callback API - Timers. - Scheduling Timers - Timers Promises API - Node.js Events - Event Emitter - Event Target and Event API – Buffers: Buffers and Typed Arrays - Buffers and iteration - Using buffers for binary data - Flowing vs. non-flowing streams. JSON.							
UNIT - IV	EXPRESS.Js						(9)
Express.js: How Express.js Works - Configuring Express.js - App Settings - Defining Routes - Starting the App - Express.js Application Structure– Configuration – Settings – Middleware - body-parser - cookie-parser - express-session - response-time - Template Engine Jade EJS. Parameters – Routing – router -route(path) - Router Class - Request Object - Response Object - Error Handling - RESTful.							

UNIT - V	MONGODB	(9)			
Introduction to MongoDB – Documents – Collections – Subcollections – Database - Data Types – Dates – Arrays - Embedded Documents - CRUD Operations - Batch Insert - Insert Validation - Querying The Documents – Cursors. Indexing - Unique Indexes -Sparse Indexes - Special Index and Collection Types - Full-Text Indexes - Geospatial Indexing - Aggregation framework.					
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS					
COURSE OUTCOMES: At the end of the course, the students will be able to:					
COs	Course Outcome	Cognitive Level			
CO1	Implement basic and advanced features of TypeScript to develop structured, object-oriented, and modular web applications.	Apply			
CO2	Construct Angular CLI to create projects, implement component-based architecture, manage forms, configure routing.	Apply			
CO3	Apply Node.js to build server-side applications by working with modules, asynchronous programming, file handling, events, buffers, and streams.	Apply			
CO4	Develop server-side web applications using Express.js by configuring routes, middleware, template engines, and handling HTTP requests, responses, and RESTful APIs.	Apply			
CO5	Implement database operations in MongoDB including CRUD, indexing, document querying, and aggregation for efficient data management in web applications.	Apply			
REFERENCES: 1. Adam Freeman, Essential TypeScript, Apress, 2019. 2. Mark Clow, Angular Projects, Apress, 2018. 3. Alex R. Young and Marc Harter, Node.js in Practice, Manning Publications, 2014. 4. Azat Mardan, Pro Express.js, Apress, 2015. 5. Kyle Banker, Peter Bakkum, Shaun Verch, Douglas Garrett, and Tim Hawkins, MongoDB in Action, 2nd Edition, Manning Publications, 2016.					
Mapping of COs with POs and PSOs					
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	2
CO2	3	-	2	-	2
CO3	3	-	2	-	2
CO4	3	-	2	-	2
CO5	3	-	2	-	2
1-low, 2-medium, 3-high					

S. Arjun
Chairman (BO3)



IT24P21	AI and ML LEARNING TECHNIQUES LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	60	0	2
PREREQUISITE: Mathematics and Statistics, Linear Algebra, Calculus, Probability and Statistics, Programming Skills, Libraries and Frameworks, Code Debugging and Optimization, Basic Machine Learning Concepts, Supervised Learning, Unsupervised Learning, Model Evaluation, Data Preprocessing and Feature Engineering , Data Cleaning, Feature Scaling and Transformation, Feature Selection, Artificial Intelligence Fundamentals, concepts of Neural Networks.							
OBJECTIVES: In this course Students will gain hands-on experience using AI and ML tools and algorithms, prepare datasets for analysis, and understand the applications of AI and ML techniques. They will also explore advanced machine learning methods to solve complex problems.							
List of Exercise/Experiments: 1. Perform data manipulation using NumPy and Pandas and, data visualization using matplotlib. 2. Implement Naive Bayes classification and predict the class label for a given data. 3. Implement linear models to approximate the given data. 4. Implement multi-layer perceptron algorithm for the specified data. 5. Implement KNN algorithm for the specified data. 6. Implement SVM algorithm for the given data. 7. Implement the concept of decision tree with suitable dataset. 8. Implement K-means clustering algorithm for the given data and visualize and interpret the result. 9. Implement genetic operators and Q-learning for the given data. 10. Build a supervised model / unsupervised model using appropriate dataset in cloud framework.							
L= 0, T=0, P=60, SL=0, TOTAL: 60 PERIODS							

S. Ananth
Chairman (BoS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Apply probabilistic based and supervised learning algorithms to analyze and solve classification problems with given data.	Apply
CO2	Analyze the architecture and working mechanism of the multilayer perceptron algorithm on provided datasets.	Analyze
CO3	Develop and implement K-NN and SVM algorithms to classify data and evaluate their performance.	Apply
CO4	Analyze and compare the practical applications and decision making scenarios for decision trees and K-means clustering algorithms.	Analyze
CO5	Create and deploy machine learning models on cloud platforms to solve real-world problems using appropriate frameworks.	Create

REFERENCES:

1. Russell/Norvig, Artificial Intelligence: A Modern Approach, Pearson Education, May 2022.
2. Vinod chandra S.S, Anand hareendran S., Artificial Intelligence and Machine Learning, PHI learning, March 2014.

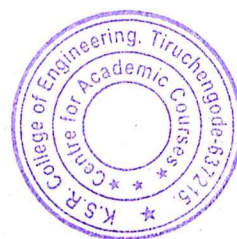
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	1	1
CO2	3	-	1	-	1
CO3	3	-	2	1	1
CO4	3	-	1	-	1
CO5	3	-	1	-	1

1-low, 2-medium, 3-high

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IT24P22	ADVANCED ALGORITHM LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	60	0	2

PREREQUISITE

The students should have the Knowledge on basic algorithmic concepts, including searching and sorting algorithms, and their time and space complexities and should be Familiar with basic graph concepts including types of graphs (directed, undirected, weighted, unweighted), graph traversal methods, and properties.

OBJECTIVES:

In this course students will implement and evaluate graph, searching, and sorting algorithms, including DFS, BFS, binary search, quicksort, and more. They will also explore optimization and heuristic techniques while analyzing algorithm efficiency and practical use cases.

List of Exercise/Experiments:

1. Implement the Bellman-Ford algorithm to find the shortest paths from a single source to all vertices in a graph with potentially negative edge weights. Test your implementation with graphs that contain negative weight cycles.
2. Implement Dijkstra's algorithm to find the shortest paths from a single source to all other vertices in a graph with non-negative edge weights. Compare its performance with Bellman-Ford on different types of graphs.
3. Implement Prim's algorithm to find the minimum spanning tree of a weighted, undirected graph. Visualize the resulting minimum spanning tree and compare it with the output of Kruskal's algorithm if implemented.
4. Implement Warshall's algorithm to compute the transitive closure of a directed graph. Verify the results by comparing with the adjacency matrix of the original graph.
5. Implement the Monte Carlo algorithm to estimate the value of π or solve an optimization problem (e.g., finding the approximate solution to a large-scale optimization problem). Analyze the accuracy and performance of your implementation.
6. Develop a menu-driven program that allows users to choose from various searching algorithms (e.g., binary search, interpolation search) and apply them to search in different types of data structures (arrays, linked lists).
7. Implement and compare various sorting algorithms (e.g., quicksort, mergesort, heapsort) for different datasets. Measure their performance and analyze the results based on time complexity and space complexity.
8. Implement a solver for linear modular equations of the form $ax \equiv b \pmod{m}$. Test your implementation with various equations and modulus values, and verify correctness using different input scenarios.
9. Create a menu-driven program to perform Depth-First Search (DFS) and Breadth-First Search (BFS) on a graph. Allow users to input the graph, choose the traversal algorithm, and visualize the traversal order.
10. Implement the Euclidean algorithm to compute the greatest common divisor (GCD) of two integers. Extend the implementation to handle multiple integers and verify its correctness.

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Chairman (BOS)

with different test cases.

11. Implement algorithms such as Johnson's algorithm for finding all pairs shortest paths or the Edmonds-Karp algorithm for solving the maximum flow problem.
12. Implement and experiment with advanced data structures such as AVL trees, Red-Black trees, or B-trees, and evaluate their performance in various scenarios.
13. Implement advanced string matching algorithms like the Knuth-Morris-Pratt (KMP) algorithm or the Boyer-Moore algorithm and compare their performance with naive string matching approaches

L= 0, T=0, P=60, SL=0, TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Demonstrate and implement the Bellman-Ford algorithm to find shortest paths in weighted graphs.	Apply
CO2	Apply linear modulo operations to design efficient algorithms for computational problems.	Apply
CO3	Construct and implement Dijkstra's algorithm for computing the shortest path in graphs.	Apply
CO4	Design and develop various sorting algorithms to organize data effectively.	Apply
CO5	Analyze and illustrate the working of different searching algorithms for efficient data retrieval.	Apply

REFERENCES:

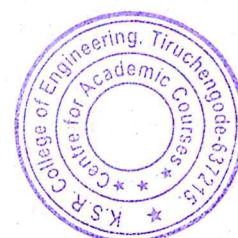
1. <https://www.khanacademy.org/computing/computer-science/algorithms>
2. <https://www.coursera.org/specializations/algorithms>

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	1	1
CO2	3	-	2	1	1
CO3	3	-	2	1	1
CO4	3	-	2	1	1
CO5	3	-	2	1	1

1-low, 2-medium, 3-high

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IT24P23	MINI PROJECT WITH SEMINAR	Category	L	T	P	SL	C
		PCC	0	0	60	0	2
PREREQUISITE: Students should start by conducting thorough research on their chosen topic, reviewing recent journals and conference papers. They must select their topic with guidance from faculty to ensure relevance. Additionally, students need to develop strong presentation skills to clearly and effectively communicate their findings, using appropriate visual aids.							
OBJECTIVES: In this course students will identify core research knowledge, explore project opportunities, and integrate acquired skills into practical implementations. They will write technical papers, create video pitches, and present their projects for feedback and improvement.							
<u>Guidelines:</u> 1. Students will engage in mutual discussions with faculty to select a specific area within personal finance management for their project. 2. Throughout the project duration, students will deliver weekly seminars on their chosen topic, sharing progress updates, insights gained from research, and challenges encountered. 3. One week before the final presentation, students will submit a comprehensive technical report to the corresponding faculty member. 4. The report should be between 30 to 50 pages in length and encompass project objectives, methodology, implementation details, results, and future recommendations. 5. References to recent journals, conference proceedings, and other scholarly sources must be cited appropriately to support the project findings. 6. The final presentation will serve as a culmination of the project, where students will showcase the developed personal budgeting application and present key findings from their research. 7. A Q&A session will follow the final presentation, allowing faculty and peers to engage with the student presenters, ask questions, and provide feedback. 8. The students should have published their project paper in journals or conference. 9. The student has to submit a technical report having 30 - 50 pages to the corresponding faculty one week before the final presentation.							
L=0, T=0, P=60, SL=0, TOTAL: 60 PERIODS							

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COURSE OUTCOMES:**At the end of the course, the students will be able to:**

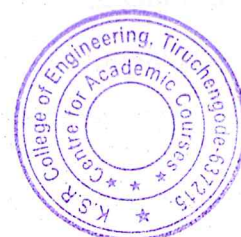
COs	Course Outcome	Cognitive Level
CO1	Employ various technical resources available from multiple fields.	Apply
CO2	Analyze the importance of intonation, word and sentence stress for improving communicative.	Analyze
CO3	Identify and overcome problem sounds.	Apply
CO4	Demonstrate technical knowledge to enhance leadership skills.	Apply
CO5	Build report and present oral demonstrations.	Create

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	-	-	-
CO2	3	3	-	-	-
CO3	3	3	-	-	-
CO4	3	3	-	-	-
CO5	3	3	-	-	-

1-low, 2-medium, 3-high

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IT24T31	ADVANCED COMPUTER NETWORKS	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Students should have a basic understanding of computer networks, including knowledge of network models (like the OSI model), IP addressing, and network devices. Familiarity with data communication concepts and fundamental programming skills.							
OBJECTIVES: This course aims to provide a comprehensive understanding of modern networking concepts, including wired and wireless communication, network devices, and protocols. It covers wireless technologies from 4G to 6G, software-defined networking (SDN), and network function virtualization (NFV). Students will gain insight into network architectures, virtualization, and simulation of network services using emerging technologies.							
UNIT - I	NETWORKING IDEAS						(9)
Peer To Peer Vs Client-Server Networks - Network Devices - Network Terminology - Network Speeds - Network throughput – delay - OSI Model – Packets – Frames and Headers - Collision and Broadcast Domains - LAN Vs WAN - Network Adapter - Hub. Switch. Router. Firewall - IP addressing.							
UNIT – II	WIRELESS NETWORKS						(9)
Wireless access techniques - IEEE 802.11a - 802.11g - 802.11e - 802.11n/ac/ax/ay/ba/be - QoS – Bluetooth – Protocol Stack – Security – Profiles – zigbee.							
UNIT - III	GENERATION OF WIRELESS NETWORKS						(9)
4G Networks and Composite Radio Environment – Protocol Boosters – Hybrid 4G Wireless Networks Protocols – Green Wireless Networks – Physical Layer and Multiple Access – Channel Modeling for 4G – Concepts of 5G – channel access – air interface - Cognitive Radio spectrum management – C-RAN architecture - Vehicular communications protocol – Network slicing – MIMO - mmWave - Introduction to 6G.							
UNIT - IV	SOFTWARE DEFINE NETWORKS						(9)
SDN Architecture. Characteristics of Software - Defined Networking - SDN and NFV Related Standards - SDN Data Plane - Data Plane Functions - Data Plane Protocols – Open Flow Logical Network Device - Flow Table Structure - Flow Table Pipeline - The Use of Multiple Tables - Group Table – Open Flow Protocol - SDN Control Plane Architecture - Control Plane Functions - Southbound Interface - Northbound Interface – Routing - ITU-T Model – Open Daylight- Open Daylight Architecture – Open Daylight Helium - SDN Application Plane Architecture - Northbound Interface.							
UNIT - V	NETWORK SERVICE SIMULATION						(9)
Motivation Virtual Machines – NFV benefits requirements – architecture - NFV Infrastructure - Virtualized Network Functions - NFV Management and Orchestration - NFV Use Cases - NFV and SDN – Network virtualization – VLAN and VPN.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Identify peer-to-peer and client-server models and demonstrate the roles of switches, routers, firewalls, and evaluate network speeds, delays, and address structures.	Understand
CO2	Interpret wireless communication technologies by analyzing quality of service and security features in IEEE 802.11 standards, Bluetooth and Zigbee protocols.	Apply
CO3	Demonstrate the evolution of wireless networks by illuminating the architecture, protocols, and features of 4G, 5G, and 6G technologies including MIMO, mmWave, and network slicing.	Apply
CO4	Apply the principles of Software Defined Networking by working with SDN architecture, OpenFlow protocol, control and data planes, and interfaces for programmable networking.	Apply
CO5	Implement network service virtualization by simulating NFV architecture, managing virtual network functions, and integrating SDN with VLAN, VPN, and virtual machines.	Apply

REFERENCES:

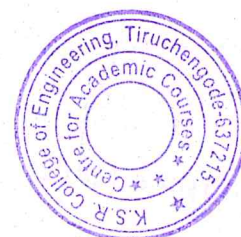
1. James Bernstein, "Networking made Easy", 2018.
2. HoudaLabiod, Costantino de Santis, HossamAfifi "Wi-Fi, Bluetooth, Zigbee and WiMax", Springer 2007.
3. Erik Dahlman, Stefan Parkvall, Johan Skold, 4G: LTE/LTE-Advanced for Mobile Broadband, Academic Press, 2013.
4. Saad Z. Asif "5G Mobile Communications Concepts and Technologies" CRC press – 2019.
5. William Stallings "Foundations of Modern Networking: SDN, NFV, QoE, IoT, and Cloud" 1st Edition, Pearson Education, 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

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Chairman (BOS)



IT24T32	CLOUD COMPUTING TECHNOLOGIES	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Students should have a basic understanding of computer networks, operating systems, and fundamental programming concepts. Prior exposure to system architecture and distributed computing will be beneficial for understanding virtualization and cloud infrastructure.							
OBJECTIVES: This course aims to provide students with a comprehensive understanding of virtualization technologies, cloud computing architectures, and cloud service models. It focuses on popular cloud platforms resembling Amazon Web Services (AWS) and Microsoft Azure, enabling learners to manage resources, deploy applications, and the distributed programming models using frameworks includes Hadoop and Aneka to build scalable cloud applications.							
UNIT - I	VIRTUALIZATION AND VIRTUALIZATION INFRASTRUCTURE					(9)	
Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines – Emulation – Interpretation – Binary Translation - Taxonomy of Virtual Machine - Virtualization – Management Virtualization – Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU - Memory and I/O devices – virtual clusters and Resource .							
UNIT - II	CLOUD PLATFORM ARCHITECTURE					(9)	
Cloud Computing: Definition - Characteristics - Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Infrastructure, platform, software - A Generic Cloud Architecture Design – Layered cloud Architectural Development – Architectural Design Challenges.							
UNIT - III	AWS CLOUD PLATFORM - IAAS					(9)	
Amazon Web Services: AWS Infrastructure - AWS API - AWS Management Console - Setting up AWS Storage - Stretching out with Elastic Compute Cloud - Elastic Container Service for Kubernetes - AWS Developer Tools: AWS Code Commit - AWS Code Build - AWS Code Deploy - AWS Code Pipeline - AWS code Star - AWS Management Tools: Cloud Watch - AWS Auto Scaling - AWS control Tower - Cloud Formation - Cloud Trail - AWS License Manager.							
UNIT - IV	PAAS CLOUD PLATFORM					(9)	
Windows Azure: Origin of Windows Azure – Features - The Fabric Controller – First Cloud APP in Windows Azure - Service Model and Managing Services: Definition and Configuration - Service runtime API - Windows Azure Developer Portal - Service Management API - Windows Azure Storage Characteristics - Storage Services - REST API – Blops.							
UNIT - V	PROGRAMMING MODEL					(9)	
Introduction to Hadoop Framework - Mapreduce, Input splitting, map and reduce functions - specifying input and output parameters - configuring and running a job – Developing Map Reduce Applications - Design of Hadoop file system – Setting up Hadoop Cluster- Aneka: Cloud Application Platform - Thread Programming - Task Programming and Map Reduce Programming in Aneka.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Arjun
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss virtualization concepts including virtual machines, CPU virtualization, and virtual clusters enhance hardware utilization.	Understand
CO2	Identify cloud computing deployment models and layered architectures, and describe cloud service categories with a clear understanding of cloud platform design.	Apply
CO3	Apply Amazon Web Services (AWS) to manage infrastructure services, storage, compute resources, and developer tools for setting up, monitoring, and maintaining cloud-based applications.	Apply
CO4	Create and manage Azure-based cloud applications and demonstrate knowledge of Azure's storage and service management capabilities.	Apply
CO5	Apply distributed computing models using Hadoop and Aneka platforms for scalable cloud application development.	Apply

REFERENCES:

1. Bernard Golden, Amazon Web Service for Dummies, John Wiley & Sons, 2013.
2. Raoul Alongi, AWS: The Most Complete Guide to Amazon Web Service from Beginner to Advanced Level, Amazon Asia- Pacific Holdings Private Limited, 2019.
3. Sriram Krishnan, Programming: Windows Azure, O'Reilly, 2010.
4. Rajkumar Buyya, Christian Vacchiola, S.Thamarai Selvi, Mastering Cloud Computing, MCGraw Hill Education (India) Pvt. Ltd., 2013.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gangayy
Chairman (POs)



IT24P31	PROJECT PHASE-I	Category	L	T	P	SL	C
		EEC	0	0	180	0	6

PREREQUISITE:

Students should have foundational knowledge in finance or economics, basic understanding of budgeting principles, and proficiency in programming or application development. Familiarity with data analysis tools, spreadsheet software, and research methodology is also recommended.

OBJECTIVES:

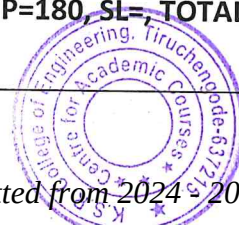
This project is to enable students to gain in-depth knowledge and hands-on experience in a specific area of personal finance management through independent research and practical application. Students will engage in discussions with faculty to select a focused project topic and will deliver weekly seminars to communicate progress, research insights, and encountered challenges. The project culminates in the development and presentation of a personal budgeting application.

Guidelines:

1. Students will engage in mutual discussions with faculty to select a specific area within personal finance management for their project.
2. Throughout the project duration, students will deliver weekly seminars on their chosen topic, sharing progress updates, insights gained from research, and challenges encountered.
3. One week before the final presentation, students will submit a comprehensive technical report to the corresponding faculty member.
4. The report should be between 45 to 90 pages in length and encompass project objectives, methodology, implementation details, results, and future recommendations.
5. References to recent journals, conference proceedings, and other scholarly sources must be cited appropriately to support the project findings.
6. The final presentation will serve as a culmination of the project, where students will showcase the developed personal budgeting application and present key findings from their research.
7. A Q&A session will follow the final presentation, allowing faculty and peers to engage with the student presenters, ask questions, and provide feedback.
8. The students should have published their project paper in journals or conference.
9. The student has to submit a technical report having 30 - 50 pages to the corresponding faculty one week before the final presentation.

L= 0, T=0, P=180, SL= TOTAL: 180 PERIODS

S. Gangaiah
Chairman (BOS)



COs	Course Outcome	Cognitive Level			
CO1	Formulate a real-world problem, identify requirements, and apply design principles to develop effective solutions.	Apply			
CO2	Identify and apply appropriate technical ideas, strategies, and methodologies relevant to the project domain.	Apply			
CO3	Utilize suitable tools, algorithms, and techniques to implement and refine the project solution.	Apply			
CO4	Test and validate the developed prototype, ensuring functionality and analyzing cost-effectiveness	Apply			
CO5	Build a comprehensive project report and deliver clear, structured oral presentations to communicate project outcomes.	Apply			
Mapping of COs with POs and PSOs					
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	-	-	-
CO2	3	3	-	-	-
CO3	3	3	-	-	-
CO4	3	3	-	-	-
CO5	3	3	-	-	-
1-low, 2-medium, 3-high					

S. Ananya
Chairman (BOS)



IT24P41	PROJECT PHASE-II	Category	L	T	P	SL	C
		EEC	0	0	360	0	12

PREREQUISITE:

Students should have foundational knowledge in finance or economics, basic understanding of budgeting principles, and proficiency in programming or application development. Familiarity with data analysis tools, spreadsheet software, and research methodology is also recommended.

OBJECTIVES:

This project is to enable students to gain in-depth knowledge and hands-on experience in a specific area of personal finance management through independent research and practical application. Students will engage in discussions with faculty to select a focused project topic and will deliver weekly seminars to communicate progress, research insights, and encountered challenges. The project culminates in the development and presentation of a personal budgeting application.

Guidelines:

1. Students will engage in mutual discussions with faculty to select a specific area within personal finance management for their project.
2. Throughout the project duration, students will deliver weekly seminars on their chosen topic, sharing progress updates, insights gained from research, and challenges encountered.
3. One week before the final presentation, students will submit a comprehensive technical report to the corresponding faculty member.
4. The report should be between 70 to 90 pages in length and encompass project objectives, methodology, implementation details, results, and future recommendations.
5. References to recent journals, conference proceedings, and other scholarly sources must be cited appropriately to support the project findings.
6. The final presentation will serve as a culmination of the project, where students will showcase the developed personal budgeting application and present key findings from their research.
7. A Q&A session will follow the final presentation, allowing faculty and peers to engage with the student presenters, ask questions, and provide feedback.
8. The students should have published their project paper in journals or conference.

L= 0, T=0, P=360, SL=, TOTAL: 360 PERIODS

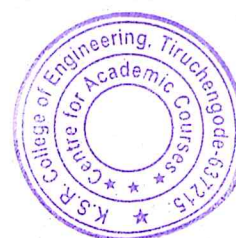


S. Gangaiah
Chairman (BOS)



COs	Course Outcome	Cognitive Level			
CO1	Formulate a real-world problem, identify requirements, and apply design principles to develop effective solutions.	Apply			
CO2	Identify and apply appropriate technical ideas, strategies, and methodologies relevant to the project domain.	Apply			
CO3	Utilize suitable tools, algorithms, and techniques to implement and refine the project solution.	Apply			
CO4	Test and validate the developed prototype, ensuring functionality and analyzing cost-effectiveness	Apply			
CO5	Build a comprehensive project report and deliver clear, structured oral presentations to communicate project outcomes.	Apply			
Mapping of COs with POs and PSOs					
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	3	-	-	-
CO2	3	3	-	-	-
CO3	3	3	-	-	-
CO4	3	3	-	-	-
CO5	3	3	-	-	-
1-low, 2-medium, 3-high					

S. Anjith
Chairman (BOS)



IT24E01	ADVANCED COMPUTER ARCHITECTURE (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE:							
Basic knowledge in processor design, memory hierarchy, digital logic, assembly language, Memory concepts and Data structure concepts.							
OBJECTIVES:							
This course aims to provide a fundamental understanding of computer design, ILP and its Exposing Exploiting. It focuses on Memory optimization and issues in multi-processor. It also focuses on architecture of intel core, SUN CMP architecture, IBM Cell Architecture. Students will also know the architecture of vector, SIMD and GPU.							
UNIT - I	FUNDAMENTALS OF COMPUTER DESIGN						(9)
Fundamentals of Computer Design - Measuring and Reporting Performance - Instruction Level Parallelism and its Exploitation - Concepts and Challenges - Exposing ILP - Advanced Branch Prediction - Dynamic Scheduling - Hardware-Based Speculation - Exploiting ILP - Instruction Delivery and Speculation - Limitations of ILP – Multithreading							
UNIT - II	MEMORY HIERARCHY DESIGN						(9)
Introduction - Optimizations of Cache Performance - Memory Technology and Optimizations - Protection: Virtual Memory and Virtual Machines - Design of Memory Hierarchies - Case Studies.							
UNIT - III	MULTIPROCESSOR ISSUES						(9)
Introduction- Centralized, Symmetric and Distributed Shared Memory Architectures - Cache Coherence Issues - Performance Issues - Synchronization - Models of Memory Consistency - Case Study - Interconnection Networks - Buses, Crossbar and Multistage Interconnection Networks							
UNIT - IV	MULTICORE ARCHITECTURES						(9)
Homogeneous and Heterogeneous Multicore Architectures - Intel Multicore Architectures - SUN CMP architecture - IBM Cell Architecture. Introduction to Warehouse - Scale computers – Architectures - Physical Infrastructure and Costs - Cloud Computing - Case Study: Google Warehouse - Scale Computer.							
UNIT - V	VECTOR, SIMD AND GPU ARCHITECTURES TLE						(9)
Introduction - Vector Architecture - SIMD Extensions for Multimedia - Graphics Processing Units - Case Studies - GPGPU Computing - Detecting and Enhancing Loop Level Parallelism - Case Studies.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargaxt
Chairman (BoS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Interpret the techniques to exploit Instruction Level Parallelism (ILP) and dynamic scheduling, speculation, and multithreading.	Understand
CO2	Discuss memory hierarchy design, including cache performance, virtual memory, and memory technologies for efficient data access.	Understand
CO3	Implement shared memory architectures, cache coherence, and interconnection networks for efficient multiprocessor system design.	Apply
CO4	Apply the principles of homogeneous and heterogeneous multicore architectures to analyze performance characteristics in Intel, SUN CMP, and IBM Cell processors.	Apply
CO5	Exploit vector and SIMD architectures to boost multimedia and parallel computing performance using GPGPU and GPU technologies.	Apply

REFERENCES:

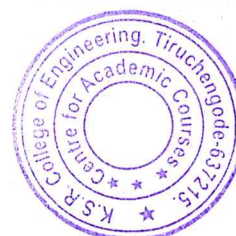
1. Darryl Gove, Multicore Application Programming: For Windows, Linux, and Oracle Solaris, Pearson, 2011.
2. John L Hennessey and David A Patterson "Computer Architecture – A quantitative approach" Morgan Kaufmann Elsevier 5th Edition 2012.
3. David B. Kirk, Wen-mei W. Hwu, -Programming Massively Parallel Processors, Morgan Kauffman, 2010.
4. William Stallings "Computer Organization and Architecture – Designing for Performance" Pearson Education 8th Edition 2010.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

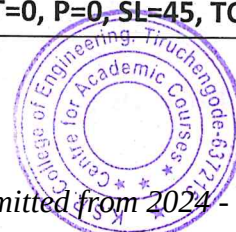
1-low, 2-medium, 3-high

S. Aravindhan
Chairman (BOS)



IT24E02	AD-HOC AND SENSOR NETWORKS (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE Basic understanding of computer networks including network topologies, routing protocols, and wireless communication principles. Familiarity with network protocols, TCP/IP model, and routing algorithms is essential. Basic knowledge of programming, operating systems, and distributed systems.							
OBJECTIVES: This course aims to provide a comprehensive understanding of ad-hoc and sensor network fundamentals, including their architecture, protocols, and applications. It focuses on energy-efficient protocols, data aggregation, and secure communication in wireless sensor networks (WSNs). Students gain insights into security challenges, including various attacks across network layers.							
UNIT - I	AD HOC NETWORKS –INTRODUCTION AND ROUTING PROTOCOLS						(9)
Elements of Ad-hoc Wireless Networks – Issues in Ad-hoc wireless networks – Example commercial applications of Ad-hoc networking – Ad-hoc wireless Internet – Classifications of Routing Protocols – Table Driven Routing Protocols – Destination Sequenced Distance Vector (DSDV) – On-Demand Routing protocols – Ad-hoc On-Demand Distance Vector Routing (AODV).							
UNIT - II	SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES						(9)
Issues – Classifications of routing protocols – Hierarchical and Power aware – Multicast routing – Classifications –Tree based – Mesh based – Ad Hoc Transport Layer Issues – TCP Over Ad Hoc – Feedback based – TCP with explicit link – TCP BuS – Ad Hoc TCP and Split TCP.							
UNIT - III	WSN NETWORKING AND PROTOCOLS						(9)
Physical Layer and MAC Protocols – Network layer protocol – Transport layer protocol – Energy efficiency in WSNs – Data aggregation and management – Security in WSNs – Case Study: Smart Cities and Healthcare.							
UNIT - IV	SENSOR NETWORK SECURITY						(9)
Network Security Requirements – Issues and Challenges in Security Provisioning – Network Security Attacks – Layer wise attacks in wireless sensor networks – possible solutions for jamming – tampering – black hole attack – flooding attack – Key Distribution and Management – Secure Routing – SPINS							
UNIT - V	MESH NETWORKS						(9)
Necessity for Mesh Networks – MAC enhancements – IEEE 802.11s Architecture – Opportunistic routing – Self configuration and Auto configuration – Capacity Models – Fairness – Heterogeneous Mesh Networks – Vehicular Mesh Networks.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Interpret the basic structure, challenges, applications of ad-hoc wireless networks and routing protocols like DSDV and AODV.	Understand
CO2	Summarize routing protocols in sensor networks, transport layer challenges and ad-hoc TCP.	Understand
CO3	Describe layered protocol in wireless sensor networks, focusing on energy-efficient communication, data aggregation, and security mechanisms	Understand
CO4	Interpret the knowledge of security requirements and challenges in wireless sensor networks, key management techniques, and secure routing protocols.	Understand
CO5	Interpret the need for mesh networks, key enhancements routing strategies, and design of heterogeneous and vehicular mesh network architectures.	Understand

REFERENCES:

1. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks", Morgan Kaufman Publishers, 2011.
2. C.Siva Ram Murthy and B.Smanoj, Ad Hoc Wireless Networks – Architectures and Protocols, Pearson Education, 2011.
3. C.K.Toth, "Ad Hoc Mobile Wireless Networks", 3rd Edition, Pearson Education, 2011.
4. Thomas Krag and SebastinBuettrich, "Wireless Mesh Networking, O'Reilly Publishers", 2007.

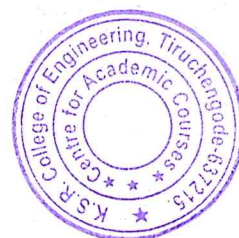
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	2	-	-	-	-
CO4	2	-	-	-	-
CO5	2	-	-	-	-

1-low, 2-medium, 3-high

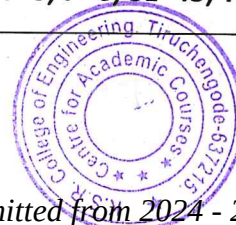
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IT24E03	COMPUTER VISION (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Strong foundation in mathematics, especially linear algebra, calculus, and probability. Proficiency in Python and libraries like OpenCV and NumPy. Basic knowledge of image processing techniques and machine learning concepts and deep learning.							
OBJECTIVES: This course aims to provide a basic understanding of image processing methods and shape and region analysis including object labeling, shape descriptors, and deformable. It focuses on Hough Transform and its variants. Students will learn 3D vision and motion analysis through projection models, surface reconstruction, and motion estimation techniques and applications.							
UNIT - I	IMAGE PROCESSING FOUNDATIONS					(9)	
Review of image processing techniques – classical filtering operations – Thresholding techniques – edge detection techniques – corner and interest point detection – mathematical morphology – texture.							
UNIT - II	SHAPES AND REGIONS					(9)	
Binary shape analysis – connectedness – object labeling and counting – size filtering – distance functions – skeletons and thinning – deformable shape analysis – boundary tracking procedures – active contours – shape models and shape recognition – centroidal profiles – handling occlusion – boundary length measures – boundary descriptors – chain codes – Fourier descriptors – region descriptors – moments.							
UNIT - III	HOUGH TRANSFORM					(9)	
Line detection – Hough Transform (HT) for line detection – foot-of-normal method – line localization – line fitting – RANSAC for straight line detection – HT based circular object detection – accurate center location – speed problem – ellipse detection – Case study: Human Iris location – hole detection – generalized Hough Transform (GHT) – spatial matched filtering – GHT for ellipse detection – object location – GHT for feature collation.							
UNIT - IV	3D VISION AND MOTION					(9)	
Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape 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.							
UNIT - V	APPLICATIONS					(9)	
Application: Photo album – Face detection – Face recognition – Eigen faces – Active appearance and 3D shape models of faces Application: Surveillance – foreground-background separation – particle filters – Chamfer matching, tracking, and occlusion – combining views from multiple cameras – human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Interpret fundamental image processing techniques and extract meaningful features, effective analysis of textures and structures in digital images.	Understand
CO2	Interpret the principles of binary shape analysis, shape descriptors, contour models, and deformable shape analysis.	Understand
CO3	Implement Hough Transform and its variants, RANSAC, foot-of-normal method, and spatial matched filtering for accurate object localization.	Apply
CO4	Develop 3D vision techniques, representation and reconstruction of 3D objects, and build applications.	Apply
CO5	Demonstrate the applications of photo management face detection and recognition, surveillance techniques and develop in vehicle vision systems.	Apply

REFERENCES:

1. D. L. Baggio et al., —Mastering OpenCV with Practical Computer Vision Projects , Packt Publishing, 2012.
2. E. R. Davies, —Computer & Machine Vision , Fourth Edition, Academic Press, 2012.
3. Jan Erik Solem, —Programming Computer Vision with Python: Tools and algorithms for analyzing images , O'Reilly Media, 2012.
4. Mark Nixon and Alberto S. Aquado, —Feature Extraction & Image Processing for Computer Vision , Third Edition, Academic Press, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	3	-	-

1-low, 2-medium, 3-high

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IT24E04	DATA SCIENCE (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Solid understanding of statistics, probability, and linear algebra. Proficiency in Python or, along with data handling using libraries such as Pandas and NumPy. Basic understanding of databases, data visualization, and machine learning, analytical thinking and problem-solving skills.							
OBJECTIVES: This course aims to provide the fundamental concepts, tools, and processes in data science. It focuses on data collection from various sources, data cleaning, and effective management. Students will learn core statistical concepts and machine learning algorithms. Students will gain hands-on experience with Python libraries such as NumPy and Pandas for data manipulation and wrangling and to create insightful visualizations using tools like Seaborn and Bokeh.							
UNIT - I	INTRODUCTION TO CORE CONCEPTS AND TECHNOLOGIES					(9)	
Introduction – Terminology – Data science process – Data science toolkit – Types of data – Exploratory Data Analysis Example applications.							
UNIT - II	DATA COLLECTION AND MANAGEMENT					(9)	
Introduction – Sources of Data – Data collection and APIs – Exploring and fixing data – Data storage and management –Using Multiple Data Sources							
UNIT - III	DATA ANALYSIS					(9)	
Introduction – Terminology and concepts – Introduction to statistics – Central tendencies and distributions – Variance –Distribution properties and arithmetic – Samples/CLT– Basic machine learning algorithms – Linear regression – SVM –Naive Bayes.							
UNIT - IV	PYTHON LIBRARIES FOR DATA WRANGLING					(9)	
Basics of Numpy Arrays – Aggregations – Computations on Arrays – Comparisons, Masks, Boolean logic – Fancy Indexing – Structured Arrays – Data Manipulation with Pandas – Data Indexing and Selection – Operating on Data – Missing Data.							
UNIT - V	DATA VISUALISATION AND APPLICATIONS					(9)	
Introduction – Types of data visualization – Data for visualization – Data types – Data encodings – Retinal variables –Mapping variables to encodings – Visual Encodings- Visualization with Seaborn. Applications: Technologies for Visualization – Bokeh (Python) Recent trends in various Data Collection and Analysis Techniques — Application Development Methods of Used in Data Science.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Interpret the core concepts and terminology of data science and recognize the potential applications.	Understand
CO2	Interpret data sources and effective techniques for data collection, methods and ability to integrate and utilize multiple data sources.	Understand
CO3	Implement basic machine learning algorithms and apply foundational predictive models in data-driven applications.	Apply
CO4	Demonstrate manipulating data using NumPy and Pandas, efficient data preprocessing, handling of missing values.	Apply
CO5	Implement the techniques of effective data visualization and tools like Seaborne and Bokeh in Python	Apply

REFERENCES:

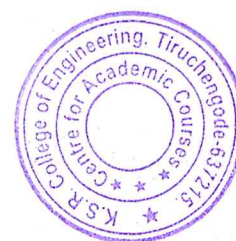
1. Luca Massaron John Paul Mueller, "Python Data Science Handbook", 2nd Edition, Wiley 2019.
2. Cathy O'Neil and Rachel Schutt. "Doing Data Science", Straight Talk From The Frontline, First Edition, O'Reilly, 2013.
3. Foster Provost, Tom Fawcett, "Data Science for Business", 1st Edition, O'Reilly Publishers, 2013
4. Bill Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", 1st Edition, John Wiley & Sons, 2012

Mapping of COs with POs and PSOs

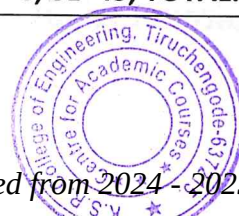
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

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COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the concepts of system modeling and various simulation techniques, including stochastic simulation and random number generation.	Understand
CO2	Apply simulation models using suitable software tools to solve real-world scientific problems.	Apply
CO3	Illustrate the optimization methods to solve one dimensional and multidimensional problem, including constrained and unconstrained optimization.	Apply
CO4	Analyze various methods for solving algebraic and transcendental equations, and compare interpolation techniques for data approximation.	Analyze
CO5	Distinguish the numerical techniques for differentiation and integration, and interpret their effectiveness in solving boundary and partial differential equations.	Analyze

REFERENCES:

1. Steven C, Chapra Raymond P Canale, Numerical Methods for Engineering, 8th Edition, McGraw-Hill 2021.
2. George F. Pinder, Numerical Methods for Solving Partial Differential Equations: A Comprehensive Introduction for Scientists and Engineers, 1st Edition, Wiley 2019.
3. Norbert Schorghofer, Lessons in Scientific Computing, 1st Edition, CRC Press, 2018.
4. Jerry Banks and John Carson, Discrete Event System Simulation, 5th Edition, Pearson Education India, 2013.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

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IT24E06	DIGITAL IMAGE PROCESSING (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3

PREREQUISITE:

Understanding of linear algebra and calculus, particularly concepts related to matrices transformations, and functions. Knowledge of signal processing fundamentals, including continuous and discrete signals, Fourier analysis, and filtering techniques. To know how imaging systems work, including sensors, optics, and the capture of images.

OBJECTIVES:

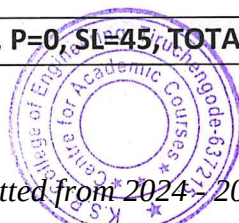
The course aims to introduce the fundamentals of digital image processing, including image representation and pixel relationships. It enables students to apply image enhancement, restoration, and segmentation techniques in both spatial and frequency domains.

UNIT - I	INTRODUCTION TO DIGITAL IMAGING	(9)
Introduction to Digital Image Processing – Elements of Digital Image Processing System - Visual perception and properties of human eye - Image Representation - A Simple Image Model - Basic Relationship Between Pixels – Image Geometry.		
UNIT - II	IMAGE OPTIMIZATION	(9)
Spatial Domain: Gray Level Transformations – Histogram Processing – Basics of Spatial Filtering – Smoothing and Sharpening – Frequency Domain: DFT (Discrete Fourier Transform) – FFT (Fast Fourier Transform) – DCT (Discrete Cosine Transform) - Smoothing and Sharpening frequency domain filters – Gaussian Filters – Homomorphism Filtering – Multi Spectral Image Enhancement – Color Image Enhancement.		
UNIT - III	IMAGE RESTORATION	(9)
Image Restoration Model – Properties – Noise Models - Inverse and Wiener Filtering - Finite Impulse Response (FIR) Wiener Filtering - Geometric Mean Filter - Constrained Least Squares Filtering- Image Reconstruction from Projections.		
UNIT - IV	IMAGE ANALYSIS AND SEGMENTATION	(9)
Spatial Feature Extraction - Edge Detection - Boundary Extraction – Scale Invariant Feature Transform (SIFT) - Thresholding - Region Based Segmentation – Region Growing – Region Splitting and Merging - Region Segmentation Using Clustering and Super pixels - Morphological Watersheds - Motion in Segmentation.		
UNIT - V	IMAGE COMPRESSION AND RECOGNITION	(9)
Need for Data Compression – Huffman – Run Length Encoding – Shift Codes – Arithmetic Coding – JPEG Standard – MPEG Standard – Boundary Representation – Boundary Description – Regional Descriptors – Topological Feature – Recognition based on Matching- Application of Image Processing.		

L= 45, T=0, P=0, SL=45

TOTAL: 90 PERIODS

S. Arun Kumar
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts of digital image processing, image representation, and relationships between pixels and geometry.	Understand
CO2	Implement spatial filtering techniques such as smoothing and sharpening to improve image quality.	Apply
CO3	Apply spatial and frequency domain techniques like histogram processing, filtering, and transforms for image enhancement.	Apply
CO4	Analyze different image segmentation methods including region growing, clustering, SIFT, and morphological techniques for feature extraction.	Analyze
CO5	Compare the image compression methods and recognition techniques, and interpret their effectiveness in practical image processing applications.	Analyze

REFERENCES:

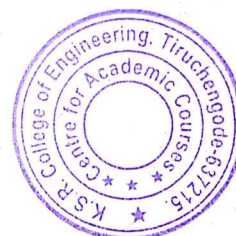
1. Rafael C. Gonzalez, Richard Eugene Woods, Digital Image Processing, 4th Edition, Pearson Education 2018.
2. Anil K. Jain, Fundamentals of Digital Image Processing, 1st Edition, Pearson Education 2015.
3. S Jayaraman, S Esakkirajan, T Veerakumar, Digital Image Processing, 2nd Edition, McGraw Hill 2020.
4. Alasdair McAndrew, A Computational Introduction to Digital Image Processing, 2nd Edition, Taylor & Francis Group, CRC Press, 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

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IT24E07	XML AND WEB SERVICES (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: A foundational knowledge of programming languages such as Java, Python, or C# is essential, as these are commonly used to implement and interact with web services. A basic understanding of web technologies, including HTTP, HTML, and CSS, is crucial for comprehending how web services operate over the internet. Additionally, familiarity with data formats like XML and JSON is important for understanding how data is structured and exchanged between systems.							
OBJECTIVES: This course aims to introduce XML technologies and their role in data representation, processing, and web integration. To understand and implement web services using SOAP, WSDL, and SOA concepts. It also explores XML applications in e-business and content management through semantic web.							
UNIT-I	XML TECHNOLOGY FAMILY						[9]
XML – benefits – Advantages of XML over HTML – EDI (Electronic Data Interchange) – Databases – XML based standards – DTD (Document Type Declaration) – XML Schemas – XML Files – XML processing – DOM (Document Object Model) – SAX (simple API for XML) – Presentation technologies – XSL (XML Style sheet Language) – XFORMS – XHTML – Voice XML.							
UNIT-II	ARCHITECTING WEB SERVICES						[9]
Business motivations for web services – B2B (Business to Business) – B2C (Business to Customer) – Technical motivations – Limitations of CORBA and DCOM – Service Oriented Architecture (SOA) – Architecting web services – Implementation view – Web services technology stack – Logical view – Composition of web services – Deployment view from application server to peer to peer – Process view – Life in the runtime..							
UNIT-III	WEB SERVICES: SOAP & WSDL						[9]
Web Services SOAP: – Structure of SOAP – SOAP Namespaces – SOAP Headers – SOAP Body – SOAP Messaging Modes – SOAP Faults – SOAP over HTTP. WSDL: Structure of WSDL – WSDLDeclarations – WSDL Abstract Interface – Messaging Exchange patterns – WSDL Implementation.							
UNIT-IV	IMPLEMENTING XML IN E-BUSINESS						[9]
B2B – B2C Applications – Different types of B2B interaction – Components of e- business XML systems – ebXML– Rosetta Net Applied XML in vertical industry – Web services for mobile devices.							
UNIT-V	XML AND CONTENT MANAGEMENT						[9]
Semantic Web – Role of Meta data in web content – Resource Description Framework – RDF schema – Architecture of semantic web – Content management workflow.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe the structure and significance of XML technologies, including DTD, XML Schema, DOM, SAX, and their role in web data exchange.	Understand
CO2	Apply SOA principles to develop and deploy web services using the appropriate technology stack and architectural views.	Apply
CO3	Sketch web services using SOAP and WSDL standards to enable effective communication between distributed systems.	Apply
CO4	Analyze different B2B and B2C XML-based e-business models and evaluate the use of standards like ebXML and RosettaNet in real-world scenarios.	Analyze
CO5	Compare the role of metadata, RDF, and content management workflows in building semantic web applications.	Analyze

REFERENCES:

1. Ron schmelzer et al, XML and Web Services, Pearson Education, 3rd Edition, 2012.
2. Richard Monson-Haefel, "J2EE Web Services", 8th Edition, Person Education, 2012.
3. Deitel. H.H, P.J.Deitel, T.R.Nieto, T.M.Lin, XML How to Program, Pearson Education, 2012.
4. Frank P, Coyle, XML, Web Services and the Data Revolution, Pearson Education, 2011.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

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Chairman (Bos)



IT24E08	DISTRIBUTED SYSTEMS (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Students are expected to have a basic understanding of operating system concepts like processes, threads, and memory management, along with foundational knowledge of computer networks and protocols.							
OBJECTIVES: This course aims to provide a comprehensive understanding of distributed systems, their architecture, and inter-process communication models.							
UNIT - I	BASIC CONCEPTS						(9)
Definition of a distributed systems – Examples - Resource sharing and the Web – Challenges - System models - Architectural and fundamental models - Networking Inter process communication - External data representation and marshalling – Client server and Group communication.							
UNIT - II	DISTRIBUTED OBJECTS AND PROCESS						(9)
Distributed objects and remote invocation - Communication between distributed objects - Remote procedure call - Events and notifications - The operating system layer – Protection - Processes and Threads - Communication and invocation - OS Architecture - Security techniques - Cryptographic algorithms - Access control - Digital signatures - Cryptography pragmatics – Needham Schroeder – Kerberos - Securing electronics transaction - IEEE 802.11 WiFi.							
UNIT - III	OPERATING SYSTEM ISSUES						(9)
Distributed file systems - Name services - Domain name system - Directory and discovery services - Peer to peer systems - Napster file sharing system - Peer to peer middleware routing overlays – Clocks Events and process states Clock Synchronization - Logical clocks Global states - Distributed debugging - Distributed mutual exclusion - Elections - Multicast communication.							
UNIT - IV	DISTRIBUTED TRANSACTION PROCESSING						(9)
Transactions - Nested transactions - Locks - Optimistic concurrency control - Timestamp ordering - Flat and nested distributed transactions - Atomic commit protocols - Concurrency control in distributed transactions - Distributed deadlocks - Transaction recovery - Overview of replication - Distributed shared memory and Web services.							
UNIT - V	DISTRIBUTED ALGORITHMS						(9)
Synchronous network model - Algorithms: leader election - maximal independent set - Asynchronous system model: I/O automata - operations on automata - fairness - Asynchronous shared memory model - Mutual exclusion: model the problem- stronger conditions - lockout - free mutual exclusion algorithms - lower bound on the number of registers - Asynchronous network model - Asynchronous network algorithms: leader election in a ring and an arbitrary network.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargya
Chairman (PEC)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts, models, and communication mechanisms used in distributed systems.	Understand
CO2	Apply remote invocation techniques, inter-process communication, and security algorithms like Kerberos and digital signatures in distributed environments.	Apply
CO3	Prepare the distributed applications using concepts like client-server architecture, RPC, and multithreaded processing.	Apply
CO4	Compare synchronization techniques, logical clocks, and election algorithms to coordinate processes in distributed systems.	Analyze
CO5	Distinguish the distributed transaction processing, concurrency control, recovery methods, and distinguish between different atomic commit protocols.	Analyze

REFERENCES:

1. George Coulouris, Jean Dollimore, and Tim Kindberg, "Distributed Systems Concepts and Design", 5th ed., Pearson Education, 2011.
2. Andrew S. Tanenbaum, Maarten van Steen, "Distributed Systems Principles and Paradigms", 2nd ed., Pearson Education, 2006.
3. Andrew S. Tanenbaum, Maarten Van Steen, "Distributed Systems, Principles and Paradigms", , 2nd Edition, PHI, 2018.
4. Ajay D. Kshemakalyani and Mukesh Singhal, "Distributed Computing, Principles, Algorithms and Systems", Cambridge, 2010.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

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Chairman (Bos)



IT24E09	MULTIMEDIA COMMUNICATONS (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Prior knowledge of basic programming concepts (preferably in C/C++ or Python), digital signal processing fundamentals, and computer networks, including the OSI model and data transmission techniques.							
OBJECTIVES: This course introduces the creation, management, and delivery of multimedia content across various platforms. It covers text and image formats, compression standards, audio and video codecs, and popular video compression techniques. Students will also learn about synchronization in multimedia systems and the role of multimedia operating systems.							
UNIT - I	INTRODUCTION					(9)	
Introduction about Multimedia Information Representation – Multimedia Networks - Multimedia Applications – Application and Network Terminology – Network QoS and Application QoS - Digitization Principles – Text. Image, Audio and Video.							
UNIT - II	TEXT AND IMAGE COMPRESSION					(9)	
Compression Principles - Text Compression Techniques - Run length, Huffman, LZW - Document Image compression Techniques - T2 and T3 coding - Image Compression Techniques - GIF, TIFF and JPEG.							
UNIT - III	AUDIO AND VIDEO COMPRESSION					(9)	
Audio Compression – Principles, DPCM, ADPCM - Adaptive and Linear predictive coding - Code-Excited LPC - Perceptual coding - Video Compression Principles - MPEG and Dolby Coders Video Compression.							
UNIT - IV	VIDEO COMPRESSION STANDARDS					(9)	
Introduction about Video Compression – Different Standards - H.261, H.263, MPEG, MPEG 1, MPEG 2, MPEG-4 - Reversible VLCs - MPEG 7 Standardization Process of Multimedia Content Description - MPEG 21 multimedia framework.							
UNIT - V	SYNCHRONIZATION					(9)	
Need for Synchronization - Presentation Requirements, Reference Model for Synchronization - Introduction to SMIL - Multimedia Operating Systems - Resource Management, Process - Resource Management Techniques.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargya
Chairman (BOE)

COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe the structure and functions of different multimedia networks.	Understand
CO2	Apply suitable image compression methods like GIF, TIFF, and JPEG based on application requirements.	Apply
CO3	Examine the features and working of Code-Excited Linear Predictive Coding (CELP) and perceptual coding methods.	Analyze
CO4	Demonstrate the working of Reversible Variable Length Codes (RVLCs) in video compression.	Apply
CO5	Apply multimedia operating system concepts to manage resources and processes effectively.	Apply

REFERENCES:

1. Fred Halsall's "Multimedia Communications: Applications, Networks, Protocols, and Standards", Pearson Education, 2001.
2. K. R Rao, Zoran S. Bojkovic, Dragorad A. Milovanovic "Multimedia Communication Systems", Pearson Education, 2004.
3. Ze-Nian Li and Mark S. Drew "Fundamentals of Multimedia", Pearson, 2014.
4. Raifsteinmetz, Klara Nahrstedt, "Multimedia: Computing, Communications and Applications", Pearson Education, 2002.

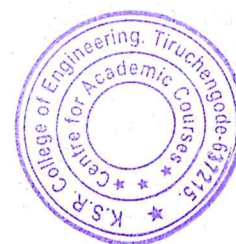
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Argyx+

Chairman (BOS)



IT24E10	INFORMATION RETRIEVAL TECHNIQUES (PROFESSIONAL ELECTIVES – I and II)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: A foundational understanding of data structures and algorithms is essential for efficient storage, indexing, and retrieval of information. Additionally, familiarity with databases and query languages such as SQL is important for comprehending data organization and access methods. Basic knowledge of search engines, web technologies, and HTML further supports the understanding of how content is retrieved and displayed on the web.							
OBJECTIVES: This course covers the basic concepts and challenges of information retrieval systems, including structural queries and their impact on performance. It explores document preprocessing techniques like clustering and text compression, data models and query languages for multimedia retrieval, and the indexing and ranking methods used by search engines.							
UNIT - I	INTRODUCTION					(9)	
Basic Concepts — Practical Issues - Retrieval Process –Open Source IR Systems – Modeling – Classic Information Retrieval – Set Theoretic- Algebraic and Probabilistic Models – Structured Text Retrieval Models – Retrieval Evaluation.							
UNIT - II	QUERYING					(9)	
Languages – Key Word based Querying- Queries in IR Systems – Pattern Matching – Structural Queries – Query Operations – User Relevance Feedback – Local and Global Analysis – Text and Multimedia languages.							
UNIT - III	TEXT OPERATIONS AND USER INTERFACE					(9)	
Document Preprocessing – Clustering – Text Compression – Indexing and Searching – Inverted files – User Interface and Visualization – Human Computer Interaction – Access Process – Starting Points – Query Specification – Context – User relevance Judgment – Interface for Search.							
UNIT - IV	MULTIMEDIA INFORMATION RETRIEVAL					(9)	
Data Models – Query Languages – Spatial Access Models – Generic Approach – One Dimensional Time Series – Two Dimensional Color Images – Feature Extraction.							
UNIT - V	APPLICATIONS					(9)	
Searching the Web – Structure of the Web – Characterizing the Web- IR and web search – Search Engines- Web Crawling and Indexing — Online IR systems – Online Public Access Catalogs – Digital Libraries – Architectural Issues – Document Models – Representations and Access – Prototypes and Standards.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Anjyxt
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Understand classic information retrieval models, including set-theoretic, algebraic, and probabilistic approaches.	Understand
CO2	Examine the role of query operations and their impact on retrieval effectiveness.	Analyze
CO3	Demonstrate effective user interface and visualization techniques to enhance human-computer interaction.	Apply
CO4	Apply various data models and query languages to organize and retrieve multimedia data effectively.	Apply
CO5	Design an efficient search engine and analyze the Web content structure.	Apply

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1. Ricardo Baeza, Yate, Berthier Ribeiro, Neto, Modern Information Retrieval, Addison Wesley, 2011.
2. Daniel Jurafsky and James H Martin, Speech and Language Processing, Pearson Education, International Edition, 2014.
3. Ricardo Baeza – Yates, Berthier Ribeiro – Neto, “Modern Information Retrieval: The Concepts and Technology behind Search”, ACM Press Books, Second Edition, 2016.
4. G G Chowdhury, Introduction to Modern Information Retrieval, Neal Schuman Publishers, Third edition, 2010.

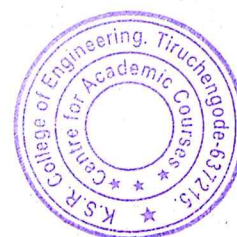
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. G. J. J.

Chairman (Bos)



IT24E11	DATA WAREHOUSING AND DATA MINING (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE							
This course helps the students to understand the overall architecture of a data warehouse and methods for data gathering and data pre-processing using OLAP tools. The different data mining models and techniques will be discussed in this course. Data mining and data warehousing applications in bioinformatics will also be explored.							
OBJECTIVES:							
This course aims to provide a clear understanding of data warehousing architectures and tools used for systematically organizing large databases to support strategic decision-making. It imparts foundational knowledge of key data mining concepts and introduces essential data mining tasks along with preprocessing techniques. Students will learn to apply clustering, classification, and visualization methods to analyze real-world datasets.							
UNIT - I	DATA WAREHOUSING AND ONLINE ANALYTICAL PROCESSING					(9)	
Basic Concepts of Data Warehousing – Data warehousing Components – Data warehouse Architecture – Data Warehouse Schemas for Decision Support – Online Analytical Processing (OLAP) – Characteristics of OLAP - OLAP and Multidimensional Data Analysis – Typical OLAP Operations – OLAP and OTAP - Data Warehousing to Data Mining.							
UNIT - II	INTRODUCTION TO DATA MINING					(9)	
Data Mining – Knowledge discovery Process - Issues and Applications - Data Mining Techniques - Data Objects and Attribute Types – Statistical Descriptions of Data - Data Visualization - Measuring Data Similarity and Dissimilarity - Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization.							
UNIT - III	DATA MINING – FREQUENT PATTERN ANALYSIS					(9)	
Basic Concepts of Mining Frequent Patterns, Associations, and Correlations - Frequent Item set Mining Methods - Advanced Pattern Mining - Pattern Mining in Multilevel, Multidimensional Space - Constraint-Based Frequent Pattern Mining – Classification using Frequent Patterns.							
UNIT - IV	CLASSIFICATION AND CLUSTERING					(9)	
Classification: Decision Tree Induction – Bayesian Classification – Rule Based Classification –Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Model Evaluation and Selection - Techniques to Improve Classification Accuracy. Clustering Techniques: Cluster Analysis – Partitioning Methods – Hierarchical methods – Density Based Methods – Grid Based Methods – Model Based Clustering Methods – Advanced Cluster analysis - Outlier Detection.							
UNIT - V	TRENDS AND APPLICATIONS IN DATA MINING					(9)	
Mining Object – Spatial, Multimedia, Text and Web Data - Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web - Data mining tools - DB Miner – WEKA - Applications: Data Mining for Intrusion Detection and Prevention - Financial Data Analysis.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Chaitanya
Chairman (BOE)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss the basic concepts of data warehousing and Online Analytical Processing.	Understand
CO2	Describe how different data mining techniques are applied to extract useful patterns from datasets.	Understand
CO3	Assess the effectiveness of frequent pattern algorithms based on application requirements and dataset characteristics.	Evaluate
CO4	Apply decision tree induction, Bayesian classification, rule-based classification, back propagation, support vector machines, associative classification, and lazy learners to solve classification problems.	Apply
CO5	Demonstrate spatial, multimedia, text, and web mining approaches to extract meaningful patterns.	Apply

REFERENCES:

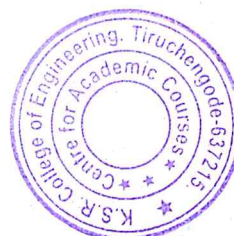
1. Jiawei Han and Micheline Kamber" Data Mining Concepts and Techniques" 3rd Edition Elsevier Reprinted 2011.
2. Alex Berson and Stephen J Smith" Data Warehousing Data Mining & OLAP" Tata McGraw – Hill Edition 13th Reprint 2010.
3. Andrew H. Johnston, "Practical Machine Learning: A Beginner's Guide to Data Mining with WEKA", July 2018.
4. Paulraj Ponniah, "Data Warehousing Fundamentals Comprehensive Guide for IT Professionals, Wiley, 2010.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high


Chairman (BOS)



IT24E12	NETWORK MANAGEMENT SYSTEM (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Students should have a fundamental understanding of computer networks, including network architectures, protocols (such as TCP/IP), and basic network communication concepts. Knowledge of network devices like routers, switches, and firewalls is essential. Familiarity with operating systems and basic programming or scripting skills will help in managing and automating network tasks.							
OBJECTIVES: This course aims to provide students with a comprehensive understanding of data communication and network management principles, covering networking basics, hardware components, and key protocols. It focuses on the role and functioning of the MAC layer, including its security and performance aspects.							
UNIT - I	DATA COMMUNICATION AND NETWORK MANAGEMENT OVERVIEW						(9)
Networking basics – LANs and WANs – Network hardware components – Server-based networks – Peer to peer networks – Server based vs peer-to-peer networks – Specialized servers – Combination networks – Network packets– Addressing packets – Multiplexing – Protocols – The OSI reference model – Internet Protocol Stack.							
UNIT - II	MAC MANAGEMENT						(9)
MAC Layer in Networking–Role and functions of the MAC layer – MAC addressing – MAC protocols – CSMA/ CD – Collision detection mechanism – CSMA/ CA – Hidden node problems – MAC layer security – Performance and optimization – Emerging trends in MAC management.							
UNIT - III	TCP/ IP NETWORKING						(9)
OSI vs TCP/ IP Model – IPV ₄ addressing and subnetting – IPV ₆ Addressing and Configuring – VLSM – Address resolution protocol – DHCP – ICMP – Error reporting – TCP – UDP – Routing protocols.							
UNIT - IV	SNMP MANAGEMENT						(9)
SNMPv1: SNMP network management concepts – SNMP management information – standard MIB – SNMP protocol specification – SNMP Group – SNMPv2 – Protocol operations – SNMPv2 Management Information Base – Conformance Statements – SNMPv2 Management Information Base – Conformance Statements.							
UNIT - V	SWITCHING AND ROUTING						(9)
Traffic modeling and simulation – Self-similar and heavy tailed models – Buffering – Blocking – Fast Forwarding Internet traffic: Self-similarity – Ethernet traffic – World-Wide – Web traffic – IP Switching – IP multicast – Multicast routing.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Aravindhan
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Summarize the functions of common network protocols and the OSI and Internet protocol models	Understand
CO2	Analyze security challenges and performance optimization techniques in MAC layer management.	Analyze
CO3	Configure IPv6 addressing and implement its features in network environments.	Apply
CO4	Interpret SNMPv2 conformance statements to ensure compliance in network management systems.	Apply
CO5	Demonstrate the characteristics of self-similar and heavy-tailed traffic models in real network environments.	Apply

REFERENCES:

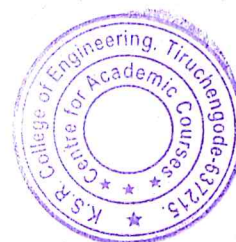
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2. William Stallings, "SNMP, SNMPv2, SNMPv3, RMON 1 AND 2", Third Edition, Pearson Education, 2009.
3. J. Richard Burke: Network management Concepts and Practices: a Hands-On Approach, PHI, 2008.
4. Morris, "Network management", 1st Edition, Pearson Education, 2008.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

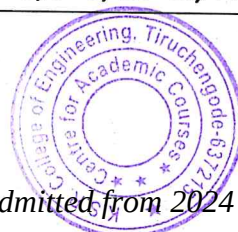
1-low, 2-medium, 3-high

S. Aravindhan
Chairman (BoS)



IT24E13	OBJECT ORIENTED PROGRAMMING IN PYTHON (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of Python - syntax, writing and invoking functions, creating variables, reading inputs, and generating outputs from the Python console, Familiarity with using a text editor or IDE, Knowledge on how to execute a Python program, Python keywords, Knowing how to raise exceptions in Python., reading and Writing Files, Understanding of Modules and Libraries.							
OBJECTIVES: This course aims to teach students how to design and implement software using OOP principles, focusing on concepts like classes, objects, inheritance, encapsulation, and polymorphism. The course will emphasize best practices for writing Pythonic code that is easy to understand, modify, and extend.							
UNIT - I	INTRODUCTION						(9)
Need for object oriented programming - Procedural Languages vs. Object oriented approach Characteristics Object oriented programming – Python Programming Basics: Basic Program Construction - Operators - Control Statements - Manipulators - Type conversion. Function Prototyping- call by reference, return by reference - Inline function- Default arguments - Function overloading.							
UNIT - II	OBJECTS AND CLASSES						(9)
Objects and Classes Simple Class - Constructors: Parameterized Constructors - Multiple Constructors in Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors - Destructors - Structures and Classes - Arrays and Strings.							
UNIT - III	OPERATOR OVERLOADING AND INHERITANCE						(9)
Operator Overloading : Need of operator overloading - Overloading Unary Operators - Overloading binary Operators - Overloading Special Operators - Data Conversion. Inheritance: Derived Class and Base Class - Derived Class Constructors - Overriding Member Functions - Class Hierarchies - Public and Private Inheritance - Levels of Inheritance - Multiple Inheritance.							
UNIT - IV	POLYMORPHISM AND FILE STREAMS						(9)
Polymorphism and File Streams: Virtual Function - Friend Function - Static Function - Assignment and Copy Initialization - Memory Management: new and delete Pointers to Objects - this Pointer- Streams:String I/O - Character I/O - Object I/O - I/O with Multiple Objects - File Pointers - Disk I/O with Member Functions - Error Handling in File I/O.							
UNIT - V	TEMPLATES AND EXCEPTION HANDLING						(9)
Templates: Introduction - Function Templates - Overloading Function Templates - user defined template - arguments - Class Templates - Exception Handling - Syntax, multiple exceptions - exceptions with arguments.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

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Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Understand and apply the correct syntax of control statements and perform type conversions in Python programs.	Understand
CO2	Explain the concept of constructors, their types, and demonstrate their usage in initializing objects and managing object creation processes in object-oriented programming.	Understand
CO3	Demonstrate the concepts of operator overloading and inheritance in object-oriented programming .	Understand
CO4	Summarize the concepts of polymorphism and file streams, and demonstrate their applications in developing flexible object-oriented programs and performing file input/output operations	Understand
CO5	Apply exception handling techniques in Python programs to identify, catch, and manage runtime errors, ensuring robust and error-resistant code execution.	Apply

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1. Steven F.Lott, Dusty Phillips, Python Object Oriented Programming, 4th Edition, Packet, 2021.
2. Dusty Phillips, Python 3 Object Oriented Programming, 2nd Edition, Packet, 2015.
3. Mark Lutz, Learning Python, Fifth Edition, O'Reilly, 2015.
4. Steven F.Lott, Mastering Object Oriented Python, 1st Edition, Packet, 2014.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	2	-	-	-	1
CO4	2	-	-	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gargya+

Chairman (Bos)



IT24E14	QUANTUM COMPUTING (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: To know about linear algebra, quantum mechanics, classical computing fundamentals, probability theory, and programming skills in languages like Python or Qiskit.							
OBJECTIVES: This course aims to equip learners with a foundational understanding of the principles and potential of quantum computation. Key objectives include differentiating quantum computing from classical computing, grasping the concept of qubits, and understanding how quantum gates and circuits operate. The course also often delves into specific quantum algorithms, their applications, and the challenges of building and programming quantum computers.							
UNIT - I	FOUNDATION						(9)
Basic Concepts of Quantum theory - Quantum Bits – The Leap from Classical to Quantum – Quantum state spaces – Single Qubit Systems – Multiple Qubit Systems – Quantum state transformations - Quantum mechanics - Application: super dense coding - Models for computation - The analysis of computational problems.							
UNIT - II	QUANTUM COMPUTATION						(9)
Quantum Circuits - Quantum algorithms - Single Orbit operations - Control Operations – Measurement - Universal Quantum Gates - Simulation of Quantum Systems - Quantum Fourier transform - Phase estimation – Applications - Quantum search algorithms - Quantum Counting - Speeding up the solution of NP - complete problems - Quantum Search for an unstructured database.							
UNIT - III	QUANTUM ALGORITHMS						(9)
Deutsch’s Algorithm - The Deutsch Jozsa Algorithm - Simon’s Periodicity Algorithm - Grover’s Search Algorithm - Shor’s Factoring Algorithm – Quantum Parallelism – Quantum Fourier Transform – Machine models and Complexity Classes.							
UNIT - IV	QUANTUM INFORMATION THEORY						(9)
Classical Cryptography - Distinguishing quantum states and the accessible information - Data compression - Classical information over noisy quantum channels - Quantum information over noisy quantum channels - Entanglement as a physical resource.							
UNIT - V	QUANTUM ERROR CORRECTION						(9)
Introduction - Short code - Theory of Quantum Error-Correction - Constructing Quantum Codes - Stabilizer codes - Fault Tolerant Quantum Computation - Entropy and information Shannon Entropy - Basic properties of Entropy - Von Neumann - Strong Sub Additivity.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargax
Chairman (PEC)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Understand the fundamental concepts of quantum computing and explore its potential applications across various domains.	Understand
CO2	Describe the principles of quantum computation and its fundamental operations.	Understand
CO3	Analyze various quantum algorithms and evaluate their effectiveness in solving computational problems.	Analyze
CO4	Apply the principles of quantum information theory to Analyze and solve problems in various case studies.	Evaluate
CO5	Discuss the various quantum error correction techniques and their importance in preserving quantum information.	Create

REFERENCES:

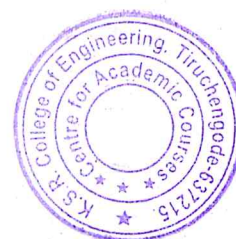
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Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Anjitha
Chairman (BOS)



IT24E15	BLOCKCHAIN TECHNOLOGY AND APPLICATIONS (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Familiarity with databases and networking protocols, including peer-to-peer networks, will help in understanding how decentralized systems operate. A basic understanding of cryptographic techniques, such as public-key encryption and digital signatures, is crucial as blockchain technology relies heavily on these for ensuring data integrity and security.							
OBJECTIVES: This course provides conceptual understanding of how block chain technology can be used to innovate and improve business processes.							
UNIT - I	BLOCKCHAIN FOUNDATION						(9)
Blockchain: Introduction – History – Features - Blockchain Terminologies - Different Version of Blockchain - Types of Blockchain – Benefits – Peer to Peer - Decentralization: Role in Blockchain - Components of Blockchain – Centralized - Decentralized and Distributed Systems.							
UNIT - II	CRYPTOGRAPHY IN BLOCKCHAIN						(9)
Cryptography: Introduction - Cryptography in Blockchain - Public and Private key Cryptography - Types of Cryptography - Cryptography and Network Security Principles - Data Encryption - Encryption algorithms - SHA-1 Hash - RC4 Encryption Algorithm - Hash Functions in System Security - Blowfish Algorithm – Data Integrity in Cryptography: Digital Signature.							
UNIT - III	BITCOIN AND CRYPTOCURRENCY						(9)
Crypto currency- creation of crypto currency - Initial coin offering (ICO) - Bitcoin Peer to Peer Network – Proof of Stake Mining Crypto currencies – Tracking. Bitcoin: Unspent Transaction Outputs UTXO - Bitcoin in Public perception.							
UNIT - IV	BITCOIN CONSENSUS						(9)
Consensus Algorithms in Block chain - Proof of Work (PoW) - Proof of Burn Consensus Algorithm - Proof of Stake (PoS) - Byzantine Generals Problem - Cryptographic Consensus Mechanisms - Delegated Proof of Stake - practical Byzantine Fault Tolerance(pBFT) - Paxos and Raft Algorithm.							
UNIT - V	HYPERLEDGER, ETHEREUM AND BLOCKCHAIN APPLICATIONS						(9)
Hyperledger: Understanding Hyperledger - Hyperledger fabric - Tools and its Applications - Ethereum: Basics of Ethereum Networks - Clients - Smart Contract in Ethereum - Tools used in Ethereum. Blockchain Applications: Smart Contract - Supply chain Industry - Digital fiat Currency - Cross border money Transfer - Insurance.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargya
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Acquire knowledge of blockchain technology by understanding its architecture, working principles, types, and real-world applications in secure digital transactions	Understand
CO2	Explain how these cryptographic algorithms are used in block chain and crypto currency systems	Understand
CO3	Analyze Bit coin's market behavior, including factors that drive its price fluctuations, investor interest	Analyze
CO4	Gain insights into Practical Byzantine Fault Tolerance (PBFT), its role in achieving consensus in a decentralized environment	Evaluate
CO5	Analyze the practical implications of Ethereum tools in real-world industries,	Analyze

REFERENCES:

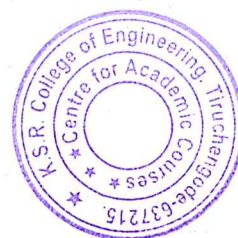
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4. Peter Lipovyanov, Blockchain for Business 2019: A user-friendly introduction to blockchain technology and its business applications, Packt Publishing Limited, January 2019.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gargaxt
Chairman (BOS)



K.S.R. College of Engineering 74 Applicable for Students admitted from 2024 - 2025 Onwards

COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Acquire knowledge on digital forensics by understanding its fundamental concepts and investigating methods for digital evidence.	Understand
CO2	Gain knowledge about digital crimes and the investigation processes involved in identifying, analyzing, and addressing cybercrime incidents using digital forensic techniques.	Understand
CO3	Examine digital evidence by understanding and applying data acquisition, identification, and analysis techniques for effective investigation and presentation of digital forensic findings.	Analyze
CO4	Investigate digital crime scenarios by identifying, extracting, and analyzing digital evidence using appropriate forensic tools and techniques while ensuring legal and ethical standards are followed.	Apply
CO5	Gain knowledge about various computer forensics tools and their functionalities in acquiring, analyzing, and reporting digital evidence during forensic investigations.	Understand

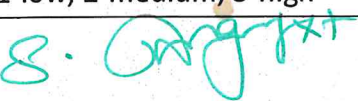
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1. Bill Nelson, Amelia Phillips & Christopher Steuart, "Guide to Computer Forensics and Investigations", Cengage Learning, 6th Edition, 2018.
2. Linda Volonino, Reynaldo Anzaldua, and Jana Godwin, "Computer Forensics: Principles and Practices", Pearson, 2017.
3. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2020.
4. Altheide .C & Carvey .H, "Digital Forensics with Open Source Tools", Syngress, 2018.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	2	-	-	-	-

1-low, 2-medium, 3-high


 Chairman (BOS)


IT24E17	SOCIAL NETWORK ANALYSIS (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: The students should be familiar with Data Structure and Algorithms, Python Programming.							
OBJECTIVES: This course aims to provide a comprehensive foundation in web technologies, semantic web evolution, and the rise of the social web and equip students with analytical and visualization techniques for online social network data. Also, to learn how to apply SNA techniques to analyze and solve practical problems across different domains. It examines practical applications of social network analysis in real-time emotion detection, opinion mining, and biometric systems.							
UNIT - I	INTRODUCTION						(9)
Introduction to Web – Limitations of Current Web – Development of Semantic Web – Emergence of the Social Web – Statistical Properties of Social Networks – Network Analysis – Development of Social Network Analysis – Key Concepts and measures in Network Analysis – Blogs and Online Communities – Web based Networks.							
UNIT - II	MODELING AND VISUALIZATION						(9)
Visualizing Online Social Networks - A Taxonomy of Visualizations - Graph Representation – Centrality - Clustering - Node Edge Diagrams - Visualizing Social Networks with Matrix - Node Link Diagrams – Hybrid Representations - Modeling and Aggregating Social Network Data - Random Walks and their Applications - Use of Hadoop and Map Reduce.							
UNIT - III	MINING COMMUNITIES						(9)
Aggregating and reasoning with Social Network Data - Advanced Representations – Extracting Evolution of Web Community from a Series of Web Archive – Detecting Communities in Social Networks – Evaluating Communities – Core Methods for Community Detection and Mining – Applications of Community Mining Algorithms – Node Classification in Social Networks.							
UNIT - IV	EVOLUTION						(9)
Evolution in Social Networks – Framework – Tracing Smoothly Evolving Communities – Model and Algorithm for Social Influence Analysis – Social Similarity and Influence – Influence Maximization in Virtual Marketing – Algorithms and Systems for Expert Location in Social Networks – Expert Location without Graph Constraints - Expert Location with Score Propagation – Expert Team Formation- Link Prediction in Social Networks – Feature based Link Prediction.							
UNIT - V	APPLICATIONS						(9)
A Learning Based Approach for Real Time Emotion Classification of Tweets – A New Linguistic Approach to Assess the Opinion of Users in Social Network Environment – Scientific and Technical Emergence Forecasting – Social Network Analysis for Biometric Template Protection.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargax
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the evolution from the traditional Web to the Semantic Web and Social Web, recognizing the limitations of earlier web architectures.	Understand
CO2	Construct and interpret social network visualizations using node-edge diagrams, matrix representations, and node-link layouts.	Understand
CO3	Apply advanced data representations to enhance the accuracy and depth of community detection.	Apply
CO4	Analyze models and algorithms for identifying smoothly evolving communities within dynamic network data.	Analyze
CO5	Explain the evolution from the traditional Web to the Semantic Web and Social Web, recognizing the limitations of earlier web architectures.	Understand

REFERENCES:

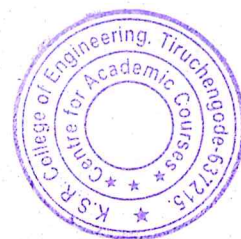
1. Guandong Xu, Yanchun Zhang "Web Mining and Social Networking – Techniques and Applications", Springer, 1st Edition, 2012.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", Springer, 1st Edition, 2011.
3. Przemyslaw Kazienko, Nitesh Chawla, "Applications of Social Media and Social Network Analysis", Springer, 2015.
4. Charu C, Aggarwal, "Social Network Data Analytics", Springer, 2014.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	2	-	-	-	-

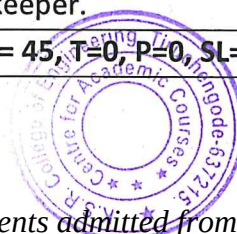
1-low, 2-medium, 3-high

S. Anjitha
Chairman (BOS)



IT24E18	BIG DATA AND ANALYTICS (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: The student should be familiar with database management systems and SQL which is essential for storing and querying large data sets. Also, they should have the understanding of basic statistics and data analysis techniques. This is useful for working with large datasets, performing data exploration, and deriving meaningful insights. Requires any basic programming knowledge for learning Hadoop.							
OBJECTIVES: This course covers foundational techniques and tools required for big data analytics. It focuses on concepts, principles and techniques applicable to any technology environment and industry and establishes a baseline for additional real-world experience. It provides in-depth knowledge on managing big data applications, giving insight on real-world big data management.							
UNIT - I	FUNDAMENTALS OF BIG DATA AND ANALYTICS	(9)					
Introduction to Big Data - Big Data Characteristics – Different Types of Big Data - Traditional Versus Big Data Approach – Big data Analytics Lifecycle – Enterprise Technologies and Big Data Business Intelligence - Big Data Challenges. Big Data Analytics: Classification of Analytics – Challenges – Importance of Big Data Analytics - Data Science - Data Scientist - Terminologies used in Big Data Environments - Top Analytics Tools.							
UNIT - II	STORING AND PROCESSING BIG DATA	(9)					
Big data Storage Concepts: Clusters – File Systems – Distributed File Systems – NoSQL – Sharding – Replication – CAP Theorem – ACID – BASE. Big data Processing Concepts: Parallel Data Processing – Hadoop – Processing Workloads – Processing in Batch mode - Processing in Realtime mode – On-Disk Storage Devices.							
UNIT - III	BIG DATA ANALYSIS & ANALYTICS TECHNIQUES	(9)					
Analysis Techniques: Quantitative Analysis - Qualitative Analysis – Statistical Analysis – Semantic Analysis – Visual Analysis – Case Study: Correlation – Regression – Time Series Plot – Clustering – Classification. Analytics Techniques: Predictive Analytics - Descriptive Analytics - Survival Analysis - Social Network Analytics.							
UNIT - IV	MONGODB, HADOOP AND MAPREDUCE PROGRAMMING	(9)					
MongoDB: Why Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. Hadoop: Apache Hadoop & Hadoop Ecosystem, Moving Data in and out of Hadoop - Data Serialization. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression.							
UNIT - V	HDFS, HIVE AND HIVEQL, HBASE	(9)					
HDFS-Overview - Installation and Shell, Java API - Hive Architecture and Installation - Comparison with Traditional Database - HiveQL Querying Data - Sorting And Aggregating - Map Reduce Scripts, Joins & Sub queries - HBase concepts, Advanced Usage - Schema Design - Advance Indexing, PIG, Zookeeper - Build Applications with Zookeeper.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargi
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Identify the type of data based on the characteristics of datasets, compare trivial data with big data and explain the lifecycle of data analytics for real world applications.	Understand
CO2	Discuss the storage and processing techniques for big data and apply them for a given scenario using Hadoop.	Understand
CO3	Analyze big data using quantitative, qualitative and machine learning approaches and implement regression, clustering and classification algorithm for a given big data application.	Analyze
CO4	Demonstrate the Map Reduce programming model to process the big data along with Hadoop tools.	Apply
CO5	Apply Zookeeper's coordination services by building distributed applications with synchronization, configuration management, and naming support.	Apply

REFERENCES:

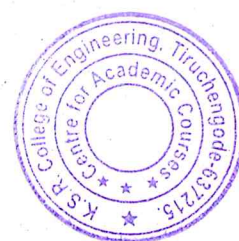
1. Michael Minelli Michelle Chambers and AmbigaDhiraj "Big Data Big Analytics: Emerging Business and Analytic trends for todaysBusiness", First Editionwiley, 2013.
2. Paul Buhler, Wajid khattak, Thomas Erl, "Big Data Fundamentals: Concepts, Drivers & Techniques", Second Edition, Prentice Hall, 2016.
3. Seema Acharya, SubhashiniChellappan, "Big Data and Analytics", Wiley Publications, First Edition, 2015.
4. Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, "Hadoop For Dummies", Wiley Publications, 2014.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gangyxt
Chairman (Bos)



IT24E19	ONTOLOGY AND SEMANTIC WEB (PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: A basic understanding of logic, specifically propositional and predicate logic, is important, as it underpins the principles of knowledge representation and reasoning. Familiarity with markup languages like XML and HTML, as well as an understanding of web development technologies such as HTTP, REST, and web services, will be helpful.							
OBJECTIVES: This course aims to provide a foundational understanding of ontologies and knowledge representation techniques that empower the Semantic Web. Students will explore the evolution from traditional web systems to intelligent, machine-process able web frameworks using ontology languages, semantic services, and linked data principles. Through practical tools and real-world case studies, learners will gain the skills to model, query, integrate, and apply semantic data effectively across diverse domains.							
UNIT - I	INTRODUCTION TO ONTOLOGIES AND KNOWLEDGE REPRESENTATION						(9)
Definition and purpose of ontologies - Real-world applications - Ontology development -lifecycle - Methodologies for ontology design - Tools for ontology engineering - Basics of knowledge representation - Description Logic (DL).							
UNIT - II	SEMANTIC WEB FUNDAMENTALS						(9)
Vision and goals of the Semantic Web - Differences between the traditional web and the Semantic Web - Resource Description Framework (RDF) - SPARQL query language - RDF Primer and SPARQL Query Language Specifications.							
UNIT - III	ONTOLOGY LANGUAGES AND SEMANTIC WEB SERVICES						(9)
Overview of OWL - OWL syntax and semantics - Using OWL for ontology modeling -Introduction to Semantic Web Services - OWL-S and other service ontologies.							
UNIT - IV	ONTOLOGY ALIGNMENT, INTEGRATION, AND LINKED DATA						(9)
Challenges of ontology alignment - Techniques for ontology matching and merging - Principles of Linked Data- Publishing and consuming Linked Data.							
UNIT - V	SEMANTIC WEB APPLICATIONS AND ADVANCED TOPICS						(9)
Case studies of Semantic Web applications - Trends and future directions - Ontology learning and automatic ontology generation - Semantic search and query expansion - Machine learning for the Semantic Web.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangotri
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe the vision and goals of the Semantic Web, emphasizing its potential to enhance web intelligence and data interoperability.	Understand
CO2	Differentiate the Semantic Web from the traditional web, and apply core technologies such as RDF and SPARQL to represent and retrieve semantic data.	Understand
CO3	Apply OWL-S and related service ontologies to model and enhance interoperability of web-based services within semantic frameworks.	Apply
CO4	Demonstrate the ability to publish and consume Linked Data using appropriate tools and frameworks for real-world applications.	Apply
CO5	Analyze the role of machine learning in enhancing Semantic Web capabilities, such as reasoning, data linking, and intelligent service discovery.	Analyze

REFERENCES:

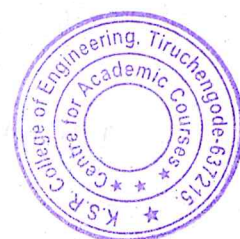
1. Dean Allemang and James Hendler , "Semantic Web for the Working Ontologist",2020.
2. Asunción Gómez-Pérez, Mariano Fernández-López, and Oscar Corcho, "Ontology Engineering" , 2018.
3. Toby Segaran, Colin Evans, and Jamie Taylor , "Programming the Semantic Web", 2011.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	1
CO2	2	-	-	-	1
CO3	3	-	2	-	1
CO4	3	-	2	-	1
CO5	3	-	2	-	1

1-low, 2-medium, 3-high

S. Gargya
Chairman (Bos)



IT24E20	AUGMENTED REALITY AND VIRTUAL REALITY PROFESSIONAL ELECTIVES – III and IV)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: The students must knowledge in programming languages such as C, C++, Swift, Python, Java, and JavaScript. Skill at using game engines such Unreal Engine and Unity. Familiarity with programming tools such as Git. The ability to use animation and design tools such as 3DS Max, Blender, and Maya.							
OBJECTIVES: This course aims to explore the concepts of augmented, virtual, and extended reality technologies. Through hands-on experience with tools such as Blender, Unity, and Unreal Engine, students will gain practical skills in 3D modeling, animation, rigging, scene design, and interactivity.							
UNIT - I	INTRODUCTION TO AR/VR/XR						(9)
Overview of AR, VR, and XR technologies - Applications and use cases - Introduction to Blender and related tools - Definition and concepts of AR, VR, and XR - Historical evolution and current trends - Comparison of AR/VR/XR technologies - Potential applications and use cases - Discussing real-world examples of AR/VR/XR applications.							
UNIT - II	GETTING STARTED WITH BLENDER						(9)
Overview of Blender interface and workspace - Basic navigation and manipulation of 3D objects Introduction to modeling tools and techniques - Understanding Blender's workflow for asset - Basic modeling techniques - UV unwrapping and texturing - advanced modeling tools and modifiers.							
UNIT - III	ADVANCED MODELING IN BLENDER						(9)
Advanced modeling techniques (e.g., subdivision modeling, sculpting) - UV unwrapping and texturing fundamentals - Introduction to Blender's material editor - Exploring Blender's modifier stack for non-destructive modeling.							
UNIT - IV	ANIMATION AND RIGGING						(9)
Key frame animation principles - Rigging basics: bones, armatures, and constraints - Weight painting and skinning - Introduction to Blender's animation tools and timeline - Integrating Blender with Unity and Unreal Engine : Overview of game engines (Unity and Unreal Engine) - Exporting Blender assets for use in Unity and Unreal Engine - Basics of scene setup and importing assets - Introduction to scripting and interactivity.							
UNIT - V	TESTING AND DEBUGGING STRATEGIES						(9)
Principles of scene composition and layout - Lighting techniques for AR/VR/XR environments Material and texture optimization for real-time rendering - Implementing basic interactions and user Interfaces - Techniques for optimizing assets and scenes for real-time performance - Building and deploying AR/VR/XR applications for different platforms - Testing and debugging strategies.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangaiah
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Compare the core features and capabilities of AR, VR, and XR technologies and their relevance in solving real-world problems.	Understand
CO2	Describe the Blender procedure used to prepare models for real-time rendering and interactivity, including UV unwrapping and texturing.	Understand
CO3	Apply advanced modeling techniques such as subdivision modeling and sculpting to create high-detail 3D assets.	Apply
CO4	Demonstrate foundational rigging techniques, including creating and manipulating bones, armatures, and constraints for character control.	Apply
CO5	Examine the strategies for asset and scene optimization, focusing on performance, memory efficiency, and responsiveness in real-time applications.	Analyze

REFERENCES:

1. The Essential Guide to Game Audio: The Theory and Practice of Sound for Games" by Steve Horowitz and Scott R. Looney, March 2014.
2. Jonathan Linowes "Unity Virtual Reality Projects: Learn Virtual Reality by Developing More Than 10 Engaging Projects with Unity", 2019.
3. Tomas Akenine-Möller, Eric Haines, and Naty Hoffman "Real-Time Rendering" August 2019.
4. Robert Scoble and Shel Israel, "The Fourth Transformation: How Augmented Reality & Artificial Intelligence Will Change Everything" , kindle Edition, December 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Gargax
Chairman (BoS)



IT24E21	APPLIED CYBER SECURITY ANALYTICS AND RISK MANAGEMENT (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Prerequisite for Applied Cyber security Analytics and Risk Management includes networks, threats, and vulnerabilities. To the foundational knowledge of risk management principles and their application in cyber security contexts.							
OBJECTIVES: This course aims to provide foundational and advanced knowledge in cyber security analytics and risk management. It enables students to understand threats, vulnerabilities, and risk mitigation using frameworks and analytical techniques. Learners will explore data collection, threat intelligence, and machine learning applications in cyber security. The course also prepares students to develop risk management plans and adapt to emerging cyber security trends and compliance needs.							
UNIT - I	INTRODUCTION TO CYBERSECURITY ANALYTICS AND RISK MANAGEMENT						(9)
Overview of Cyber security Landscape - Importance of Cyber security Analytics - Introduction to Risk Management in Cyber security - Key Concepts: Threats – Vulnerabilities – Risks and Controls – Cyber security Frameworks.							
UNIT - II	CYBERSECURITY THREAT INTELLIGENCE AND DATA COLLECTION						(9)
Threat Intelligence Lifecycle - Types of Threat Intelligence - Data Sources for Cyber Security Analytics - Tools for Data Collection - Data Preprocessing and Normalization - Ethical and Legal Considerations in Data Collection.							
UNIT - III	CYBERSECURITY ANALYTICS TECHNIQUES						(9)
Developing a Cyber security Risk Management Plan - Incident Response and Recovery Planning - Role of Automation and AI in Cyber security - Emerging Threats - Privacy and Compliance - Future Trends in Cyber security Analytics and Risk Management.							
UNIT - IV	RISK ASSESSMENT AND MANAGEMENT FRAMEWORKS						(9)
Risk Assessment Methodologies - Risk Identification, Analysis, and Evaluation - Risk Treatment Strategies - Cyber security Risk Metrics and KPIs- Continuous Monitoring and Risk Reporting - Integrating Risk Management into Organizational Processes.							
UNIT - V	APPLIED CYBER SECURITY RISK MANAGEMENT AND FUTURE TRENDS						(9)
Developing a Cyber security Risk Management Plan - Incident Response and Recovery Planning - Role of Automation and AI in Cyber security - Emerging Threats - Privacy and Compliance - Future Trends in Cyber security Analytics and Risk Management.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangaiah
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Understand the cyber security landscape, including key concepts such as threats, vulnerabilities, risks, controls, and frameworks essential for effective cyber security analytics and risk management.	Understand
CO2	Explain the threat intelligence lifecycle, types of threat intelligence, and ethical considerations involved in data collection and preprocessing for cyber security analytics.	Understand
CO3	Apply various cyber security analytics techniques including descriptive, diagnostic, predictive, and prescriptive analytics to detect, analyze, and mitigate cyber security threats.	Apply
CO4	Understand and implement risk assessment methodologies, including risk identification, analysis, evaluation, and treatment strategies within organizational contexts.	Understand
CO5	Develop and apply cyber security risk management plans, including incident response and recovery, while exploring the role of automation, AI, and emerging trends in enhancing cyber security resilience.	Apply

REFERENCES:

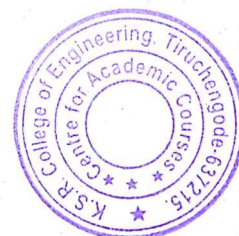
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Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	2	-	-	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Gargya
Chairman (Bos)



IT24E22	DEEP LEARNING AND APPLICATIONS (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Prerequisite for deep learning and applications includes Basic programming skills in Python and knowledge of machine learning fundamentals and understanding of mathematics, including linear algebra, calculus, and probability theory.							
OBJECTIVES: This course aims to provide a strong foundation in deep learning principles and practices. It covers neural networks, CNNs, RNNs, Transformers, GANs, and reinforcement learning. Students will explore deep learning frameworks like TensorFlow and PyTorch for practical implementation. The course also discusses emerging trends including healthcare applications, XAI, and privacy-preserving AI.							
UNIT - I	INTRODUCTION TO DEEP LEARNING					(9)	
Basics of Machine Learning and Neural Networks – History and Evolution of Deep Learning – Artificial Neural Networks (ANN) – Backpropagation and Optimization Techniques – Gradient Descent Variants – Regularization Techniques – Vanishing/Exploding Gradient Problem & Solutions – Hyper parameter Tuning and Model Selection-Introduction to Deep Learning Frameworks – Tensor Flow, PyTorch.							
UNIT - II	CONVOLUTIONAL NEURAL NETWORK					(9)	
Basics of Image Processing and Feature Extraction – Convolutional Layers and Pooling Techniques– CNN Architectures– Transfer Learning and Pretrained Models– Object Detection Techniques: R-CNN, Fast R-CNN, YOLO– Image Segmentation: U-Net, Mask R – CNN – Data Augmentation for CNNs – Challenges in Training CNNs & Solutions – Applications of CNNs: Medical Imaging - Face Recognition.							
UNIT - III	RECURRENT NEURAL NETWORKS (RNN) AND TRANSFORMERS					(9)	
Introduction to Sequential Data – Recurrent Neural Networks (RNNs) – Types of RNNs: Standard RNN, LSTM, and GRU – Challenges in RNNs: Exploding and Vanishing Gradients – Attention Mechanism – Introduction to Transformers – Popular Transformer Models: BERT and GPT– Deep Learning for Text Processing – Case Study: ChatGPT and Large Language Models (LLMs).							
UNIT - IV	GENERATIVE MODELS AND REINFORCEMENT LEARNING					(9)	
Generative Adversarial Networks (GANs) – Variational Auto encoders (VAEs) – Applications of GANs: Image Synthesis - Style Transfer – Introduction to Reinforcement Learning (RL) – Deep Q-Networks (DQN) and Policy Gradient Methods – Actor - Critic Algorithms – Reinforcement Learning Applications: Robotics, Gaming – Ethical Considerations in AI and Deep Learning - Audio and video summarization.							
UNIT - V	FUTURE DIRECTIONS IN DEEP LEARNING					(9)	
Deep Learning in Healthcare and Medical Diagnosis – Autonomous Systems: Self Driving Cars and Robotics – Explainable AI (XAI) and Model Interpretability – Federated Learning and Privacy - Preserving AI –Speech and Audio Processing with Deep Learning – AI for Drug Discovery and Smart Healthcare.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangaiah
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss the Fundamentals of Deep Learning.	Understand
CO2	Analyse different convolution neural network (CNN) architectures and interpret their roles in image recognition and feature extraction tasks.	Analyze
CO3	Analyze the mechanisms of Recurrent Neural Networks (RNNs) and Transformers.	Analyze
CO4	Exploring Generative Models and Reinforcement Learning.	Evaluate
CO5	Apply Deep Learning to Real-World Problems and Emerging Trends.	Apply

REFERENCES:

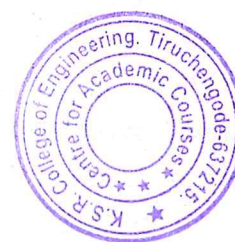
1. Sebastian Raschka and VahidMirjalili, "Python Machine Learning: Machine Learning and Deep Learning with Python".
2. Michael Nielsen, "Neural Networks and Deep Learning".
3. Tarek S. S. A. A., "Deep Learning with Tensor Flow 2 and Keras".
4. John D. Kelleher "Deep Learning: Theories and Algorithms for Learning from Data".

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Arghav
Chairman (BOS)



IT24E23	HUMAN COMPUTER INTERACTION TECHNIQUES (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Prerequisite for Advanced Algorithm includes Dynamic Programming methods, graph traversal techniques, brute-force and algorithms, NP-hard and NP-complete problems, probabilistic and randomized algorithms.							
OBJECTIVES: This course aims to introduce the principles of human-computer interaction and models of human information processing. It emphasizes user-centred design, usability engineering, and interface evaluation methods. Students will explore design principles, cognitive models, and interaction paradigms across diverse platforms. The course also covers collaborative systems, emerging interfaces like AR/VR, and adaptive support systems.							
UNIT - I	INTRODUCTION TO HUMAN-COMPUTER INTERACTION					(9)	
The Human - Information Processing – The Computer – Information Processing – Human Computer Interaction –Models, theories and frameworks in HCI – Ergonomics – Interaction Styles – Interactivity – Context of Interaction – Strategies for building interactive systems – Paradigms of Interaction.							
UNIT - II	DESIGNING INTERACTIVE SYSTEMS					(9)	
Introduction to basics of design – Process – User focus – Navigation – Screen design – Iteration and Prototyping – HCI in software process – Usability Engineering - Iteration and Prototyping –Design Rules – Principles – Standards – Guidelines – Golden rules and heuristics –Implementation support – Windowing systems – Programming in the application – Toolkits – User Interface Management Systems.							
UNIT - III	EVALUATION AND UNIVERSAL DESIGN PRINCIPLES					(9)	
Need for evaluation – Goals – Expert Analysis – User Participation and Feedback – Reporting Results - Choosing the evaluation method – Universal Design Principles – Multimodal Interaction – Designing for Diversity - Requirements for User support – Approaches - Adaptive help systems.							
UNIT - IV	MODELS AND THEORIES					(9)	
Cognitive Models – Goals & Task Hierarchies – Linguistic models – Challenges of the display based system – Physical – Device models – Socio- Organizational issues – Communication and collaboration – Face-to-face – conversation – text based – group working – Task analysis techniques – decomposition of task – knowledge-based analysis – entity-relationship based analysis – Dialog design model – design notations – graphical – textual – semantics – System models – formalisms – interactions – continuous behavior.							
UNIT - V	HCI IN COLLABORATIVE APPLICATIONS					(9)	
Groupware – Computer – Mediated Communication – Meeting & Decision Support – Sharedapplications and artifacts – Frameworks – Synchronous groupware – Ubiquitous computing –Virtual and Augmented Reality – Information & Data visualization – Web – Hypertext – Findingthings – Issues – Static web – Dynamic web.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargya
Chairman (BOB)



COURSE OUTCOMES:**At the end of the course, the students will be able to:**

COs	Course Outcome	Cognitive Level
CO1	Gain knowledge in models, theories related to human-computer interaction.	Understand
CO2	Apply user-centered design principles and guidelines for interactive systems.	Apply
CO3	Utilize appropriate evaluation methods and techniques to assess the usability and user experience of interactive systems	Apply
CO4	Analyze various HCI models, such as task models and dialogue models, to design interactive systems.	Analyze
CO5	Design HCI solutions for collaborative applications including groupware, AR/VR, and dynamic web interfaces.	Create

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2. Preece, J., Sharp, H., Rogers, Y., "Interaction Design: Beyond Human-Computer Interaction", Sixth Edition, Wiley, 2022.
3. Jonathan Lazar Jinjuan Heidi Feng, Harry Hochheiser, "Research Methods Human Computer Interaction", Second Edition, Morgan Kaufmann, 2021.
4. Ben Shneiderman, Catherine Plaisant, "Designing the User Interface: Strategies for Effective Human-Computer Interaction", Sixth Edition, Addison Wesley, 2021.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

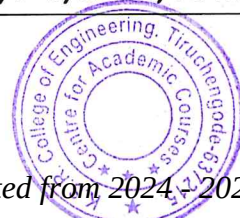
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Chairman (BOS)



IT24E24	AWS CLOUD SOLUTION ARCHITECTURE (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE:							
Prerequisite for AWS course includes cloud computing fundamentals, networking concepts, virtualization, storage services, IAM roles and policies, serverless computing, and basic Linux and scripting knowledge.							
OBJECTIVES:							
This course introduces the foundational concepts of cloud computing and Amazon Web Services (AWS).It covers key AWS components like EC2, S3, IAM, serverless computing, and security management. Students will gain hands-on experience in deploying, configuring, and managing AWS services. The course also explores pricing models, automation, and application services for real-world cloud applications.							
UNIT - I	INTRODUCTION TO CLOUD COMPUTING AND AWS						(9)
Introduction to Cloud Computing – Cloud service and deployment Models – various cloud computing products offered by AWS- AWS - AWS architecture and the AWS console - Virtualization in AWS – AWS EC2.							
UNIT - II	ELASTIC COMPUTE CLOUD						(9)
Know Your EC2 Region – Discuss About SSH Key Pair – Launching Our First EC2 Instance Using Launch Wizard – Launching EC2 Instance Using Launch Template – Create Custom AMI – Know What is Private IP and Public IP – EC2 Instance Types & Pricing Models – EC2 Spot Instance - Reserved Instance and Host – EC2 Auto Scaling – AWS Graviton Instances.							
UNIT - III	AWS STORAGE						(9)
Introduction to AWS Storage – Pre-S3 – online cloud storage – API - S3 consistency models - Storage hierarchy - buckets in S3 - Objects in S3 - metadata and storage classes - Databases and InMemory Data Stores - Amazon RDS - DynamoDB.							
UNIT - IV	SECURITY MANAGEMENT IN AWS						(9)
Identity Access Management (IAM) – Various access policies across – AWS Services Security Token Services – AWS Resource Access Manager (RAM) – AWS Single Sign On (SSO) – AWS Cognito – AWS Security & Encryption: KMS - Cloud HSM – Shield – WAF – Guard Duty – API keys service access – Best practices for IAM – Access billing and create alerts on billing.							
UNIT - V	APPLICATION SERVICES						(9)
AWS Simple Email Service (SES) – Implement SES – Demonstrate the working of SNS SQS: Work with SQS - ASG with SQS – Amazon MQ – Amazon Event Bridge – AWS Simple Notification Service (SNS) – AWS Simple Work Flow (SWF) – AWS Lambda AWS Serverless Application.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargya
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss the core principles of AWS Cloud Computing, including service models, deployment types, and global infrastructure.	Understand
CO2	Configure and launch EC2 instances using the AWS Management Console and CLI, selecting appropriate instance types and settings.	Apply
CO3	Analyze various AWS storage services (S3, EBS, Glacier) and determine suitable data migration strategies based on performance, cost, and durability.	Analyze
CO4	Assign and manage IAM roles and permissions to control secure access for EC2 instances and other AWS resources.	Apply
CO5	Evaluate AWS tools and services (e.g., Elastic Beanstalk, Cloud Formation) to automate, deploy, and manage applications effectively.	Evaluate

REFERENCES:

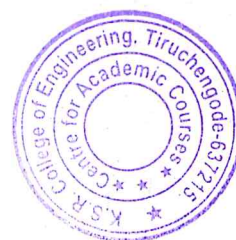
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2. Theo H King, "AWS: The Ultimate Guide From Beginners To Advance For The Amazon Web Services", 2020 Edition.
3. Aurobindo Sarkar, "Learning AWS" - Second Edition, 2018.
4. Learning Amazon Web Services (AWS): A Hands-On Guide to the Fundamentals of AWS Cloud 1st Edition by Mark Wilkins.
5. <https://elearn.nptel.ac.in/shop/iit-workshops/completed/amazon-web-services-aws/?v=c86ee0d9d7ed>.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

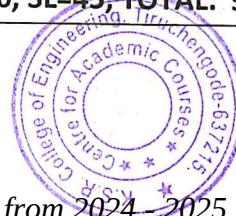
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S. Aravindhan
Chairman (BoS)



IT24E25	INTERNET OF THINGS (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: The students should participate actively in creative thinking exercises. IOT is futuristic and will require students to understand other technologies and current uses where IOT can be integrated to make a make a quantum jump in the efficiencies in application. Also requires basic programming knowledge to build IoT related applications.							
OBJECTIVES: This course covers the fundamentals of IoT architecture and system design. Students learn to build IoT applications using Raspberry Pi and explore use cases in smart cities and healthcare.							
UNIT - I	INTRODUCTION TO IoT	(9)					
Evolution of Internet of Things – Characteristics - Physical& Logical Design – IoT Enabling Technologies – IoT Levels& Deployment Templates – Domain Specific IoTs – Challenges in IoT - IoT System Management with NETCONF YANG – IoT Platforms Design Methodology – Fog, Edge, Cloud in IoT.							
UNIT - II	IoT ARCHITECTURE – STATE OF THE ART	(9)					
Simplified IoT Architecture – Core IoT Functional Stack - IoT and M2M –SDN and NDF for IoT - M2M high level ETSI architecture – IETF architecture for IoT – OGC architecture – IoT reference model – Domain model – Information Model – Functional Model – Communication Model and API's.							
UNIT - III	IoT PROTOCOLS	(9)					
Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BAC Net Protocol – Mod bus – Zig bee Architecture – Network layer – 6LowPAN – CoAP – MQTT – AMQP – Bluetooth Low Energy – Z-wave – Security.							
UNIT - IV	BUILDING IoT WITH RASPBERRY PI	(9)					
Building IOT with RASPBERRY PI – IoT Systems – Logical Design using Python – IoT Physical Devices & Endpoints – IoT Device – Building blocks – Raspberry Pi Board – Linux on Raspberry Pi – Raspberry Pi Interfaces – Python Programming with Raspberry Pi – Controlling output – Reading input from pins.							
UNIT - V	CASE STUDIES AND APPLICATIONS	(9)					
Business models for the internet of things – Smart and connected Cities – Smart Traffic – Smart Parking – Smart Home Automation – Smart Agriculture – Smart Health – Smart Grid – Weather Monitoring.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangaiah
Chairman (HOD)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the fundamental concepts, components, and characteristics of the Internet of Things (IoT).	Understand
CO2	Discuss the architecture and layered design models of IoT systems.	Understand
CO3	Analyze various communication protocols and standards used in IoT networks.	Analyze
CO4	Develop basic IoT applications using Raspberry Pi and Python programming.	Create
CO5	Analyze real-time applications and use cases of IoT in different domains such as healthcare, smart cities, and industrial automation.	Analyze

REFERENCES:

1. Arshdeep Bahga Vijay Madisett, Internet of Things – A hands on approach, Universities Press ,2015
2. Dieter Uckelmann Mark Harrison Michahelles Florian (Eds), Architecting the Internet of Things, Springer 2011
3. Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things – Key applications and Protocols”, Wiley, 2012

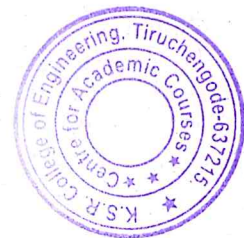
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	2
CO2	2	-	-	-	2
CO3	3	-	2	-	2
CO4	3	-	2	-	2
CO5	3	-	2	-	2

1-low, 2-medium, 3-high

S. Gargya X

Chairman (BOS)



IT24E26	GPU COMPUTING (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: The students shall have the Knowledge of Programming in C Language and Python programming and also have the knowledge on Data Structure and also known about Computer architecture and operating systems concept.							
OBJECTIVES: This course introduces parallel computing and GPU architectures with a focus on CUDA programming. Students learn to develop optimized GPU-accelerated applications using tools like cuDNN and TensorRT.							
UNIT - I	INTRODUCTION TO PARALLEL COMPUTING AND GPU ARCHITECTURE						(9)
Introduction to Parallel Computing: Concepts of parallelism - concurrency and distributed computing - Different parallel architectures (shared memory and distributed memory) - Amdahl's Law and performance analysis - Motivations for using GPUs - GPU Architecture: Overview of GPU architecture - Comparison of CPU and GPU architectures - Understanding the strengths and weaknesses of GPUs - GPU generations and trends.							
UNIT - II	CUDA PROGRAMMING MODEL						(9)
CUDA Kernels: CUDA programming model – Threads - blocks and grids - Execution model: Warps and scheduling - Understanding thread execution and mapping to hardware - Memory Management: Memory types in CUDA-Memory allocation and deallocation on the GPU - Data transfer between CPU and GPU - Understanding the Single Instruction Multiple Thread (SIMT) execution model - Data parallelism and task parallelism on GPUs.							
UNIT - III	CUDA PROGRAMMING TECHNIQUES AND OPTIMIZATION						(9)
Synchronization: Thread synchronization within a block (shared memory- barriers) . Atomic operations. Synchronization between blocks (global memory- streams) . Kernel Optimization: Profiling and performance analysis tools . Identifying and addressing performance bottlenecks . Loop unrolling - loop fusion and other optimization techniques . Introduction to profiling tools. Memory Coalescing and Bank Conflicts: Understanding memory access patterns and their impact on performance - Optimizing memory access for coalescing and avoiding bank conflicts in shared memory.							
UNIT - IV	PARALLEL ALGORITHMS AND APPLICATIONS						(9)
Parallel Algorithms: Reduction- Scan (Prefix Sum)- Histogramming – Sorting – Searching - Implementing These Algorithms On Gpus. Matrix Operations: Parallel Matrix Multiplication - Vector Operations - Other Linear Algebra Operations On Gpus - Libraries For Linear Algebra (Cublas). Image And Signal Processing: Introduction To Image Processing Concepts - Implementing Basic Image Filtering And Manipulation Algorithms On Gpus.							
UNIT - V	DEEP LEARNING & GPU APPLICATIONS						(9)
Introduction to GPU - Accelerated Deep Learning - Overview of deep learning frameworks (TensorFlow and PyTorch) - GPU acceleration in neural networks - Introduction to cuDNN and TensorRT. GPU Applications in AI & Scientific Computing: GPU in image processing and computer vision - Financial modeling and realtime analytics - GPU accelerated cryptography							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. G. J. A.
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe the principles of parallel computing and the architecture of modern GPUs.	Understand
CO2	Write and debug CUDA programs for parallel execution on GPUs.	Apply
CO3	Optimize CUDA code for performance using various techniques, including memory management and kernel optimization.	Apply
CO4	Develop and implement parallel algorithms using CUDA for various computational tasks, including matrix operations, image processing, and basic deep learning operations.	Analyze
CO5	Develop and implement a GPU-accelerated solution for a complex problem in a relevant domain.	Analyze

REFERENCES:

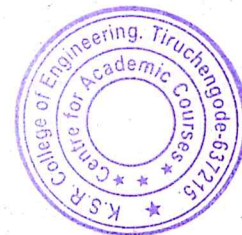
1. R. Chandra, L. Dagum "Parallel Programming for Multicore and Manycore Architectures" .
2. Eli Stevens, Luca Antiga, and Thomas Viehmann "Deep Learning with PyTorch".
3. NVIDIA Developer Website: <https://developer.nvidia.com/>
4. CUDA C Programming Guide (Available on the NVIDIA website)

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high


Chairman (BOS)



IT24E27	INTERACTIVE AND DIGITAL MARKETING (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Prerequisite for Interactive and Digital Marketing includes Basic Computer and Internet Skills, Software Engineering, familiarity with data analytics tools, understanding of social media platforms.							
OBJECTIVES: This course covers the fundamentals of digital marketing, consumer behavior, and communication strategies. Students learn to apply SEO, SEM, email, and mobile marketing while analyzing digital campaigns.							
UNIT - I	BASICS OF DIGITAL MARKETING					(9)	
Evolution of Digital Marketing – Digital Marketing an Introduction – Internet Marketing: Underlying Technology and Frameworks – Digital Marketing Framework – Factors Impacting Digital Marketplace –Value Chain Digitization – The Consumer for Digital Marketing – Consumer Behavior on the Internet – Evolution of Consumer Behavior Models – Managing Consumer Demand – Integrated Marketing Communications							
UNIT - II	SEARCH ENGINE OPTIMISATION					(9)	
Search Engine optimization - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement.							
UNIT - III	DIGITAL MARKETING PLANNING AND SETUP					(9)	
Digital Marketing Communications and Channel Mix: Digital Marketing Planning Development – Designing the Communication Mix – Introduction to Digital Marketing Channels. Digital Marketing Operations Setup : Understanding Digital Marketing Conversion – Basics of Web Development and Management – User Experience, Usability, and Service Quality Elements.							
UNIT - IV	DIGITAL MARKETING EXECUTION					(9)	
Digital Marketing Campaign Management: Basic Elements of Digital Campaigns – Basic Elements of Digital Campaign Management – Implementing Intent – Based Campaigns (Search Execution) – Implementing Brand – Based Campaigns (Display Execution) – Campaign Execution for Emerging Marketing Models – Campaign Analytics and Marketing Rol. Digital Marketing Execution Elements – Managing Digital Marketing Revenue – Managing Service Delivery and Payment – Managing Digital Implementation Challenges.							
UNIT - V	E- MAIL MARKETING					(9)	
E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation – Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. Mobile Marketing- Mobile Inventory/channels- Location based; Context based; Coupons and offers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargax
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Illustrate the basic concepts, strategies, and tools used in digital marketing.	Understand
CO2	Carry out various search engine optimization (SEO) techniques to improve website visibility and ranking.	Analyze
CO3	Illustrate the steps involved in digital marketing planning and campaign setup.	Analyze
CO4	Demonstrate the ability to manage and monitor digital marketing campaigns effectively across platforms.	Analyze
CO5	Apply suitable techniques and best practices for executing successful e-mail marketing campaigns.	Apply

REFERENCES:

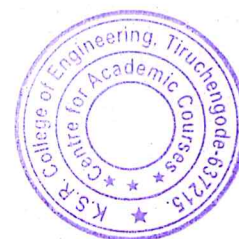
1. Puneet Bhatia, "Fundamentals of Digital Marketing".
2. Vandana Ahuja, "Digital Marketing".
3. R S N Pillai, Bagavathi, "Modern marketing Principles and Practices".
4. Dominik Kosorin, "Introduction to Programmatic Advertising".
5. Philip Kotler, "Marketing 4.0: Moving from Traditional to Digital".

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Arjun
Chairman (Bos)



IT24E28	COGNITIVE SCIENCE (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3

PREREQUISITE:

Students are expected to have a foundational understanding of psychology, computer science, or neuroscience, along with basic knowledge of logic, mathematics, or statistics.

OBJECTIVES:

This course introduces the core concepts of cognitive science, integrating AI, psychology, neuroscience, and computer science. It covers learning, language, reasoning, decision-making, and emotions.

UNIT - I	INTRODUCTION TO COGNITIVE SCIENCE	(9)
The Cognitive view – Some Fundamental Concepts – Computers in Cognitive Science – Applied Cognitive Science – The Interdisciplinary Nature of Cognitive Science – Artificial Intelligence: Knowledge representation - The Nature of Artificial Intelligence - Knowledge Representation & Planning – Artificial Intelligence: Search, Control, and Learning. Planning and Acting in the Real World		
UNIT - II	COGNITIVE PSYCHOLOGY	(9)
Cognitive Psychology – The Architecture of the Mind - The Nature of Cognitive Psychology- A Global View of the Cognitive Architecture - Propositional Representation- Schematic Representation- Cognitive Processes, Working Memory, and Attention- The Acquisition of Skill - The Connectionist Approach to Cognitive Architecture.		
UNIT - III	COGNITIVE NEUROSCIENCE	(9)
Brain and Cognition Introduction to the Study of the Nervous System – Neural Representation – Neuropsychology- Computational Neuroscience - The Organization of the mind - Organization of Cognitive systems - Strategies for Brain mapping – A Case study : Exploring mind reading.		
UNIT - IV	LANGUAGE ACQUISITION, SEMANTICS AND PROCESSING MODELS, LEARNING	(9)
Milestones in Acquisition – Theoretical Perspectives- Semantics and Cognitive Science – Meaning and Entailment – Reference – Sense – Cognitive and Computational Models of Semantic Processing– Information Processing Models of the Mind- Physical symbol systems and language of thought- Applying the Symbolic Paradigm- Neural networks and distributed information processing. Knowledge in Learning, Reinforcement Learning		
UNIT - V	HIGHER-LEVEL COGNITION	(9)
Reasoning – Decision Making – Computer Science and AI : Foundations & Robotics – New Horizons- Dynamical systems and situated cognition – Challenges – Emotions and Consciousness- Physical and Social Environments– Applications.		

L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS

COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Explain the basics of Cognitive Science with focus on acquisition, representation and use of knowledge by individual minds, brains, and machines	Understand
CO2	Apply the role of neuro -science in the cognitive field	Apply
CO3	Apply the role of neuro-science in the cognitive field.	Apply
CO4	Compare the computational models for semantic processing.	Analyze
CO5	Discuss the role of reasoning in cognitive processing.	Analyze

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2. David Wood, "Linking government Data", Springer Science&BusinessMedia, 2011.
3. Jure Leskovec, Anand Raja Raman, Jeffrey David Ullman, "Mining of Massive Data sets", Cambridge University Press, 2014
4. Russell, Stuart J., and Peter Norvig. *Artificial Intelligence: A Modern Approach*. 2nd ed. Upper Saddle River, N.J.: Prentice Hall/Pearson Education, 2003. ISBN: 0137903952

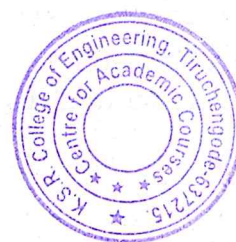
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

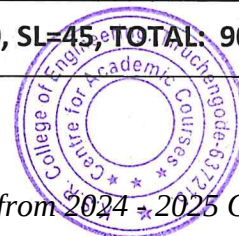
S. Gangaiah

Chairman (BOS)



IT24E29	DATA VISUALIZATION (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of statistics, programming (Python/R), and data analysis							
OBJECTIVES: This course aims to provide a strong foundation in data visualization concepts and techniques. It helps students understand different data types, visual variables, and perception-based design.							
UNIT - I	INTRODUCTION TO DATA VISUALIZATION					(9)	
Basics - Relationship between Visualization and Other Fields -The Visualization Process - Pseudo code Conventions - The Scatter plot. Data Foundation - Types of Data - Structure within and between Records - Data Pre-processing - Data Sets							
UNIT - II	FOUNDATIONS FOR VISUALIZATION					(9)	
Visualization stages - Semiology of Graphical Symbols - The Eight Visual Variables – Historical Perspective - Taxonomies - Experimental Semiotics based on Perception Gibson’s Affordance theory – A Model of Perceptual Processing.							
UNIT - III	VISUALIZATION TECHNIQUES					(9)	
Spatial Data: One-Dimensional Data - Two-Dimensional Data – Three Dimensional Data - Dynamic Data - Combining Techniques. Geospatial Data : Visualizing Spatial Data - Visualization of Point Data -Visualization of Line Data - Visualization of Area Data – Other Issues in Geospatial Data Visualization Multivariate Data : Point-Based Techniques - LineBased Techniques - Region-Based Techniques - Combinations of Techniques – Trees Displaying Hierarchical Structures – Graphics and Networks- Displaying Arbitrary Graphs/Networks.							
UNIT - IV	INTERACTION CONCEPTS AND TECHNIQUES					(9)	
Text and Document Visualization: Introduction - Levels of Text Representations - The Vector Space Model - Single Document Visualizations -Document Collection Visualizations – Extended Text Visualizations Interaction Concepts: Interaction Operators - Interaction Operands and Spaces - A Unified Framework. Interaction Techniques: Screen Space - Object-Space –Data Space - Attribute Space- Data Structure Space - Visualization Structure – Animating Transformations - Interaction Control.							
UNIT - V	RESEARCH DIRECTIONS IN VISUALIZATIONS					(9)	
Steps in designing Visualizations – Problems in designing effective Visualizations- Issues of Data. Issues of Cognition, Perception, and Reasoning. Issues of System Design Evaluation , Hardware and Applications							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gargi
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discuss the Visualize of objects in different dimensions.	Understand
CO2	Analyze the process of data for Visualization.	Analyze
CO3	Apply the visualization techniques in physical sciences, computer science, applied mathematics and medical sciences.	Apply
CO4	Assess the virtualization techniques for research projects.	Evaluate
CO5	Identify appropriate data visualization techniques given particular requirements imposed by the data.	Apply

REFERENCES:

1. Matthew Ward, Georges Grinstein and Daniel Keim, "Interactive Data Visualization Foundations, Techniques, Applications", 2010.
2. Colin Ware, "Information Visualization Perception for Design", 4th edition, Morgan Kaufmann Publishers, 2021.
3. Robert Spence "Information visualization – Design for interaction", Pearson Education, 2nd Edition, 2007.
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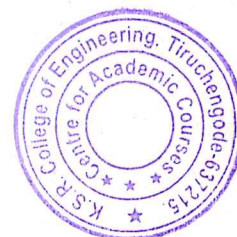
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

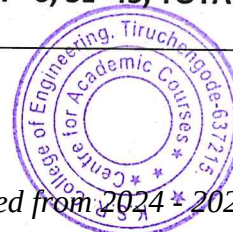
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Chairman (BOS)



IT24E30	ADVANCED BUSINESS ANALYTICS WITH R (PROFESSIONAL ELECTIVES – V and VI)	Category	L	T	P	SL	C
		PEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of statistics, probability, and data analysis is required to understand analytical concepts in R Programming fundamentals and business or engineering applications will enhance practical learning and implementation.							
OBJECTIVES: This course equips students with advanced business analytics skills using R, covering data handling, visualization, and statistical modeling. It introduces predictive and machine learning techniques for real-world problem solving.							
UNIT – I	FUNDAMENTAL OF ADVANCED BUSINESS ANALYTICS IN R					(9)	
Introduction to Advanced Business Analytics - Types of Business Analytics: Descriptive, Predictive, and Prescriptive - R programming fundamentals - Data types, structures, and control statements - Data Wrangling and Pre processing - Data Visualization with R.							
UNIT – II	STATISTICAL METHODS AND PROBABILITY FOR BUSINESS ANALYTICS					(9)	
Descriptive Statistics: Mean, median, mode - Probability Distributions and Data Modeling: Normal, Poisson, Binomial, Exponential distributions - Regression and Predictive Modeling: Logistic regression and Generalized Linear Models (GLM).							
UNIT– III	PREDICTIVE MODELING AND MACHINE LEARNING IN R					(9)	
Introduction to Predictive Analytics - Regression Analysis in R - Logistic regression for classification - Classification Models in R: Decision Trees - Random Forest Classifier- Naïve Bayes Classifier - Model Evaluation Techniques - Performance metrics.							
UNIT–IV	ADVANCED ANALYTICS AND TIME SERIES FORECASTING					(9)	
Statistical Forecasting Models – Forecasting Models for Stationary Time Series – Time Series Analysis and Forecasting - Text Analytics and Sentiment Analysis - NLP in R.							
UNIT – V	BUSINESS APPLICATIONS & CASE STUDY IN ANALYTICS					(9)	
Business Applications of Analytics : Customer segmentation, campaign optimization - Marketing analytics-Fraud detection, credit scoring models - Financial analytics- Employee attrition prediction, workforce analytics -HR analytics- Demand forecasting, price optimization.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Ganguly
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe data pre-processing and visualization techniques in R for business insights.	Understand
CO2	Apply statistical methods and probability distributions for decision-making.	Apply
CO3	Apply predictive models using machine learning algorithms in R	Apply
CO4	Implement time series forecasting and optimization techniques for business applications.	Apply
CO5	Analyze real-world case studies in business analytics using R	Analyze

REFERENCES:

1. Data Science for Business and Decision Making – Luiz Paulo Fávero & Patrícia Belfiore.
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3. Business Analytics: Data Analysis & Decision Making – S. Christian Albright & Wayne L. Winston.
4. Applied Predictive Analytics: Principles and Techniques for the Professional Data Analyst – Dean Abbott.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	3	-	2	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

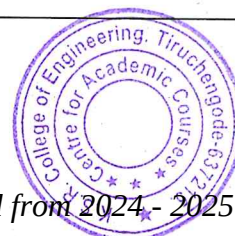
1-low, 2-medium, 3-high

S. Aravind
Chairman (BOS)



IT24O01	IOT FOR SMART SYSTEM (OPEN ELECTIVE)	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge about electronics, microcontrollers (Arduino, Raspberry Pi), networking (Wi-Fi, MQTT), and programming (Python, C/C++).							
OBJECTIVES: This course aims to provide a basic understanding of the Internet of Things (IoT) and its components like sensors, actuators, and processors. It covers IoT architecture, communication protocols, and wireless technologies.							
UNIT - I	INTRODUCTION TO INTERNET OF THINGS						(9)
Overview, Hardware and software requirements for IOT - Sensor and actuators - Technology drivers - Business drivers - Typical IoT applications - Trends and implications.							
UNIT - II	IOT ARCHITECTURE						(9)
IoT reference model and architecture - Node Structure - Sensing, Processing, Communication, Powering, Networking - Topologies, Layer/Stack architecture, IoT standards, Cloud computing for IoT, Bluetooth, Bluetooth Low Energy beacons.							
UNIT - III	PROTOCOLS AND WIRELESS TECHNOLOGIES FOR IOT PROTOCOLS						(9)
NFC, SCADA and RFID - Zigbee MIPI - M-PHY - UniPro - SPMI, SPI, M-PCIe GSM - CDMA, LTE, GPRS, small cell. Wireless technologies for IoT: WiFi (IEEE 802.11) - Bluetooth/Bluetooth Smart - ZigBee / ZigBee Smart - UWB (IEEE 802.15.4) - 6LoWPAN - Proprietary systems - Recent trends.							
UNIT - IV	IOT PROCESSORS						(9)
Services/Attributes: Big-Data Analytics for IOT – Dependability – Interoperability - Security, Maintainability. Embedded processors for IOT: Introduction to Python programming - Building IOT with RASPERRY PI and Arduino.							
UNIT - V	CASE STUDIES						(9)
Industrial IoT - Home Automation - smart cities - Smart Grid - connected vehicles - electric vehicle charging – Environment – Agriculture - Productivity Applications - IOT Defence.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. Gangaiah
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Discover the concepts of IoT and its present developments.	Analyze
CO2	Compare and contrast different platforms and infrastructures available for IoT.	Analyze
CO3	Explain different protocols and communication technologies used in IoT.	Understand
CO4	Compare the big data analytic and programming of IoT.	Analyze
CO5	Implement IoT solutions for smart applications.	Apply

REFERENCES:

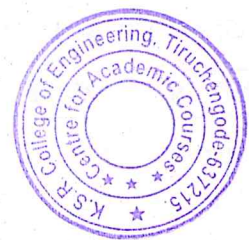
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3. Samuel Greengard, "The Internet of Things", The MIT press, 2015.
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Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	3	-	2	-	-
CO2	3	-	2	-	-
CO3	2	-	-	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Anjitha
Chairman (BOS)



S. Gargya
Chairman (BOS)

COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Describe the components of multimedia authoring tools.	Understand
CO2	Demonstrate the concepts of computer networks and their role in multimedia communication.	Understand
CO3	Experiment the results of Bayesian analysis and communicate findings effectively.	Analyze
CO4	Explain the performance of context-based methods using relevant metrics	Evaluate
CO5	Categories the various feature extraction techniques and 3D modalities.	Analyze

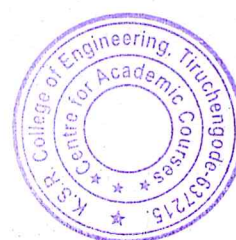
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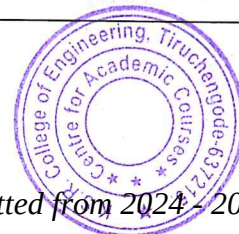
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high


Chairman (Bos)

S. Grogan
Chairman (BOS)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Demonstrate traditional and agile software process models, and explain the need, practices, and challenges of adopting DevOps.	Understand
CO2	Describe cloud-based platforms (IaaS, PaaS, SaaS), virtualization, and operational services required for supporting DevOps.	Understand
CO3	Build the concepts of micro services, continuous integration, and deployment pipelines for effective software delivery and testing.	Apply
CO4	Utilize automation tools for infrastructure management, configuration, performance monitoring, and deployment in DevOps environments.	Apply
CO5	Apply MLOps practices to develop, deploy, and manage machine learning models effectively, addressing real-world challenges and ensuring model governance.	Apply

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2. Joakim Verona "Practical DevOps" - Packet Publishing, 2016.
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4. Mark Treveil, and the Dataiku Team "Introducing MLOps" - O'Reilly Media- 2020.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

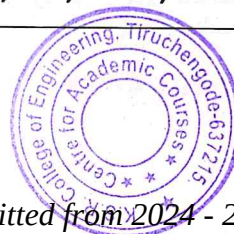
S. Aravindhan
Chairman (BOS)



IT24O04	CYBER SECURITY AND DIGITAL AWARENESS (OPEN ELECTIVE)	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: The students shall have the Knowledge in Basic computer operation, Network management, Programming skills, Security tools and platform							
OBJECTIVES: This course is to provide students with a practical understanding of cybersecurity principles, threat landscapes, and digital awareness. It aims to expose learners to common cyber threats such as malware, phishing, and advanced persistent threats, and to equip them with hands-on skills in identifying and mitigating these attacks using industry-standard tools.							
UNIT - I	APPLICATION OF CYBER SECURITY						(9)
Introduction to Cyber security: Overview of Cyber security principles and concepts – Threat landscape and current trends – Importance of cyber threat intelligence and Digital awareness.							
UNIT - II	DIGITAL AWARENESS AND CYBER THREATS						(9)
Malware: types, characteristics and propagation techniques – Social Engineering: Phishing – spear phishing and social media attacks - Ransomware attacks - Man in the middle attacks-Denial of Service (DoS) and Distributed denial of service attacks (DDoS) - Password attacks-drive by download attacks – Keylogging - Packet Sniffing-Bug Bounties-Breaking Caesar Cipher-SQL Injection - Password Strength – Advanced Persistent Threats (APTs) and Targeted Attacks							
UNIT - III	APPLYING TOOLS IN CYBER SECURITY						(9)
Tools and Techniques to perform Packet Sniffing, SQL Injection, Password Strength Analysis, Discovery and risk detection in remote hosts by listening open ports – Network Security Vulnerabilities: Network Protocols and vulnerabilities – Wireless Network Vulnerabilities and attacks – Network Scanning and reconnaissance techniques - Network security monitoring tools - Encryption tools - Web vulnerability scanning tools.							
UNIT - IV	NETWORK EXPLORATION AND WEB VULNERABILITIES						(9)
HTTP methods enumeration – HTTP proxy check – Discovering directories in web servers – User account enumeration – Detecting XST vulnerabilities and Detecting XSS vulnerabilities – Brute forcing DNS records.							
UNIT - V	WEB APPLICATION SECURITY						(9)
Common vulnerabilities in web applications - Session hijacking and Cross-Site Request Forgery (CSRF) attacks - Security best practices for web development - Web application firewalls and security testing tools – Case Study(Cyber security)1 : SQL injection, Cross-Site Scripting in real time applications, Case Study(Digital awareness)2 : Cyber security attacks Cyber crime frauds and safety tips.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S. G. J. X+

Chairman (Bos)



COURSE OUTCOMES:

At the end of the course, the students will be able to:

COs	Course Outcome	Cognitive Level
CO1	Understand the fundamental principles, concepts, and current trends in cyber security and cyber threat intelligence.	Understand
CO2	Understand various types of cyber threats including malware, phishing, denial-of-service attacks, SQL injection, and other common attack vectors.	Understand
CO3	Apply cyber security tools and techniques such as packet sniffing, SQL injection testing, and password strength analysis to detect and analyze vulnerabilities.	Apply
CO4	Illustrate role of encryption tools and web vulnerability scanning tools.	Apply
CO5	Articulate the Concept of network exploration and web vulnerabilities.	Apply

REFERENCES:

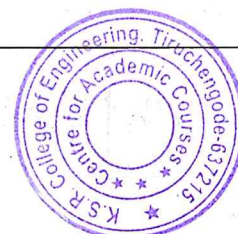
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3. Hacking: Computer Hacking, "Security Testing, Penetration Testing, and Basic Security" Gary Hall, Erin Watson 2012.
4. Hadis Karimipour, Pirathayini Srikantha, Hany Farag, Jin Wei-Kocsis, "Security of Cyber-Physical Systems-Vulnerability and Impact", Springer Nature, 2020.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	3	-	2	-	-
CO4	3	-	2	-	-
CO5	3	-	2	-	-

1-low, 2-medium, 3-high

S. Gargaxt
Chairman (BOS)



AX24A01	DISASTER MANAGEMENT	Category	L	T	P	SL	C
		AC	45	0	0	45	0
PREREQUISITE: A basic understanding of geography, environmental science, and public health is a prerequisite for studying disaster management.							
OBJECTIVES: To summarize disaster basics, understand key concepts in disaster risk reduction and humanitarian response, illustrate policies and practices from multiple perspectives, describe standards and relevance in various disaster contexts, and evaluate strengths and weaknesses of disaster management approaches.							
UNIT - I	INTRODUCTION	(9)					
Disaster: Definition, Factors and Significance - Difference between Hazard and Disaster - Natural and Manmade Disasters: Difference – Nature - Types and Magnitude.							
UNIT - II	REPERCUSSIONS OF DISASTERS AND HAZARDS	(9)					
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.							
UNIT - III	DISASTER PRONE AREAS IN INDIA	(9)					
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.							
UNIT - IV	DISASTER PREPAREDNESS AND MANAGEMENT	(9)					
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.							
UNIT - V	RISK ASSESSMENT	(9)					
Disaster Risk: Concept and Elements - Disaster Risk Reduction - Global and National Disaster Risk Situation. Techniques of Risk Assessment - Green economy - Blue economy - Global Co-Operation in Risk Assessment and Warning - People's Participation in Risk Assessment - Strategies for Survival							
LECTURE: 45, SELF LEARNING: 45, TOTAL: 90 PERIODS							
 Chairman (BoS) 							

COURSE OUTCOMES:**At the end of the course, the students will be able to:**

COs	Course Outcome	Cognitive Level
CO1	Understand the definitions, differences, and classifications of disasters and hazards	Understand
CO2	Analyze the impact of natural and man-made disasters on economy, life, and environment	Analyze
CO3	Evaluate the implications of post-disaster diseases and epidemics.	Evaluate
CO4	Evaluate governmental and community preparedness strategies.	Evaluate
CO5	Analyze the concept and components of disaster risk, apply risk assessment techniques, and evaluate global, national, and community-based strategies	Analyze

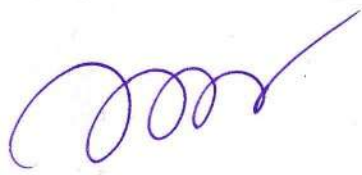
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Mapping of COs with POs and PSOs

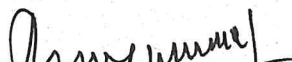
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	2	1	2	1	1
CO2	2	1	2	2	1
CO3	2	1	2	2	2
CO4	2	1	2	2	2
CO5	2	1	2	1	2
Avg.	2	1	2	2	2

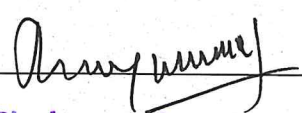
1-Low, 2-Medium, 3-High

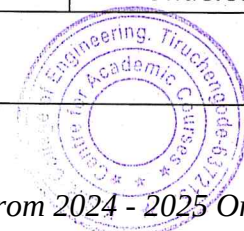


Chairman (BoS)


AX24A02	VALUE EDUCATION (AUDIT COURSE)	Category	L	T	P	SL	C
		AC	30	0	0	0	0
PREREQUISITE: Basic understanding of moral principles, social responsibilities, and a willingness to engage in Self-reflection and personal growth.							
OBJECTIVES: To foster self-development, strengthen human values, and promote overall personality growth and social empowerment through value-based education.							
UNIT - I	INTRODUCTION TO VALUE EDUCATION	(6)					
Values and self-development –Social values and individual attitudes- Work ethics- Indian vision of humanism- Moral and non- moral valuation- Standards and principles- Value judgments.							
UNIT - II	IMPORTANCE OF VALUES	(6)					
Importance of cultivation of values- Sense of duty- Devotion- Self-reliance- Confidence- Concentration- Truthfulness- Cleanliness. Honesty- Humanity- Power of faith- National Unity- Patriotism- Love for nature- Discipline.							
UNIT - III	INFLUENCE OF VALUE EDUCATION	(6)					
Personality and Behaviour development - Soul and Scientific attitude. Positive Thinking- Integrity and discipline- Punctuality- Love and Kindness- avoid fault Thinking- Free from anger- Dignity of labour- Universal brotherhood and religious tolerance- True friendship Happiness Vs suffering- love for truth.							
UNIT - IV	REINCARNATION THROUGH VALUE EDUCATION	(6)					
Aware of self-destructive habits- Association and Cooperation- Doing best for saving nature Character and Competence –Holy books vs Blind faith- Self-management and Good health- Science of reincarnation.							
UNIT - V	VALUE EDUCATION IN SOCIAL EMPOWERMENT	(6)					
Equality- Nonviolence- Humility- Role of Women- all religions and same message- mind your Mind- Self-control- Honesty- Studying effectively.							
L= 30, T=0, P=0, SL=0, TOTAL: 30 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Gain knowledge of self-development.	Understand					
CO2	Learn the importance of Human values.	Understand					
CO3	Develop the overall personality through value education.	Understand					
CO4	Overcome the self-destructive habits with value education.	Understand					
CO5	Interpret social empowerment with value education.	Understand					




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2. Das, M.S., Gupta, V.K. "Social Values among Young adults: A changing Scenario", M.D. Publications, New Delhi, 1995.
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Mapping of COs with POs and PSOs

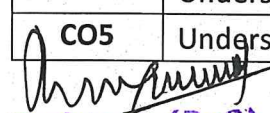
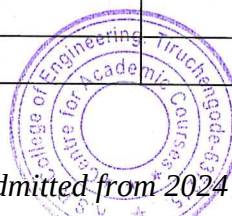
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	2	-	-	-	-
CO4	2	-	-	-	-
CO5	2	-	-	-	-

1-low, 2-medium, 3-high


Chairman (BoS)



AX24A03	CONSTITUTION OF INDIA (AUDIT COURSE)	Category	L	T	P	SL	C
		AC	30	0	0	0	0
PREREQUISITE: Basic awareness of Indian history, civics, and political system at the school level, along with an Interest in understanding the democratic framework and governance of India.							
OBJECTIVES: To provide a comprehensive understanding of the India Constitution, including its basic structure, fundamental rights and duties, directive principles, the functioning of the Union and State governments, and the electoral system.							
UNIT - I	INTRODUCTION TO INDIAN CONSTITUTION						(6)
Indian Constitution: Necessity of the Constitution- Societies before and after the Constitution adoption. Introduction to the Indian constitution- Making of the Constitution- Role of the Constituent Assembly.							
UNIT - II	FUNDAMENTAL RIGHTS AND DUTIES						(6)
Fundamental Rights- Right to Equality- Right to Freedom- Right against Exploitation- Right to Freedom of Religion- Cultural and Educational Rights- Right to Constitutional Remedies- Directive Principles of State Policy- Fundamental Duties.							
UNIT - III	UNION GOVERNMENT						(6)
Parliamentary System- Union Executive – President- Prime Minister- Union Cabinet- Parliament - LS and RS- Parliamentary Committees- Important Parliamentary Terminologies. Supreme Court of India, Judicial Reviews and Judicial Activism.							
UNIT - IV	STATE GOVERNMENT						(6)
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts.							
UNIT - V	ELECTION COMMISSION						(6)
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners - Institute and Bodies for the welfare of SC/ST/OBC and women.							
L= 30, T=0, P=0, SL=0, TOTAL: 30 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome						Cognitive Level
CO1	Understand the basic structure of Indian Constitution.						Understand
CO2	Remember their Fundamental Rights, DPSP's and Fundamental Duties (FD's) of our constitution.						Understand
CO3	Know about our Union Government, political structure & codes, procedures.						Understand
CO4	Understand our State Executive of India.						Understand
CO5	Understand our Elections system of India.						Understand


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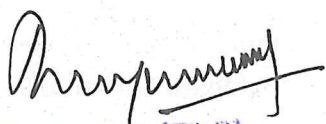
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Mapping of COs with POs and PSOs

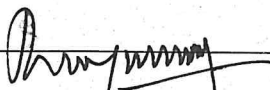
COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	2	-	-	-	-
CO4	2	-	-	-	-
CO5	2	-	-	-	-

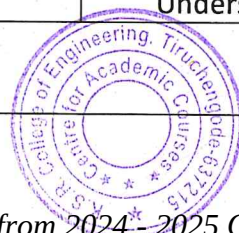
1-low, 2-medium, 3-high


Chairman (BoS)



AX24A04	INDIAN KNOWLEDGE SYSTEM (AUDIT COURSE)	Category	L	T	P	SL	C
		AC	30	0	0	0	0
PREREQUISITE: Basic knowledge of Indian history and culture, and an interest in exploring traditional systems of knowledge across disciplines such as science, technology, humanities, and philosophy.							
OBJECTIVES: To provide an understanding of the historical evolution, key features, and multidisciplinary applications of the Indian Knowledge System, encompassing its contributions to humanities, science, engineering, socio-religious practices, and the need for its protection and Preservation.							
UNIT - I	INTRODUCTION TO INDIAN KNOWLEDGE SYSTEM					(6)	
Importance of Ancient Knowledge System- Definition- concept- and scope of Indian Knowledge System (IKS)- IKS based approaches on knowledge paradigms- IKS in modern India- Some unique Aspects of IKS.							
UNIT - II	TRADITIONAL KNOWLEDGE IN HUMANITIES AND SCIENCES					(6)	
Linguistics- Number and measurements - Mathematics- Chemistry- Physics- Art- Astronomy- Astrology, Crafts and Trade in India and Engineering and Technology.							
UNIT - III	TRADITIONAL KNOWLEDGE IN PROFESSIONAL DOMAIN					(6)	
Town planning and architecture Construction- Health- wellness and Psychology - Medicine- Agriculture- Governance and public administration- United Nations Sustainable development goals.							
UNIT - IV	APPLIED TRADITIONAL KNOWLEDGE					(6)	
Myths- Rituals- Spirituals- Taboos and Belief System- Folk Stories- Songs- Proverbs- Dance- Play- Acts and Traditional Narratives- Agriculture- animal husbandry- Forest- Sacred Groves- Water Mills- Sacred Water Bodies- Land- water and Soil Conservation and management Practices- Indigenous Bio-resource Conservation- Utilization Practices and Food Preservation Methods- Handicrafts- Wood Processing and Carving- Fiber Extraction and Costumes.							
UNIT - V	PROTECTION OF INDIAN KNOWLEDGE SYSTEM					(6)	
Documentation and Preservation of IKS- approaches for conservation and Management of nature and bio-resources- Approaches and strategies to protection and conservation of IKS.							
L= 30, T=0, P=0, SL=0, TOTAL: 30 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome					Cognitive Level	
CO1	Explain the historicity of Indian Knowledge System.					Understand	
CO2	Explain the features of traditional knowledge in humanities and sciences.					Understand	
CO3	Develop familiarity with science, engineering and technology of IKS.					Understand	
CO4	Understand the importance of functional, aesthetic, and socio-religious concept of IKS.					Understand	
CO5	Understand the concepts of protection of IKS.					Understand	



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Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5
CO1	2	-	-	-	-
CO2	2	-	-	-	-
CO3	2	-	-	-	-
CO4	2	-	-	-	-
CO5	2	-	-	-	-

1-low, 2-medium, 3-high


Chairman (BOS)

