



Mahavir Education Trust's  
**Shah & Anchor Kutchhi Engineering College**  
An Autonomous Institute Affiliated to University of Mumbai

**2025-26**

# *Scheme & Syllabus*

## **Bachelor of Technology (B.Tech.)** **in** **Information Technology**

Third Year B.Tech.  
(with effect from 2025-2026 )



Mahavir Education Trust's

**Shah & Anchor Kutchhi Engineering College**

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# CURRICULUM STRUCTURE THIRD YEAR B.Tech.


Information Technology

REVISION: R1-V0-2025-26

Effective for Academic Year 2025-26 only

Approved by Board of Studies on 17/06/2025

Approved by Academic Council on 19/06/2025

  
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Dr. Bhavesh Patel  
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Shah & Anchor Kutchhi Engineering College  
Chembur, Mumbai - 400088



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## UG Program in Information Technology

### VISION:

To develop skilled Information Technology engineers by offering quality education with rapidly evolving advanced technologies to embark upon global challenges and standards for the betterment of society.

### MISSION:

1. To create competent and trained professionals in Information Technology who shall contribute towards the advancement of engineering, science and technology useful for the society.
2. To impart quality and value based education to raise the satisfaction level of all stakeholders.
3. To generate technically sound professionals and entrepreneurs to become part of the industry and research organizations at national levels.

### PROGRAM SPECIFIC OUTCOMES (PSO)

- **PSO1:** The Information Technology graduates are able to analyze, design, develop, test and apply management principles, mathematical foundations in the development of IT based solutions for real world and open-ended problems.
- **PSO2:** The Information Technology graduates are able to perform various roles in creating innovative career paths: to be an entrepreneur, a successful professional, pursue higher studies with realization of moral values and ethics.

### PROGRAM EDUCATIONAL OBJECTIVES (PEO)

- **PEO1:** A graduate will excel in a professional career and contribute to social needs through Information Technology.
- **PEO2:** A graduate will be integrated into the world of practicing professionals for collaborations, pursue higher education, conduct research, demonstrate professionalism and ethics.
- **PEO3:** A graduate will Exhibit innovation, team work, leadership and communication skills through lifelong learning.



## UG Program in Information Technology

### KNOWLEDGE AND ATTITUDE PROFILE (WK)

1. **WK1:** A systematic, theory-based understanding of the natural sciences applicable to the discipline and awareness of relevant social sciences.
2. **WK2:** Conceptually-based mathematics, numerical analysis, data analysis, statistics and formal aspects of computer and information science to support detailed analysis and modelling applicable to the discipline.
3. **WK3:** A systematic, theory-based formulation of engineering fundamentals required in the engineering discipline.
4. **WK4:** Engineering specialist knowledge that provides theoretical frameworks and bodies of knowledge for the accepted practice areas in the engineering discipline; much is at the forefront of the discipline.
5. **WK5:** Knowledge, including efficient resource use, environmental impacts, whole-life cost, re-use of resources, net zero carbon, and similar concepts, that supports engineering design and operations in a practice area.
6. **WK6:** Knowledge of engineering practice (technology) in the practice areas in the engineering discipline.
7. **WK7:** Knowledge of the role of engineering in society and identified issues in engineering practice in the discipline, such as the professional responsibility of an engineer to public safety and sustainable development.
8. **WK8:** Engagement with selected knowledge in the current research literature of the discipline, awareness of the power of critical thinking and creative approaches to evaluate emerging issues.
9. **WK9:** Ethics, inclusive behavior and conduct. Knowledge of professional ethics, responsibilities, and norms of engineering practice. Awareness of the need for diversity by reason of ethnicity, gender, age, physical ability etc. with mutual understanding and respect, and of inclusive attitudes.





## UG Program in Information Technology

### PROGRAM OUTCOMES (PO)

1. **PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
2. **PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
3. **PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems/components/processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)
4. **PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis interpretation of data to provide valid conclusions. (WK8).
5. **PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering IT tools, including prediction and modelling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)
6. **PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, and WK7).
7. **PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national international laws. (WK9)
8. **PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
9. **PO9: Communication:** Communicate effectively and inclusively within the engineering community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences.
10. **PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
11. **PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for  
i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)



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## UG Program in Information Technology

### PREAMBLE

Shah and Anchor Kutchhi Engineering College (SAKEC) has been granted academic autonomy by University Grants Commission (UGC) from Academic Year 2024-25 for 10 years. The program in Information Technology (IT) has prepared an Autonomy Scheme curriculum for 4 years undergraduate (UG) and 2 years of post-graduate (PG). The overall credits and courses for the first year of engineering and second year of engineering curriculum is in line with the NEP 2020. The first year of engineering consists of foundational courses in basic science and engineering science category and other categories are value education, ability enhancement, and co-curricular courses. Second year of engineering contains mainly program core courses. Multidisciplinary courses and entrepreneurship category courses are introduced for the second year. The emphasis is on vocational and skill development courses for all four years of engineering. The first year and second year focuses on building the foundations, and is structured as per NEP credit distribution to categories. The third year and final year is for developing the skills and knowledge of the students in various domains through electives. The curriculum is designed to cater to industry requirements and different students may follow different paths and take different set of courses in it. The curriculum is designed to impart technical knowledge as per latest industry standards. In order to gain practical skills learners are offered various skill based courses, program electives, project based learning. New courses are introduced to cater to co-curricular and extra curricular development of learners. It provides enhanced learning experience with the introduction of activity based learning and project based learning. Human values are instilled in the learners by incorporating social involvement and real world problem solving through field visits, case studies, project developments and internships. Therefore, it boosts the learner's profile for taking up higher studies as well as for finding appropriate jobs. It has also given ample opportunities to explore entrepreneurship as a career option. It also focuses on continuous internal assessment which is very encouraging and beneficial for the learners. The factors which led to this present curriculum development are research, innovation and outcome based education. The shift in focus from teacher-centric to learner-centric education for designing this curriculum will definitely improve quality of education. This curriculum is an amalgamation of knowledge, skills and value education. The motto of the program in information technology is Technology driven holistic development through the right blend of courses.



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## UG Program in Information Technology

Abbreviations used in course codes for course categories based on NEP

Category	Course Category	Abbreviation
BSC/ESC	Basic Science Courses	BS
	Engineering Science Courses	ES
Program Courses	Programme Core Course	PC
	Programme Elective Course	PE
Multidisciplinary Courses	Multidisciplinary Minor	MD
	Open Elective	OE
Skill Courses	Vocational & Skill Enhancement Course	VS
Humanities Social Science & Management	Entrepreneurship / Economics / Management Courses	ED
	Indian Knowledge System	IK
	Value Education Course	VE
	Ability Enhancement	AE
Experiential Learning Courses	Research Methodology	RM
	Field Project/Community Engagement Project	CP
	Project	PR
	Internship	IN
Liberal Learning Courses	Co-curricular course	CC



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## Program Structure for Third Year B.Tech. in Information Technology (with effect from 2025–2026)

### Semester V

				Learning Scheme					Credits	Assessment Scheme																											
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL	Total		Exam	Theory					Practical				SLA		Total															
											CIA		ESE	Total		CIAP	ESEP	Total																			
				CL	TL	LL					Notional Hours												Duration in Hrs	MSE	CCE	Max	Max		Max	Max	Max	Max	Max	Max	Max		
																								Max	Max											Max	Max
1	Software Engineering	PC	ITCOR1PC301	2		-	2	2	90	3	2	20	20	60	100	40		25	-	25	10	25		10	150												
2	Cryptography and Network Security	PC	ITCOR1PC302	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150															
3	Foundations of Artificial Intelligence and Data Science	PC	ITCOR1PC303	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150															
4	Programme Elective-I	PE	ITCOR1PE301.X	3	1	2	2	120	4	2	20	20	60	100	40	25	-	25	10	25	10	150															
5	Entrepreneurship and Management	ED	ITCOR1ED301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75															
6	Open Elective-II	OE	XXCOR1OE301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75															
7	Full Stack Development Lab	PC	ITLOR1PC304	-	-	4	-	60	2	2	-	-	-	-	-	40	60	100	40	-	-	100															
8	Research Methodology Lab	RM	ITLOR1RM301	-	-	2	-	30	1	-	-	-	-	-	-	25	-	25	10	-	-	25															
Total				15	3	14	12	660	22	-	80	180	240	500	-	135	90	225	-	150	-	875															

#### Abbreviations:

CL: Classroom Learning TL: Tutorial Learning LL: Laboratory Learning SL: Self Learning (Activity/Assignment/Micro-Project) CIA: Continuous Internal Assessment  
CCE: Continuous Comprehensive Evaluation MSE: Mid Semester Examination ESE: End Semester Examination CIAP: Continuous Internal Assessment Practical ESEP: End Semester Examination Practical  
SLA: Self Learning Assessment

#### Note:

- Notional Learning hours for the semester are (CL+LL+TL+SL) hrs × 15 Weeks.
- 1 credit is equivalent to 30 Notional hrs.
- Self learning hours shall not be reflected in the Time Table.
- SLA will have separate head of passing





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**Program Structure for Third Year B.Tech. in  
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Semester V

**Program Elective - I**

Sr. No	Course Code	Course Name
1	ITCOR1PE301.1	Wireless Technology
2	ITCOR1PE301.2	Game theory and Gen AI
3	ITCOR1PE301.3	Advanced Database Management System

**Open Elective - II**

Sr. No	Course Code	Course Name
1	VDCOR1OE301	Family Consumer Science
2	ACCOR1OE301	Vedic Mathematics
3	CSCOR1OE301	Skills for a Balanced Life
4	ITCOR1OE301	Human Resources Management



**Program Structure for Third Year B.Tech. in  
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**Semester VI**

				Learning Scheme					Credits	Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL	Total			Theory					Practical				SLA		Total	
				CL	TL	LL				Duration in Hrs	Exam	CIA		ESE	Total		CIAP	ESEP	Total				
												MSE	CCE										
												Max	Max										Max
1	Cloud Computing	PC	ITCER1PC305	2	-	2	2	90	3	2+2	20	20	60	100	40	10	15	25	10	25	10	150	
2	Machine Learning and Business Intelligence	PC	ITCER1PC306	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150	
3	Programme Elective-II	PE	ITCER1PE302.X	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150	
4	Programme Elective-III	PE	ITCER1PE303.X	3	1	2	2	120	4	2	20	20	60	100	40	25	-	25	10	25	10	150	
5	IOT And Applications	MD	ITCER1MD301	1	-	4	1	90	3	-	-	50	-	50	20	50	-	50	20	25	10	125	
6	Open Elective-III	OE	XXCER1OE302	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75	
7	DevOps (Skill Based Lab)	VS	ITLER1VS301	-	-	4	-	60	2	-	-	-	-	-	-	50	-	50	20	-	-	50	
Total				14	3	16	11	660	22	-	80	180	240	500	-	155	45	200	-	150	-	850	

**Abbreviations:**

CL: Classroom Learning    TL: Tutorial Learning    LL: Laboratory Learning    SL: Self Learning (Activity/Assignment/Micro-Project)    CIA: Continuous Internal Assessment  
CCE: Continuous Comprehensive Evaluation    MSE: Mid Semester Examination    ESE: End Semester Examination    CIAP: Continuous Internal Assessment Practical    ESEP: End Semester Examination Practical  
SLA: Self Learning Assessment

**Note:**

1. Notional Learning hours for the semester are (CL+LL+TL+SL) hrs × 15 Weeks.
2. 1 credit is equivalent to 30 Notional hrs.
3. Self learning hours shall not be reflected in the Time Table.
4. SLA will have separate head of passing



**Program Structure for Third Year B.Tech. in  
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Semester VI

**Program Elective - II**

Sr. No	Course Code	Course Name
1	ITCER1PE302.1	Ethical Hacking and Digital Forensics
2	ITCER1PE302.2	Data Visualization and Analytics
3	ITCER1PE302.3	Advanced Data Structures and Analysis

**Program Elective - III**

Sr. No	Course Code	Course Name
1	ITCER1PE303.1	Cyber Security and Laws
2	ITCER1PE303.2	NLP and Cognitive computing
3	ITCER1PE303.3	Big Data Analytics

**Open Elective - III**

Sr. No	Course Code	Course Name
1	VDCER1OE302	Fundamentals of Bioinformatics
2	ACCER1OE302	Integrative Biology and Engineering
3	CSCER1OE302	Emotional Intelligence and Leadership
4	ITCER1OE302	Disaster Management



### T.Y. Credit Distribution

Course code	Category		Sem 5	Sem 6	Total
-	BSC ESC	Basic Science	-	-	-
		Engineering Science	-	-	-
ITC0R1PC301/ITCOR1PC302 / ITCOR1PC303/ITLOR1PC304/ ITCER1PC305/ITCER1PC306	Program Courses	Program Core	13	7	20
ITCOR1PE301.X / ITCER1PE302.X / ITCER1PE303.X		Program Elective	4	8	12
ITCER1MD301	Multidisciplinary Courses	Multidisciplinary Minor	-	3	3
XXCOR1OE301 / XXCER1OE302		Open Elective	2	2	4
ITLER1VS301	Skill Courses	Vocational & Skill Enhancement	-	2	2
ITCOR1ED301	Humanities Social Science & Management	Entrepreneurship/ Economics/ Management Courses	2	-	2
-		Indian Knowledge System	-	-	-
-		Value Education Course	-	-	-
-		Ability Enhancement	-	-	-
ITLOR1RM301	Experiential Learning Courses	Research Methodology	1	-	1
-		Field Project/Community Engage- ment Project	-	-	-
-		Project	-	-	-
-		Internship	-	-	-
-	Liberal Learning Course	Co-Curricular Course	-	-	-
<b>Total</b>			<b>22</b>	<b>22</b>	<b>44</b>



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## Semester V



Program	Third Year B. Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Software Engineering	Course Code: ITCOR1PC301	2	-	2	2	3
Course Type:	Programme Core (PC)					
Pre-requisite:	Nil					

## I RATIONALE

Software engineering is essential because it provides a structured and disciplined approach to developing complex software systems, ensuring they are reliable, efficient, and meet user needs. This discipline helps manage the inherent complexity of software, reduces risks, and improves the overall quality, maintainability, and cost-effectiveness of software projects.

## II COMPETENCY

Demonstrates a diverse skill set spanning both technical and interpersonal domains, including software development life cycle (SDLC), debugging, expertise in testing and quality assurance effective communication.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Apply suitable software development process model.
2	Apply user-centric design concepts, software design principles, and effective user interface principles to real world projects
3	Develop project schedule, estimate budget and RMMM plan.
4	Apply software testing concept for achieving software quality.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme				Assessment Scheme														
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week				SL	Total	Credits	Exam	Theory				Practical				SLA		Total
												Duration in Hrs	CIA		ESE	Total		CIAP	ESEP			
													MSE	CCE		Max	Min			Max	Min	
1	Software Engineering	PC	ITCOR1PC301	2	-	2	2	90	3	2	20	20	60	100	40	25	-	25	10	25	10	150

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Analyze technical, economic, legal, operational, and schedule feasibility of proposed software systems.	Feasibility Study and selection of Process Model	CO1
2	Analyze the minimum requirements for the development of Software application	Requirement Gathering and Acceptance Criteria	CO1
3	Apply behavioral modeling techniques by designing use case and activity diagrams	Behavioral Modeling: Use case diagram and activity diagram	CO2
4	Apply structural modeling techniques by designing class and object diagrams	Structural Modeling: Class diagram and Object diagram.	CO2
5	Develop behavioral models of a software system using state chart and interaction diagrams.	Behavioral Modeling: State chart diagram and interaction diagram.	CO2
6	Design component and deployment diagram	Architectural Modeling: Component diagram and Deployment Diagram.	CO2
7	Develop project schedule and estimate budget	Project estimation and resources allocation.	CO3
8	Analyze project risk and management plan .	Risk analysis and Management plan.	CO3
9	Summarize testing strategies	Study different testing strategies	CO4
10	Apply different testing strategies for test cases	Design of test cases	CO4

## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	1. Compare different software development process models 2. Describe software requirements. 3.	<b>Software Development Process and Requirement Engineering</b> 1.1 Characteristics of Software, Software Development Process. 1.2 Waterfall process Model, Incremental-RAD process Model 1.3 Evolutionary Process Model: Spiral, Prototyping and Concurrent Development Model 1.4 Agile Methodology, Scrum, Kanban Model and Extreme Programming. 1.5 Software Requirement Overview, Types of Requirements, Requirement Gathering, Tasks of Requirement Engineering. 1.6 User Acceptance. Explain radiation mechanism	7
2	CO2	1. Apply user centric design concepts. 2. Summarize Software Architecture level, component level, user interface design concept.	<b>Software Analysis Design Engineering</b> 2.1 Analysis Model: Scenario based, Flow based, behavior and class based. 2.2 Design Concepts, Design Principles. 2.3 Architecture level: what is software architecture, Architectural style, Architectural design 2.4 Component Level Design: What is component, designing class based component, conducting component level design, component level design for Web applications. 2.5 User Interface Design: Golden rules of User. interface design, user interface analysis and design, interface analysis, interface design steps	8

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<ol style="list-style-type: none"> <li>1. Summarize Software Project Estimation Techniques.</li> <li>2. Estimate Software Project Effort, Time, and Cost.</li> <li>3. Develop Project Schedules Using Various Tools.</li> <li>4. Design RMMM plan for software application.</li> </ol>	<p><b>Software Project Estimation Scheduling Configuration and Risk Management</b></p> <p>3.1 Software Project Estimation, LOC based estimation, Function point based and Use case based estimation  3.2 COCOMO II, Work breakdown structure,  3.3 Developing the Project Schedule, Critical path method and PERT, Gantt chart.  3.4 Software Configuration Management, SCM Process.  3.5 Software Risk Identification, Risk Projection and RMMM Plan.</p>	8
4	CO4	<ol style="list-style-type: none"> <li>1. Summarize software testing strategies.</li> <li>2. Apply software testing concept to achieve software quality.</li> </ol>	<p><b>Software Testing and Quality Assurance</b></p> <p>4.1 Importance of Testing, Testing strategies, Strategic approach, strategic issues, Test strategies for conventional software and object –oriented software, White box testing and its types, Black box testing and its types.  4.2 Software quality, McCall's Quality Factor, Walkthrough and formal technical review, Software Maintenance and Reengineering,</p>	7

## VII SUGGESTED SELF LEARNING ACTIVITIES

Case study/Micro project based on agile tools.

### VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

Sr. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Apply suitable software development process model.	20%	30%	50%	-	-	-	100%
2	Apply user-centric design concepts, software design principles, and effective user interface principles to real world projects	20%	30%	50%	-	-	-	100%
3	Develop project schedule, estimate budget and RMMM plan.	-	20%	80%	-	-	-	100%
4	Apply software testing concept for achieving software quality.	-	30%	70%	-	-	-	100%

### IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

#### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Software Engineering: A practitioner's approach	8 <sup>th</sup> Edition	Roger S. Pressman	McGraw Hill	2015
2	Software Engineering	9 <sup>th</sup> Edition	Ian Sommerville	Pearson	2011
3	Project Management: A managerial approach	11 <sup>th</sup> Edition	Jack Meredith and Samuel Mantel	Wiley India	2021

#### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Software Engineering: an Engineering approach	6 <sup>th</sup> Edition	James Peter	John Wiley	2012





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## Online References

Sr. No	Website Name
A	<a href="https://www.udemy.com/course/software-engineering-us/?couponCode=PMNVD2025">https://www.udemy.com/course/software-engineering-us/?couponCode=PMNVD2025</a>
B	<a href="https://onlinecourses.nptel.ac.in/noc24_mg01/ProjectManagement">https://onlinecourses.nptel.ac.in/noc24_mg01/ProjectManagement</a>





<b>Program</b>	<b>Third Year B.Tech. Information Technology (Semester V)</b>	<b>CL</b>	<b>TL</b>	<b>LL</b>	<b>SL</b>	<b>C</b>
<b>Course Name:</b> Cryptography and Network Security	<b>Course Code:</b> ITCOR1PC302	3	1	2	2	4
<b>Course Type:</b>	Programme Code (PC)					
<b>Pre-requisite:</b>	Computer Network, Problem Solving and Programming with C					

## I RATIONALE

In today's digital world, the 'Cryptography and Network Security' course provides essential knowledge and skills to secure information. It covers core concepts like confidentiality, integrity, and availability, along with cryptographic techniques including symmetric, asymmetric encryption, hashing, and digital signatures. Students learn to assess network security using real-world tools and explore security at the network, transport, and application layers. Through theory and practical lab sessions, learners gain a comprehensive understanding of cybersecurity principles, preparing them to design and implement effective security solutions in modern computing environments.

## II COMPETENCY

Upon completing the Cryptography and Network Security course, students will gain the competency to analyze security threats and apply cryptographic techniques for data protection. They will be skilled in assessing network vulnerabilities, implementing secure communication protocols, and using industry-standard tools. This prepares them to design, evaluate, and manage security measures across different layers, enabling them to address real-world cybersecurity challenges in various IT environments.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Analyze the concepts of computer security and network security.
2	Examine the cryptographic techniques.
3	Assess the network security of various domain using different methods.
4	Analyze various layers of security with protocols.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme					Assessment Scheme																	
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week					SL	Total	Credits	Exam	Theory					Practical					SLA		Total	
				CL	TL	LL							Duration in Hrs	MSE	CCE	ESE	Total	CIAP	ESEP	Total						
																					Max	Max				
1	Cryptography and Network Security	PC	ITCOR1PC302	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150				

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Hack the classical cipher i.e. Mono-alphabetic substitution	Breaking the Mono-alphabetic Substitution Cipher using Frequency analysis method.	CO1
2	Encrypt the messages using a cryptography algorithm.	Encrypt the messages using various modes of operation using AES or DES.	CO2
3	Examine hashing function	Cryptographic Hash Functions and Applications (HMAC) to understand the need, design and applications of collision resistant hash functions.	CO2
4	Analysis Asymmetric cryptography algorithm	Implementation and analysis of RSA cryptosystem and Digital signature scheme using RSA	CO2
5	Assess network reconnaissance tools	Study the use of network reconnaissance tools like WHOIS, dig, traceroute, nslookup to gather information about networks and domain registrars.	CO3
6	Assess packet sniffer tools	Study of packet sniffer tools wireshark: - a. Observe performance in promiscuous as well as non-promiscuous mode. b. Show the packets can be traced based on different filters.	CO3
7	Assess network discovery and security auditing tool	Download, install NMAP and use it with different options to scan open ports, perform OS fingerprinting, ping scan, TCP port scan, UDP port scan.	CO3
8	Analyze various malicious software using different tools.	Study of malicious software using different tools like use the NESSUS/ISO Kali Linux tool to scan the network for vulnerability	CO4
9	Analyze Network security using tool i.e. Snort	Study of Network security by Setup Snort and study the logs.	CO4
10	Develop microproject	Microproject	CO1,2,3,4

## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	1. Analysis Computer security and Network Security building blocks  2. Solve the problems based on Classical Encryption techniques  3. Discuss on steganography techniques	<b>Basic of Computer and Network Security</b> 1.1 Computer security and Network Security, 1.2 CIA, 1.3 Services, Mechanisms, and attacks, 1.4 The OSI security architecture, Network security model. 1.5 Classical Encryption techniques (monoalphabetic and poly-alphabetic) 1.6 substitution techniques: Vigenere cipher, playfair cipher. 1.7 Transposition techniques: keyed and keyless transposition ciphers. 1.8 Introduction to steganography techniques	10
2	CO2	1. Analyze Block and stream ciphers 2. Solve Public key cryptography 3. Examine Hashing Techniques 4. Compare Digital Signature Schemes 5. Compare Key Management 6. Explain Digital Certificate	<b>Cryptography: Symmetric, Asymmetric, Hashing and Key Management</b> 2.1 Block cipher modes of operation, 2.2 Data Encryption Standard(DES), 2.3 Advanced Encryption Standard (AES). 2.4 RC5 algorithm. 2.5 Public key cryptography: RSA algorithm. 2.6 Hashing Techniques 2.7 SHA256, 2.8 HMAC, 2.9 Digital Signature Schemes – RSA, DSS, 2.10 Key Management, 2.11 Kerberos, 2.12 Digital Certificate: X.509, 2.13 PKI.	15

(Continued on next page)



Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<ol style="list-style-type: none"> <li>1. Analyze IP Network Scanning</li> <li>2. Assess Remote Information Services</li> <li>3. Assess Database Server</li> <li>4. Assess Web Server</li> <li>5. Assess Web Application</li> </ol>	<b>Network Security Assessment</b> 3.1 IP Network Scanning: ICMP probing, TCP Probing, UDP Probing. 3.2 Assessing Remote Information Services: DNS, Finger, Auth, NTP, SNMP. 3.3 Assessing Database Server: Oracle, MySQL 3.4 Assessing Web Server: Fingerprint Accessible Web Services, 3.4 Enumerating Virtual Hosts and Web sites. 3.5 Investigating known vulnerabilities. 3.6 Assessing Web Application: Web Application Profiling, Web application Attack Strategies, Web Application Vulnerabilities.	10
4	CO4	<ol style="list-style-type: none"> <li>1. Describe IP, TCP, Application layers Security</li> <li>2. Explain Email Security</li> </ol>	<b>Network, Transport, Application layer security</b> 4.1 Internet Layer Security: IPSec Architecture, Protection Mechanism (AH and ESP) 4.2 Transport Layer Security: Introduction to Transport Layer Security 4.3 HTTPS, Secure Shell. 4.4 Electronic Mail Security: Introduction to Mail Architecture, Mail Formats, Email Threats and Email Security, 4.5 S/MIME, 4.6 Pretty Good Privacy.	10





## VII SUGGESTED SELF LEARNING ACTIVITIES

User A wants to send message to user B securely on network.

- Select any two techniques to encrypt message. . Implement both the techniques.
- Evaluate result of implementation.
- Compare complexity of both techniques.
- Prepare report.

Prepare admin level report of company who wants to implement allocate fixed system to each employee for authentic access to maintain security.

- Explain various single level authentication method available to access the system.
- Analyse the weakness and security threats to this problem.
- Suggest multi factor authentication for given problem situation.
- Compare impact of single and multi-factor authentication on given situation.

A bank has more than 1000 user accounts. Around 100 users received message regarding deduction of specific amount without intimation and after that all authorized user are not able to access online banking service of that bank.

- Identify type of crime and attack.
- Write procedure to investigate that crime.
- Write preventive measure to avoid such type of attack in future.
- Write punishment of such type of attacks and state cyber law act.
- Write a report.

Case study on Cyber Crime in Social Engineering in India.

- Explain various Social Engineering attacks.
- Select topic for case study.
- Write problem statement of attack.
- Write procedure to investigate that attack.
- Write a report.

Teacher shall allocate any other microproject relevant to COs.

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### VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Analyze the concepts of computer security and network security.	20%	20%	30%	30%	-	-	100%
2	Examine the cryptographic techniques.	10%	20%	40%	30%	-	-	100%
3	Assess the network security of various domain using different methods.	10%	20%	20%	30%	20%	-	100%
4	Analyze various layers of security with protocols.	20%	40%	20%	20%	-	-	100%

### IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

#### Text Books

Sr. No	Title	Edition	Authors	Publisher	Year
1	Cryptography and Network Principle, Principle and Practice	6 <sup>th</sup> Edition	William Stallings	Pearson	2017
2	Cryptography and Network Security	Speacial Indian Edition	Behrouz A. Forouzan	Tata McGraw-Hill	2007
3	Network Security Assessment	3 <sup>rd</sup> Edition	Chris McNab	O'reilly	2016

#### Reference Books

Sr. No	Title	Edition	Authors	Publisher	Year
1	Applied Cryptography, Protocols, Algorithms and Source Code in C	1 <sup>st</sup> Edition	Bruce Schneier	Wiley	2015
2	Cryptography and Network Security	4 <sup>th</sup> Edition	Atul Kahate	Tata McGraw-Hill	2019



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## Online References

Sr. No	Website Name
A	<a href="http://www.classcentral.com/course/swayam-Cryptography and Network Security">http://www.classcentral.com/course/swayam-Cryptography and Network Security</a>
B	<a href="http://www.coursera.org/browse/computer-science/computer-security-and-networks">http://www.coursera.org/browse/computer-science/computer-security-and-networks</a>



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Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
<b>Course Name:</b> Foundation of Artificial Intelligence and Data Science	<b>Course Code:</b> ITCOR1PC303	3	1	2	2	4
<b>Course Type:</b>	Programme Core (PC)					
<b>Pre-requisite:</b>	Data structure and Analysis, Engineering Mathematics					

## I RATIONALE

In today's era of digital transformation, Artificial Intelligence (AI) and Data Science (DS) technologies are at the forefront of innovation, enabling intelligent decision-making, automation of complex tasks, and extraction of meaningful insights from large volumes of data.

## II COMPETENCY

Demonstrate the fundamental concepts, techniques, and tools of Artificial Intelligence and Data Science for solve real-world problems by analyzing data, designing intelligent systems, and making data-driven decisions across various domains such as healthcare, finance, education, and automation.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Apply foundational building blocks of AI and searching techniques for solving real world problems.
2	Apply knowledge-representation schemes and expert systems for real-world scenarios .
3	Analyze probability distributions and sampling theory in the context of engineering problems.
4	Develop exploratory data analysis techniques.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme				Credits	Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Exam	Theory					Practical				SLA	Total	
				CL	TL	LL					Duration in Hrs	CIA		ESE	Total	CIAP	ESEP	Total				
												Max	Min					Max	Min			Max
1	Foundation of Artificial Intelligence and Data Science	PC	ITCOR1PC303	3	1	2	2	120	4	2+2	20	20	60	100	40	10	15	25	10	25	10	150

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Implement an uninformed search technique such as Breadth-First Search (BFS).	Implementation of any one of the Uninformed search techniques such as DFS or BFS or DSL .	CO1
2	Implement an informed search technique such as A (A-star) algorithm.	Implementation of any one of the inform search techniques Such as A* Search or RBFS or Hill Climbing.	CO1
3	Implement the Min-Max algorithm to implement adversarial search in a two-player game scenario.	Implementation of adversarial search using min-max algorithm.	CO1
4	Implement the data preparation techniques using NumPy and Pandas to clean, transform, and organize a given dataset.	Implementation of Data preparation using NumPy and Pandas on a given dataset.	CO2
5	Implement the basic data modeling techniques to train,validate,and evaluate a machine learning model.	Implementation of data Modeling on a given dataset.	CO3
6	Implement the data visualization techniques using Matplotlib and Seaborn to perform exploratory data analysis.	Implementation of Data Visualization/Exploratory Data Analysis for the selected data set using Matplotlib and Seaborn.	CO4
7	Implement a statistical hypothesis testing method using Scipy or Scikit-learn.	Implementation of Statistical Hypothesis Test using Scipy and Sci-kit learn [Anyone] Normality Test.	CO3
8	Implement an exploratory data analysis techniques using Apache Spark and Pandas to summarize, visualize, and interpret key patterns.	Implementation of Exploratory Data Analysis using Apache Spark and Pandas.	CO4
9	Implement Apache Spark to implement batch and streamed data analysis for processing, transforming.	Implementation of Batch and Streamed data Analysis using Spark.	CO3
10	Implement fundamental concepts and tools of Artificial Intelligence and Data Science.	Mini Project.	CO4



## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Apply the fundamental concepts, structure, and types of Artificial Intelligence in real-world scenarios.</li> <li>2. Apply local and adversarial search algorithms such as Hill-Climbing, Min-Max, and Alpha-Beta Pruning, along with uninformed search strategies like Uniform Cost Search, Depth-Limited Search, Iterative Deepening, and Bidirectional Search to solve problem-solving and decision-making tasks.</li> <li>3. Use informed search strategies such as Best-First Search, A Search, and Hill Climbing by employing heuristic functions to solve search problems.</li> <li>4. Implement constraint satisfaction and optimization techniques such as Simulated Annealing to solve complex problems, and adversarial search strategies like Min-Max and Alpha-Beta Pruning in two-player game scenarios.</li> </ol>	<b>AI Basics and Search Techniques</b>  1.1 Introduction: Introduction to AI, AI techniques, Problem Formulation, Intelligent Agents: Structure of Intelligent agents, Types of Agents, Agent Environments PEAS representation for an Agent. Heuristic function. 1.2 Hill-Climbing Algorithm, tic-tac-toe problem, Min-Max search, Alpha-Beta pruning. 1.3 Uninformed Search Techniques: Uniform cost search, Depth Limited Search, Iterative Deepening, Bidirectional search, Informed Search Methods: Heuristic functions, Best First Search, A*, Hill Climbing. 1.4 Simulated Annealing Constraint Satisfaction Problem Solving: Crypto-Arithmetic, Problem, Water Jug, Graph Coloring, Adversarial Search: Game Playing, Min-Max Search, Alpha Beta Pruning, Comparing Different Techniques.	10

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
2	CO2	<ol style="list-style-type: none"> <li>1. Illustrate the structure and decision-making process of a Knowledge-Based Agent within the Wumpus World scenario.</li> <li>2. Demonstrate logical inference using the principles of Propositional and First Order Predicate Logic.</li> <li>3. Demonstrate how Expert Systems operate by modeling their architecture and reasoning process.</li> <li>4. Apply the role of planning in knowledge-based agents to solve goal-directed tasks.</li> </ol>	<b>Knowledge Representation</b> <ol style="list-style-type: none"> <li>2.1 A Knowledge Based Agent, WUMPUS WORLD Environment.</li> <li>2.2 Propositional Logic, First Order Predicate Logic.</li> <li>2.3 Introduction to Expert System, Forward and Backward Chaining, Resolution.</li> <li>2.4 Planning as an application of a knowledge based agent, Concepts of Partial Order planning, Hierarchical Planning and Conditional Planning.</li> </ol>	9
3	CO3	<ol style="list-style-type: none"> <li>1. Demonstrate the concept of random variables through examples involving both discrete and continuous cases.</li> <li>2. Illustrate the role of normal and sampling distributions in statistical estimation and hypothesis testing.</li> <li>3. Apply the concepts of hypothesis testing for small samples, including one-tailed tests and degrees of freedom, to make statistical inferences.</li> </ol>	<b>Probability Distribution and Sampling Theory</b> <ol style="list-style-type: none"> <li>3.1 Random variable, Discrete and continuous random variable with probability distribution and density function.</li> <li>3.2 Normal distribution, Sampling distribution, Test of Hypothesis, Level of Significance Critical region.</li> <li>3.3 One-tailed test, Degree of freedom, Small sample Test, chi Square test: Test of goodness of fit and independence of attributes, contingency table.</li> </ol>	10

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
4	CO4	<ol style="list-style-type: none"> <li>1. Use knowledge of the evolution of Data Science to distinguish it from related fields like Business Analytics and Big Data.</li> <li>2. Implement data exploration techniques while recognizing the function of each role involved in data science projects.</li> <li>3. Demonstrate EDA approaches by performing univariate and multivariate analysis using both graphical and non-graphical tools.</li> </ol>	<b>Exploratory Data Analysis and Data Science</b>  4.1 Introduction and Evolution of Data Science, Data Science Vs. Business Analytics Vs. Big Data, Data Analytics, Life cycle. 4.2 Roles in Data Science Projects, Introduction to exploratory data analysis, Typical data formats. 4.3 Types of EDA, Graphical/Non graphical Methods, Uni variate methods, Multivariate methods, Correlation and covariance, Degree of freedom.	8

## VII SUGGESTED SELF LEARNING ACTIVITIES

1. IBM WATSON with Aim, PEAS of Watson, history or versions, Relate with AI techniques remark.
2. Watch NPTEL/MOOC videos on the evolution of AI and DS.
3. Explore real-world applications of AI and Data Science in domains like healthcare, finance, education, or marketing..

### VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Apply foundational building blocks of AI and searching techniques for solving real world problems.	10%	30%	60%	-	-	-	100%
2	Apply knowledge-representation schemes and expert systems for real-world scenarios .	10%	30%	60%	-	-	-	100%
3	Analyze probability distributions and sampling theory in the context of engineering problems.	10%	20%	50%	20%	-	-	100%
4	Develop exploratory data analysis techniques.	10%	20%	50%	20%	-	-	100%

### IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

#### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Introduction to Machine Learning	4 <sup>th</sup> Edition	Ethem Alpaydm	MIT Press	2020
2	Artificial Intelligence: A Modern Approach	3 <sup>rd</sup> Edition	Stuart Russell and Peter Norvig	Pearson Education	2013
3	Experimental Design and Analysis	1 <sup>st</sup> Edition	Howard J. Seltman, Carnegie Mellon University	Publisher	2012
4	Artificial Intelligence	4 <sup>th</sup> Edition	George Lugar	Pearson Education	2002

Sr. No.	Title	Edition	Authors	Publisher	Year
1	A First Course in Artificial Intelligence	1 <sup>st</sup> Edition	Deepak Khemani	McGraw Hill	2014
2	Statistics for Management	3 <sup>rd</sup> Edition	Richard I. Levin and David S. Rubin	Pearson	2017
3	Probability, Statistics and Random Processes	3 <sup>rd</sup> Edition	Veerarajan T.	McGraw-Hill	2017
4	Data Science and Big Data Analytics	1 <sup>st</sup> Edition	EMC Education Ser- vices	Wiley	2015
5	AI-Structures and Strategies for Com-plex Problem Solving	1 <sup>st</sup> Edition	EMC Education Ser- vices	Wiley	2015

## Reference Books

## Online References

Sr. No	Website Name
A	<a href="https://www.scaler.com/topics/artificial-intelligence-tutorial/search-algorithms-in-artificial-intelligence/">https://www.scaler.com/topics/artificial-intelligence-tutorial/search-algorithms-in-artificial-intelligence/</a>
B	<a href="https://www.geeksforgeeks.org/knowledge-representation-in-ai/">https://www.geeksforgeeks.org/knowledge-representation-in-ai/</a>
C	<a href="https://www.w3schools.com/datascience/ds_introduction.asp">https://www.w3schools.com/datascience/ds_introduction.asp</a>

Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Wireless Technology	Course Code: ITCOR1PE301.1	3	1	2	2	4
Course Type:	Program Elective (PE)					
Pre-requisite:	Networking Fundamentals, Electromagnetics and Signal Theory,Digital Communication Systems					

## I RATIONALE

Wireless technology enables communication without the need for physical cables, using radio waves or other wireless signals. Wireless technology has become essential in today's interconnected world because it enables communication and data transfer without the constraints of physical cables. This freedom from wired connections offers unparalleled mobility, allowing users to stay connected from virtually anywhere within the network's range.

## II COMPETENCY

Analyze wireless system components and performance to identify causes of issues or areas for optimization.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Apply frequency allocation and Multiple Access Techniques in wireless networks.
2	Demonstrate the different wireless technologies
3	Apply wireless technologies for wireless networks
4	Illustrate the principles, operation and applications of Satellite and RADAR System

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme					Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Credits	Exam	Theory				Practical				SLA		Total
				CL	TL	LL						Duration in Hrs	CIA		ESE	Total	CIAP	ESEP	Total			
													Max	CCE						Max	Max	
1	Wireless Technology	PE	ITCOR1PE301.1	3	1	2	2	120	4	2	20	20	60	100	40	25	-	25	10	25	10	150

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Apply the concepts of cellular communication to explain mobile operation in real scenarios.	Study the features, specification and working of cellular mobile	CO1
2	Model the TDMA system using simulation tools	Modeling and simulation of TDMA for wireless communication	CO1
3	Demonstrate the ability to troubleshoot common issues in FDMA simulation	Modeling and simulation of FDMA for wireless communication	CO1
4	Simulate the working of CDMA to analyze system performance	Modeling and simulation of CDMA for wireless communication	CO1
5	Identify the functions of each GSM subsystem and their key elements	To Study GSM Architecture	CO2
6	Demonstrate the process of data transfer between two Bluetooth devices	Identify the functions of each GSM subsystem and their key elements	CO3
7	Identify practical challenges in WSNs such as node failures, signal interference, and limited energy resources through simulated scenarios.	Demonstrate the simulation of WSN using the Network Simulators TinkerCAD	CO3
8	Identify the different types of satellites based on their orbits and purposes	To study different types of Satellite and compare them	CO4

## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Apply the concept of frequency reuse to assign channels efficiently in a cellular network and perform basic capacity calculations.</li> <li>2. Demonstrate handoff mechanisms in cellular systems by applying knowledge of interference and system capacity to maintain call continuity.</li> <li>3. Apply multiple access techniques (FDMA, TDMA, CDMA) to assign resources and explain their role in cellular communication.</li> </ol>	<b>CELLULAR ARCHITECTURE</b>  1.1 Cellular concept Frequency reuse - channel assignment, Capacity calculations 1.2 Hand off- interference and system capacity- trunking and grade of service, Coverage and capacity improvement 1.3 Multiple Access techniques - FDMA, TDMA, CDMA	12
2	CO2	<ol style="list-style-type: none"> <li>1. Apply knowledge of GSM architecture and radio air interface to explain the basic operation of GSM networks and their key components.</li> <li>2. Apply GSM services and frame structure concepts to interpret GSM communication processes.</li> <li>3. Apply knowledge of GPRS and UMTS architectures to explain packet data transmission and enhancements over GSM.</li> </ol>	<b>MOBILE TELECOMMUNICATION SYSTEM</b>  2.1 GSM Architecture, GSM Radio air Interface, GSM Services 2.2 GSM Frame Structure, Frequency Allocation – GSM Call Routing – Mobility Management 2.3 GPRS Architecture, UMTS.	10

(Continued on next page)



Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<ol style="list-style-type: none"> <li>1. Apply knowledge of Wireless MAN, LAN, PAN, and Wireless Sensor Networks to identify and describe their features and typical applications..</li> <li>2. Apply the IEEE 802.11 standard architecture and services to explain wireless LAN operations</li> <li>3. Apply wireless technologies (Bluetooth, Wi-Fi, WiMAX, Zigbee) for device communication.</li> </ol>	<b>WIRELESS NETWORKS</b>  3.1 Wireless MAN , LANs and PAN, Wireless Sensor Network 3.2 IEEE 802.11 Standard Architecture Services 3.3 Bluetooth- Wi-Fi – WiMAX, Zigbee	7
4	CO4	<ol style="list-style-type: none"> <li>1. Apply knowledge of satellite communication concepts to describe satellite network setups and service configurations.</li> <li>2. Apply the knowledge of satellite types and orbits to select appropriate satellites for specific communication requirements.</li> <li>3. Use Kepler's laws to calculate orbital parameters like apogee and perigee for satellite systems..</li> <li>4. Apply radar system principles to explain radar operation</li> </ol>	<b>SATELLITE and RADAR COMMUNICATION</b>  4.1 Basic concepts of Satellite Communications, Communication Networks and Services 4.2 Types of Satellite ,Orbit and Description: A brief History of Satellite Communication 4.3 Kepler's Law , Apogee and Perigee height Satellite Systems, Applications 4.4 Introduction to RADAR System, Radar Block Diagram and Operation, Radar Frequencies and Applications.	16

## VII SUGGESTED SELF LEARNING ACTIVITIES

### 1. Micro project

Students can use Software or Hardware for Micro Project.  
 For a micro project, consider the following parameters.

#### 1.1 Project Title (Topic Selection)

#### 1.2 Required software or Hardware Components

#### 1.3 Circuit Diagram/Block Diagram

#### 1.4 Working Explanation

#### 1.5 Output (Simulation using software/(Working photos/videos)

#### 1.6 Report Format (Documentation)

### 2. IEEE Paper

Develop the ability to search, read, analyze, and summarize IEEE research papers related to wireless communication technologies.

#### 2.1 Topic Selection

#### 2.2 Paper Reading and Analysis

#### 2.3 IEEE Paper Preparation

#### 2.4 Plagiarism Checking (It should be less than 20%)

## VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

Sr.No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Apply frequency allocation and Multiple Access Techniques in wireless networks	20%	30%	50%	-	-	-	100%
2	Demonstrate the different wireless technologies	20%	30%	50%	-	-	-	100%
3	Apply wireless technologies for wireless networks	25%	25%	50%	-	-	-	100%
4	Illustrate the principles, operation and applications of Satellite and RADAR System	25%	25%	50%	-	-	-	100%

## IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Wireless Communications	2 <sup>nd</sup> Edition	Andrea Goldsmith	Cambridge University Press	2023
2	Principles of Wireless Networks: A Unified Approach	2 <sup>nd</sup> Edition	Kaveh Pahlavan, Prashant Krishnamurthy	Pearson	2022
3	Wireless Communications and Networking	1 <sup>st</sup> Edition	Vijay K. Garg	Morgan Kaufmann	2023
4	Satellite Communications Systems: Systems, Techniques and Technology	6 <sup>th</sup> Edition	Gerard Maral, Michel Bousquet, Zhili Sun	John Wiley and Sons	2020

### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Cellular Communication Networks and Standards: The Evolution from 1G to 6G	1 <sup>st</sup> Edition	Wei Jiang and Bin Han	Springer	2024
2	Enabling Technologies for Next Generation Wireless Communications	2 <sup>nd</sup> Edition	Mohammed Usman, MohdWajid, MohdDilshad Ansari	CRC Press	2024
3	Satellite Communication	5 <sup>th</sup> Edition	Dennis Roddy, W.Linwood Jones, DavidG. Long	McGraw-Hill Education	2024

### Online References

Sr. No	Website Name
A	<a href="https://www.lifewire.com/wireless-standards-802-11a-802-11b-g-n-and-802-11ac-816553?">https://www.lifewire.com/wireless-standards-802-11a-802-11b-g-n-and-802-11ac-816553?</a>
B	<a href="https://www.rfwireless-world.com/tutorials/cellular-communication-basics">https://www.rfwireless-world.com/tutorials/cellular-communication-basics</a>
C	<a href="https://www.rfwireless-world.com/tutorials/satellite-communication-tutorial">https://www.rfwireless-world.com/tutorials/satellite-communication-tutorial</a>
D	<a href="https://www.tutorialspoint.com/radar_systems/index.htm">https://www.tutorialspoint.com/radar_systems/index.htm</a>



Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Game theory and Gen AI	Course Code:ITCOR1PE301.2	3	1	2	2	4
Course Type:	Programme Elective (PE)					
Pre-requisite:	Courses:Engineering Mathematics, Artificial Intelligence and Data Science					

## I RATIONALE

In today's era of digital transformation, the integration of advanced technologies, Game Theory and Generative AI stand out as crucial components for building intelligent, strategic, and creative systems. Game Theory provides the mathematical foundation for analyzing decision-making in competitive and cooperative environments. Generative AI (Gen AI), on the other hand, focuses on the creation of new data such as text, images, audio, and even software code.

## II COMPETENCY

Demonstrate the ability to apply game-theoretic principles to the design, training, and evaluation of Generative AI systems, with a focus on strategic interaction, adversarial modeling, and decision-making in multi-agent environments.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Apply foundational principles of Game Theory for solving decision-making problems.
2	Apply concepts of games with imperfect information for real-world scenarios involving uncertainty.
3	Develop the practical knowledge of Generative AI models and their applications.
4	Analyze game-theoretic reasoning to enhance the design and evaluation of Generative AI systems.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme				Credits	Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Exam	Theory					Practical				SLA		Total
				CL	TL	LL					Duration in Hrs	CIA		ESE	Total	CIAP	ESEP	Total				
												Max	Min					Max	Min	Max	Min	
1	Game theory and Gen AI	PE	ITCOR1PE301.2	3	1	2	2	120	4	2	20	20	60	100	40	25	-	25	10	25	10	150

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Implement the Prisoner's Dilemma using programming or simulation tools.	Implementation of Prisoner's Dilemma techniques.	CO1
2	Implement the Stag Hunt game to analyze coordination problems.	Implementation of Stag Hunt techniques.	CO1
3	Implement the Matching Pennies game to understand mixed strategy equilibria, zero-sum interactions.	Implementation of the Matching Pennies algorithm.	CO1
4	Implement and simulate the evolution of mixed strategies using the concept of polymorphic equilibrium.	Implementation of Mixed Strategy Evolution using Polymorphic Equilibrium.	CO2
5	Implement the Buyer-Seller game using Bayesian game theory with private information.	Implementation of the Buyer-Seller Game using a Bayesian Game with private information.	CO2
6	Implement and train Generative Adversarial Networks (GANs) to generate realistic images.	Implementation of image generation with Generative Adversarial Networks (GANs).	CO3
7	Implement and train a WaveNet model to generate human-like audio sequences.	Implementation of audio generation with WaveNet.	CO3
8	Implement generative models for video generation to understand temporal dynamics, frame consistency.	Implementation of video generation with generative models.	CO3
9	Implement fine-tuning techniques on pre-trained Large Language Models (LLMs).	Implementation of fine-tuning techniques for Large Language Models (LLMs).	CO4
10	Implement simulations of deceptive behavior in Large Language Models (LLMs).	Implementation of simulating deceptive behavior in Large Language Models (LLMs).	CO4

## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Demonstrate Nash Equilibrium by analyzing strategy profiles that lead to stability in game-theoretic settings.</li> <li>2. Illustrate strategic decision-making in economic contexts by applying the concept of Nash Equilibrium.</li> <li>3. Model strategies in the War of Attrition using game theoretic reasoning.</li> </ol>	<b>Introduction to Game Theory</b>  1.1 Introduction, The theory of rational choice, Games with Perfect Information, Nash Equilibrium: Theory, Prisoner's Dilemma, Stag Hunt, Matching Pennies, BOS, Multi. 1.2 NE, Cooperative and Competitive Games, Strict and Non Strict NE, Best response functions for NE. 1.3 Nash Equilibrium: Illustrations, Cournot's, Models of Oligopoly, Bertrand's model of oligopoly, Electoral competition. 1.4 The War of Attrition, Auctions, Mixed Strategy Equilibrium, Strategic games in which players may randomize, Dominated actions.	11
2	CO2	<ol style="list-style-type: none"> <li>1. Implement Bayesian Games to analyze strategies in uncertain environments using expected utility based on beliefs and types.</li> <li>2. Illustrate how maximin strategies lead to optimal outcomes in strictly competitive game settings with hostile opponents.</li> <li>3. Demonstrate how mixed strategies can be employed in games where deterministic choices are suboptimal.</li> </ol>	<b>Games with Imperfect Information</b>  2.1 Bayesian Games, Introduction, Motivational examples, General definitions, two examples concerning information. 2.2 Strictly Competitive Games and Max Minimization, Rationalizability, Evolutionary Equilibrium, Monomorphic pure strategy equilibrium. 2.3 Mixed strategies and Polymorphic Equilibrium, Repeated games: The Prisoner's Dilemma, Infinitely repeated games, Strategies, General Results, Mechanism Design and Auction Theory, Multiagent Systems and Strategy Optimization.	12

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<ol style="list-style-type: none"> <li>1. Analyze the development and contribution of Generative AI in the context of modern AI advancements and data technologies.</li> <li>2. Identify and describe key applications of Generative AI in text, image, audio, and video generation, along with real-world use cases in various industries.</li> <li>3. Demonstrate the adversarial relationship between generator and discriminator in GANs through the lens of game theory.</li> <li>4. Illustrate the adversarial training cycle in GANs by modeling how synthetic data is produced and refined over iterations.</li> </ol>	<b>Introduction to Generative AI</b> 3.1 Introduction to Generative AI, Overview of Machine Learning vs Deep Learning vs Generative Models. 3.2 Applications of Gen AI: Text, Image, Audio, and Video Generation, Ethics and societal implications of Gen AI. 3.3 AI, Strategic Interaction and Generative Model Architectures: Generative Adversarial Networks (GANs). 3.4 Architecture Generative Adversarial Networks (GANs): Training, Variational Autoencoders (VAEs), Attention Mechanism, Transformer architectures and the foundational principles of Large Language Models (LLMs).	12
4	CO4	<ol style="list-style-type: none"> <li>1. Apply appropriate evaluation metrics (e.g., FID, BLEU, ROUGE, Inception Score, Perplexity) to assess the performance and quality of Generative AI models across text, image, audio, and video domains.</li> <li>2. Illustrate the role of prompt design in steering LLM behavior for task-specific outcomes across domains.</li> <li>3. Demonstrate optimization methods such as reinforcement learning, self-play, and evolutionary algorithms for improving strategies in generative settings.</li> </ol>	<b>Theoretic Approaches in Gen AI and Research Trends</b> 4.1 Gen AI Model Evaluation Metrics, Multi-agent Reinforcement Learning (MARL), AI alignment and strategic behavior in LLMs. 4.2 LLMs, Prompt engineering and AI safety, Adversarial Training as a Game, Game-Theoretic Evaluation of Generative Models. 4.3 Strategy optimization in generative environments, Cooperative AI and negotiation with LLMs.	10



## VII SUGGESTED SELF LEARNING ACTIVITIES

1. Investigate the role of game theory in training Generative Adversarial Networks (GANs).
2. Watch a YouTube video or NPTEL lecture on Nash Equilibrium and write a summary.
3. Solve at least two strategic games using pure and mixed strategy approaches based on 1) Correct identification of game type 2) Solution using pure strategies 3) solution using mixed strategies 4) Comparison and justification 5) Interpretation of results.
4. Select a real-world use case (e.g., online ad auctions, bidding in e-commerce, GAN training, AI in poker) based on 1) Clearly define the chosen real-world scenario. 2) Correctly identify the underlying game-theoretic or AI model 3) Use diagrams, payoff matrices, or system flowcharts where applicable 4) Apply game theory, reinforcement learning, or generative AI methods to explain or simulate the behavior of agents 5) Analyze outcomes (e.g., equilibrium reached, payoff maximization, convergence in GANs).





**VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE**

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Apply foundational principles of Game Theory for solving decision-making problems.	10%	30%	60%	-	-	-	100%
2	Apply concepts of games with imperfect information for real-world scenarios involving uncertainty.	10%	30%	50%	-	-	-	100%
3	Develop the practical knowledge of Generative AI models and their applications.	10%	30%	60%	-	-	-	100%
4	Analyze game-theoretic reasoning to enhance the design and evaluation of Generative AI systems	10%	20%	50%	20%	-	-	100%

## IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Generative DeepLearning: Teaching Machines to Paint, Write, Compose, and Play	2 <sup>nd</sup> Edition	David Foster	O'Reilly Medial	2022
2	Generative AI with Python and TensorFlow 2: Harness	1 <sup>st</sup> Edition	Carl Hamacher,Zvonko Vranesic, and Safwat Zaky	Oxford University Press	2021
3	An Introduction to Game Theory	1 <sup>st</sup> Edition	Martin J. Osborne	Tata McGraw-Hill	2003

### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	A Course in Game Theory	1 <sup>st</sup> Edition	Thomas S. Ferguson	World Scientific Publishing	2020
2	Probabilistic Deep Learning: With Python, Keras and TensorFlow Probability	1 <sup>st</sup> Edition	Oliver D urr, BeateSick, Elvis Murina	Manning Publications	2020
3	Introduction to Game Theory	1 <sup>st</sup> Edition	Stef Tijs	Hindustan Book Agency	2003

### Online References

Sr. No	Website Name
A	<a href="https://staff.science.uva.nl/u.endriss/teaching/game-theory/slides/gt8.pdf">https://staff.science.uva.nl/u.endriss/teaching/game-theory/slides/gt8.pdf</a>
B	<a href="https://www.coursera.org/learn/introduction-to-generative-ai">https://www.coursera.org/learn/introduction-to-generative-ai</a>
C	<a href="https://www.google.com/search?q=GameTheoretic+Approaches+in+Gen+AI+and+Research+Trends&amp;oq=Game-Theoretic+Approaches+in+Gen+AI+and+Research+Trends&amp;aqs=chrome..69i57j33i160.792j0j15&amp;sourceid=chrome&amp;ie=UTF-8">https://www.google.com/search?q=GameTheoretic+Approaches+in+Gen+AI+and+Research+Trends&amp;oq=Game-Theoretic+Approaches+in+Gen+AI+and+Research+Trends&amp;aqs=chrome..69i57j33i160.792j0j15&amp;sourceid=chrome&amp;ie=UTF-8</a>



Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
<b>Course Name:</b> Advanced Database Management System	<b>Course Code:</b> ITCOR1PE301.3	3	1	2	2	4
<b>Course Type:</b>	Programme Elective-I(PE)					
<b>Pre-requisite:</b>	Database System Concepts					

## I RATIONALE

As data become the backbone of modern decision making, businesses and organizations demand not just storage, but intelligent and optimized access to information. An Advanced Database Management System course equips students with the skills to go beyond the basics of data handling, delving into optimization, distributed databases, data warehousing and emerging technologies like NoSQL.

## II COMPETENCY

Demonstrate the ability to design, implement, and manage complex database systems using advanced techniques including query optimization, distributed databases and emerging database technologies, while ensuring high levels of data integrity, scalability, and performance.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Design efficient paths for query execution by calculating query cost.
2	Apply sophisticated access protocols to control access to the database models.
3	Build a Data warehouse , process it using ETL and OLAP.
4	Design modern applications using NoSQL databases.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme					Assessment Scheme															
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Credits	Exam	Theory					Practical				SLA			Total
				CL	TL	LL						Duration in Hrs	CIA		ESE	Total		CIAP	ESEP	Total				
													Max	Min		Max	Min			Max	Min	Max	Min	
1	Advanced Database Management System	PE-I	ITCOR1PE301.3	3	1	2	2	120	4	2	20	Max	20	60	100	40	25	-	25	10	25	10	150	

## V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Define real-world problems in terms of data requirements and effectively model them using Entity-Relationship diagrams	Problem Definition and draw ER/EER diagram	CO1
2	Implement relational databases using appropriate data types, constraints and trigger	Creation of the database: using constrains and triggers	CO1
3	Execute advanced SQL queries involving views, nested sub queries, and recursive queries for efficient data retrieval.	Advanced SQL – must cover Views, nested and recursive queries.	CO1
4	Implement relational databases with JDBC, Dynamics and embedded SQL.	Implementing an application and integrating with the database using JDBC, Dynamic and embedded SQL	CO2
5	Design a distributed database by performing data fragmentation and distributed query processing.	Implementing a Distributed Database.	CO3
6	Demonstrate security mechanisms such as authorization and authentication.	Demonstration of database access control techniques	CO2
7	Analyze analytical needs of an organization and define data warehouse requirements	Problem Definition for a Data Warehouse.	CO3
8	Design a dimensional model based on business intelligence requirements using fact and dimension tables.	Construction of Star Schema Model	CO3
9	Perform OLAP operations such as roll-up, drill-down, slicing, dicing, and pivoting to extract meaningful insights from multidimensional data.	Creation of a DW and running OLAP operations on them ( Roll up, Drill down, Slice, Dice, pivot)	CO3
10	Investigate Cloudera, a big data tools to process, analyze, and visualize large-scale datasets in a Hadoop ecosystem.	Explore Cloudera big data analytics tool	CO4

## VI THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	1. Evaluate the cost implications of selection, sorting, and join operations in query processing.  2. Describe how expression trees are constructed and optimized.	<b>Query Processing and Optimization</b> 1.1 Basics of Query processing, Query processing in DBMS 1.2 Steps of Query Processing 1.3 Measures of Query Cost Selection Operation, Sorting, Join Operation 1.4 Evaluation of Expressions 1.5 Basics of Query Optimization, Goals of Query Optimization 1.6 Transformations of Relational Expression 1.7 Estimating Statistics of Expression Results Choice of Evaluation Plans	08
2	CO2	1. Discuss the principles of various Access Control protocols and how it simplifies access management through defined user roles.  2. Describe the characteristics and challenges of various advanced databases.  3. Explain the concepts of data fragmentation and how data is allocated across sites to optimize.	<b>Advanced Data Management Techniques</b> 2.1 Advanced Database Access protocols: Discretionary Access Control Based on Granting and Revoking Privileges 2.2 Mandatory Access Control and Role- Based Access Control, Remote Database access protocol 2.3 Advanced Database: Overview of Advanced Database Models like Mobile databases, Temporal databases 2.4 Spatial databases, Distributed Database: Introduction: Distributed Data Processing 2.5 Distributed Database System: Architecture, Types, Design Issues. 2.6 Data Fragmentation, Allocation in distributed databases.	14

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	1. Evaluate the relevance of data warehouses in the era of big data and the key features and advantages of a data warehouse.  2. Describe the principles of dimensional modeling for data analysis and differentiate between star and snowflake schemas with examples.  3. Demonstrate understanding of OLAP operations and different OLAP architectures.  4. Describe what ETL means and learn how data is collected, changed, and stored.	<b>Data Warehousing, Dimensional Modeling, ETL Process and OLAP</b> 3.1 Basics of Data Warehousing: Definition ; Is data warehouse still relevant in the age of big data 3.2 Features of a Data Warehouse, Advantage of Data warehousing Data Warehouse Architecture 3.3 Data Warehouse and Data Marts; Data Warehousing Design Strategies 3.4 Dimensional Modeling: The Star Schema; How Does a Query Execute? The Snowflake Schema; Fact Tables and Dimension Tables; 3.5 Factless Fact Table; Updates To Dimension Tables, Primary Keys, Surrogate Keys and Foreign Keys. 3.6 OLAP: Purpose; OLAP Operations in a cube: Roll-up, Drill-down, Slice, Dice, Pivot, 3.7 OLAP Architectures: MOLAP, ROLAP, DOLAP and HOLAP. 3.8 ETL Process: Data Extraction, Data Transformation: Tasks Involved in Data Transformation and 3.9 Techniques of Data Loading	16
4	CO4	1. Summarize the CAP and BASE Theorem that support the flexibility of NoSQL systems.  2. Compare and contrast NoSQL types to determine which is most appropriate for a given application scenario.	<b>Fundamental to Big data</b> 4.1 Big data: Definition, Categories and Features of big data 4.2 NoSQL: CAP theorem, BASE property 4.3 Types of NoSQL: Key-value stores, Graph stores 4.4 Column family stores, Document stores.	07

## VII SUGGESTED SELF LEARNING ACTIVITIES

1. Explore data fragmentation techniques of distributed databases.
2. Consider a scenario (e.g., online food delivery system), present fact and dimension tables with keys and potential OLAP queries.

### VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Design efficient paths for query execution by calculating query cost.	20%	30%	50%	-	-	-	100%
2	Apply sophisticated access protocols to control access to the database models.	-	20 %	30%	50%	-	-	100%
3	Build a Data warehouse , process it using ETL and OLAP.	20%	50%	30%	-	-	-	100%
4	Design modern applications using NoSQL databases.	25%	25%	50%	-	-	-	100%

### IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

#### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Data Warehousing	5 <sup>th</sup> Edition	Theraja Reema	Oxford University Press	2009
2	Fundamentals of Database Systems	3 <sup>rd</sup> Edition	Elmasri and Navathe	PEARSON	2008

#### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	The Data Warehouse Toolkit: The Definitive Guide To Dimensional Modeling	3 <sup>rd</sup> Edition	Ralph Kimball, Margy Ross	Wiley India	2005



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An Autonomous Institute Affiliated to University of Mumbai

## Online References

Sr. No	Website Name
A	<a href="https://www.udemy.com/course/advanced-database-queries/">https://www.udemy.com/course/advanced-database-queries/</a> , Udemy Course: Advanced Database Queries By Prof. Aspen Olmsted (Professor of Computer Science at Wentworth Institute of Tech);





Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Entrepreneurship and Management	Course Code: ITCOR1ED301	2	-	-	2	2
Course Type:	Entrepreneurship and Development (ED)					
Pre-requisite:	Nil					

## I RATIONALE

Entrepreneurship and management create a balance between innovation and stability. Although entrepreneurs bring vision and new possibilities, strong management ensures practical execution and long-term success. Their synergy is essential to build resilient and adaptable businesses that thrive in evolving markets.

## II COMPETENCY

Demonstrates creativity, resilience, and a proactive approach to identify opportunities and solve problems in dynamic environments.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Summarize the fundamentals of Entrepreneurship and Business Management.
2	Analyze key challenges in launching and managing new ventures.
3	Analyze various E-business models and architectural frameworks to evaluate the effectiveness in different business environments.
4	Analyze E-business strategies and associated digital technologies.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme			Credits	Assessment Scheme														
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week				SL	Total	Exam	Theory					Practical				SLA		Total
				CL	TL	LL					Duration in Hrs	MSE	CCE	ESE	Total	CIAP	ESEP	Total				
																			Max			
1	Entrepreneurship and Management	ED	ITCOR1ED301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75

## V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Explore the fundamentals of entrepreneurship.</li> <li>2. Assess the strengths and limitations of entrepreneurial and managerial mindsets.</li> <li>3. Explore the unique challenges and contributions of different entrepreneur types</li> </ol>	<b>Entrepreneurship Fundamentals</b> 1.1 Fundamentals Definition and Evolution of Entrepreneurship 1.2 Entrepreneur vs Managerial 1.3 Mindset Types and Classifications of Entrepreneurs (Women, Corporate, Social) 1.4 Entrepreneurial Motivation and Leadership Characteristics 1.5 Entrepreneurship Process, Opportunities, and Challenges	10
2	CO2	<ol style="list-style-type: none"> <li>1. Analyze competition to create differentiated positioning in the market.</li> <li>2. Create compelling pitch decks tailored to investors and stakeholders</li> </ol>	<b>Venture Planning and Startup Finance</b> 2.1 Methods to Initiate Ventures, Acquisitions 2.2 Marketing Plans: Customer, Sales and Competition Analysis Business Plan 2.3 Elements and Pitch Deck Creation 2.4 Funding Life cycle: Angel, VC, Bootstrap Strategic 2.5 General Management for Startups	5
3	CO3	<ol style="list-style-type: none"> <li>1. Identify trends shaping the future of e-business models.</li> <li>2. Develop strategic insights in various e-commerce and digital payment systems</li> </ol>	<b>E-Business Landscape.</b> 3.1 Concept and Scope of E-Business 3.2 E-commerce: B2C, B2B, C2C Models. 3.3 Differentiate near-field vs far-field regions 3.4 Success Factors in E-commerce 3.5 Payments (UPI, Razorpay, Stripe) 3.6 Introduction to FinTech, E-Government	5

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Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
4	CO4	<ol style="list-style-type: none"><li>1. Differentiate between functional areas in business ecosystems.</li><li>2. Evaluate the advantages and challenges of ERP implementation in various industries</li><li>3. Explore different types of e-procurement.</li></ol>	<b>Digital Strategies and Enterprise Tech</b> 4.1 CRM: Functional Areas, SRM, PRM, ERM, AI in CRM 4.2 ERP: Core vs Extended Modules, Implementation Benefits and Risks 4.3 SCM: Push vs Pull Models, E-SCM Use Cases, Integration with IoT 4.4 E-Procurement: Types, Components, Drivers	10

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## VI SUGGESTED SELF LEARNING ACTIVITIES

1. Startup: Choose a successful startup. Research its origin story, funding journey, business model, and key milestones. Reflect on what made it succeed or fail. Prepare a Presentation.
2. Team Simulation Role-Play Write scenarios where you act as a manager handling tough situations (conflict resolution, poor performance, project delays). Practice Responses and Decisions. Prepare Presentation.

## VII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Summarize the fundamentals of Entrepreneurship and Business Management.	-	50%	50%	-	-	-	100%
2	Analyze key challenges in launching and managing new ventures	-	50%	50%	-	-	-	100%
3	Analyze various E-business models and architectural frameworks to evaluate the effectiveness in different business environments.	-	-	50%	50%	-	-	100%
4	Analyze E-business strategies and associated digital technologies.	-	-	50%	50%	-	-	100%

## VIII SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Entrepreneurship	11 <sup>th</sup> Edition	Robert Hisrich, Michael Peters	Tata McGraw Hill	2020
2	Entrepreneurship New venture creation	11 <sup>th</sup> Edition	David Holt	Prentice Hall of India Pvt Ltd	2016
3	E-Business & E-Commerce Management: Strategy, Implementation	5 <sup>th</sup> Edition	Dave Chaffey	Pearson Education	2013
4	Business & E-commerce-A Managerial Perspective	1 <sup>st</sup> Edition	P. T. Joseph	Prentice Hall India Publications	2004

**Reference Books**

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Business Driven Technology	5 <sup>th</sup> Edition	Haag/Baltzan/Philips	Tata McGraw Hill	2012

**Online References**

Sr. No	Website Name
A	<a href="https://onlinecourses.nptel.ac.in/noc25_de20/preview">https://onlinecourses.nptel.ac.in/noc25_de20/preview</a> , NPTEL Course: Understanding Incubation and Entrepreneurship by Prof. B.K. Chakravarthy (IIT Mumbai);



Program	Third Year B. Tech Electronics Engineering (VLSI Design and Technology) (Semester V)	CL	TL	LL	SL	C
Course Name: Family Consumer Science	Course Code: VDCOR1OE301	2	-	-	2	2
Course Type:	Open Elective					
Pre-requisite:	Nil					

## I RATIONALE

Learning Family and Consumer Science helps individuals make informed and responsible decisions about personal budgeting, nutrition, health, and consumer rights, fostering independence and well-being in everyday life.

## II COMPETENCY

Ability to plan and manage a personal or family budget, make smart consumer choices, understand and exercise consumer rights, and adopt healthy nutritional and lifestyle habits for long-term personal and family welfare.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Apply essential nutritional knowledge for maintaining health.
2	Apply investing strategies and compare options for achieving short- and long-term financial goals.
3	Develop and implement a personalized stress management plan based on individual needs and preferences.
4	Develop a business idea based on market needs, trends, and personal interests or strengths.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

								Learning Scheme			Assessment Scheme														
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL	Total	Credits		Exam	Theory					Practical				SLA		Total		
				CL	TL	LL						Duration	CIA		ESE	Total	CIAP	ESEP	Total						
													MSE	CCE					Max	Min				Max	Min
6	Family Consumer Science	OE	VDCOR1OE301	2	-	-	2	60	2		-	50	-	50	20	-	-	-	-	25	10	75			

## V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Explain the connection between nutrition and overall wellness.</li> <li>2. Identify the roles of key nutrients in human health.</li> <li>3. Develop balanced meal plans for diverse dietary requirements.</li> <li>4. Apply safe food handling and preparation techniques.</li> <li>5. Explore professional pathways in nutrition and health-related careers.</li> </ol>	<b>Nutrition and Wellness</b> 1.1 Introduction to nutrition and principles of wellness 1.2 Major nutrients and their physiological functions 1.3 Meal planning for various age groups and dietary needs 1.4 Safe food preparation practices and hygiene standards 1.5 Strategies for healthy weight management 1.6 Identification and understanding of eating disorders 1.7 Career opportunities in nutrition and health sciences	8
2	CO2	<ol style="list-style-type: none"> <li>1. Explain the concept and importance of managing money effectively.</li> <li>2. Analyze the family's role in financial planning and budgeting.</li> <li>3. Apply work simplification techniques to reduce household effort.</li> <li>4. Evaluate the contribution of working women to economic well-being.</li> <li>5. Improve work conditions through structured task planning.</li> </ol>	<b>Money Management and Work Simplification</b> 2.1 Definition, meaning, and significance of money management 2.2 Role of family members in planning and managing family income 2.3 Budgeting techniques and practical tools for money management 2.4 Economic impact of working women in the household 2.5 Meaning and relevance of work simplification in daily life 2.6 Techniques to simplify tasks and reduce time and effort 2.7 Methods to improve workflow and enhance work conditions	8
3	CO3	<ol style="list-style-type: none"> <li>1. Explain the causes and impact of stress on well-being.</li> <li>2. Apply effective techniques to manage and reduce stress.</li> </ol>	<b>Stress Management</b> 3.1 Meaning and significance of stress in daily life 3.2 Common causes and effects of stress on physical and mental health 3.3 Techniques for managing and coping with stress effectively	8

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
4	CO4	<ol style="list-style-type: none"> <li>1. Explain the process and need for entrepreneurship development.</li> <li>2. Identify the economic roles played by enterprises locally and globally.</li> <li>3. Compare types of entrepreneurship along with their merits and challenges.</li> <li>4. Interpret government and private initiatives supporting entrepreneurs.</li> <li>5. Develop core entrepreneurial competencies including creativity and interpersonal skills.</li> </ol>	<b>The Entrepreneur</b> 4.1 Concept, need, and stages of the entrepreneurship development process 4.2 Role of enterprises in national and global economic growth 4.3 Types of entrepreneurship with their respective merits and demerits 4.4 Government and private sector schemes and policies for enterprise promotion 4.5 Development of entrepreneurial competencies and mindset 4.6 Importance of self-awareness and interpersonal skills in entrepreneurship 4.7 Role of creativity and achievement orientation in entrepreneurial success	8

## VI SELF LEARNING ACTIVITIES

Activity	Description	Relevant CO
Diet Analysis	Analyze daily diet based on health requirements	CO1
Budget Analysis	Analyze Expenses for monthly budget	CO2
Well Being Analysis	Analyze mental well being and manage stress	CO3
Business Analysis	Analyze current business market to come up with a business idea	CO4

## VII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE



Sr. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Apply essential nutritional knowledge for maintaining health.	-	25%	50%	25%	-		100%
2	Apply investing strategies and compare options for achieving short- and long-term financial goals.	-	25%	50%	25%	-	-	100%
3	Develop and implement a personalized stress management plan based on individual needs and preferences.	-	25%	50%	25%	-	-	100%
4	Develop a business idea based on market needs, trends, and personal interests or strengths.	-	25%	50%	25%	-	-	100%

## VIII SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Foundations of Family and Consumer Sciences: Careers Serving Individuals, Families, and Communities	2 <sup>nd</sup> Edition	Sharleen L. Kato, Ed.D., and Janice G. Elias	Goodheart-Willcox	2014
2	Introduction to Family and Consumer Sciences	2 <sup>nd</sup> Edition	Zoe Engstrom	Kendall Hunt Publishing Company	2018

**Reference Books**

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Family and Consumer Sciences: Preventative and Restorative Education	1 <sup>st</sup> Edition	Melinda Swafford and Elizabeth Ramsey	Cognella Academic Publishing	2022
2	Teaching Home Economics	6 <sup>th</sup> Edition	Margaret E. Bubolz, Jean E. Saterlee	John Wiley & Sons	1991

**Online References**

Sr. No	Website Name
A	<a href="https://en.wikiversity.org/wiki/Home_economics?utm_source=">https://en.wikiversity.org/wiki/Home_economics?utm_source=</a> , Web Resource
B	<a href="https://www.investopedia.com/financial-literacy-resource-center-7151950?utm=">https://www.investopedia.com/financial-literacy-resource-center-7151950?utm=</a> , Web Resource

<b>Program</b>	<b>Third Year B.Tech Electronics and Communication (Advanced Communication Technology)(Semester V)</b>	<b>CL</b>	<b>TL</b>	<b>LL</b>	<b>SL</b>	<b>C</b>
<b>Course Name:</b> Vedic Mathematics	<b>Course Code:</b> ACCOR1OE301	2	-	-	2	2
<b>Course Type:</b>	Open Elective (OE)					
<b>Pre-requisite:</b>	NA					

## I RATIONALE

The Vedic Mathematics course reconnects students with the rich heritage of ancient Indian mathematics, highlighting its foundational role in modern concepts and its integration with literature, philosophy, and spirituality. By exploring contributions from scholars like Aryabhata, Bhaskaracharya, and Pingala, students gain insights into early developments in number systems, algebra, geometry, trigonometry, and combinatorics. The course emphasizes creative, interdisciplinary thinking through poetic structures like Chhandas Shastra and activity-based learning, fostering both analytical skills and cultural appreciation.

## II COMPETENCY

Apply ancient Indian mathematical concepts, algorithms, and number systems to solve arithmetic, algebraic, geometric, and combinatorial problems, while appreciating the interdisciplinary connection between mathematics, literature, and cultural heritage.

## III COURSE OUTCOMES (COs)

After the completion of course based learning students will be able to,

Course Outcome Number	Course Outcome Statement
1	Identify contribution of various ancient Indian Mathematicians.
2	Apply various mathematical algorithms in the ancient Indian Mathematics.
3	Analyze relation of poetry and literature with mathematics.
4	Identify application of ancient Indian Mathematical concepts and algorithms in real modern world.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme					Credits	Assessment Scheme												
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL	Total		Exam	Theory					Practical				SLA		Total
				CL	TL	LL					MSE	CCE	ESE	Total		CIAP	ESEP	Total				
Duration in Hrs		Max	Max	Max	Max	Max	Min	Max	Max	Max	Min	Max	Min									
1	Vedic Mathematics	OE	ACCOR1OE301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75

**V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT**

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO2, CO4	<ol style="list-style-type: none"> <li>1. Apply the concept of place value and large number representation using ancient Indian number systems.</li> <li>2. Explain the concept of place value, large number representation, and the decimal system.</li> <li>3. Demonstrate the use of Bhuta-Sankhya and Katapayadi systems for encoding numbers.</li> <li>4. Make use of Use of ancient measurement techniques for time, distance, and weight.</li> </ol>	<b>Number System and Units of Measurement</b> 1.1 Number system in Ancient India, The Concept of Zero and its importance. 1.2 Large numbers and their representation, Place value of numerals, Decimal System. 1.3 Encoding number using Bhuta-Samkhya and Katapayadi system. 1.4 Measurements for Time, Distance and Weight.	6
2	CO1, CO2, CO4	<ol style="list-style-type: none"> <li>1. Apply square, square root, and progression techniques based on ancient Indian arithmetic algorithms.</li> <li>2. Use ancient arithmetic algorithms like squaring, square roots, and progressions.</li> <li>3. Explain the contributions of mathematicians such as Bhaskaracharya and Aryabhatta.</li> <li>4. Implement ancient arithmetic logic to derive results efficiently.</li> </ol>	<b>Mathematics in Ancient Bharat(India)</b> 2.1 Unique aspects of Indian Mathematics, Great Mathematicians and their contributions. 2.2 Introduction to Ancient Indian Arithmetic Algorithms and Algebra: Square of number, Square root, Series and Progression. Solve linear equations. 2.3 Study of the contribution of Bhaskaracharya or Aryabhatta.	8

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO2, CO4	<ol style="list-style-type: none"> <li>1. Explain the use of geometry in altar construction and the Sulbha Sutra rules.</li> <li>2. Apply geometrical and trigonometric concepts to derive values like PI and sine (Jya).</li> <li>3. Interpret geometric interpretations of right-angled triangle properties from Vedic texts.</li> <li>4. Demonstrate computation of R-sines using ancient trigonometric principles.</li> </ol>	<b>Geometry and Trigonometry in Ancient Bharat(India)</b> 3.1 Geometry: Use of Geometry in construction of Altars, The Value of PI, Property of Right angled, Traingle in Sulbha Sutras, Brahmgupta's Theorm and quadrilateral. 3.2 Trigonometry: The Jya and Cojya in Indian Mathematics, Computation of R-Sines, Madhava's Sine and Cosine series. 3.3 Study of altar for Darshapurnamasvedi.	8
4	CO1, CO2, CO3	<ol style="list-style-type: none"> <li>1. Describe the principles of Bhadraganitam, magic squares, and binary number logic.</li> <li>2. Analyze the binary mathematical system in Chhandas Shastra through the concepts of Laghu and Guru.</li> <li>3. Demonstrate Pingala's algorithms such as Prastara and Nashta for generating verse patterns.</li> <li>4. Analyze the construction and recursive properties of Varn Meru (Pascal-like triangle) and relate it to binomial coefficients and modern combinatorial methods.</li> </ol>	<b>Bhadraganitam, Binary Mathematics and Combinatorial Problems in Chhandah-sastra of Pingala</b> 4.1 Bhadraganitam- Construction of magic squares, Binary Mathematics and Combinatorics: Introduction to concept of Laghu/Guru. 4.2 Pingal's contribution in Chhandas Shastra, Overview of Algorithms by Pingala - Prastara, Samkhya, Uddishta, Lagakriya, Nashta, Adhvayoga, Concept of Varn meru. 4.3 Applications of Magic Squares.	8

## VI SUGGESTED SELF LEARNING ACTIVITIES

Case Study / Article writing on recent researches using vedic mathematics and their contribution to the modern world.

## VII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Identify contribution of various ancient Indian Mathematicians.		30%	70%				100%
2	Apply various mathematical algorithms in the ancient Indian Mathematics.		20%	80%				100%
3	Analyze relation of poetry and literature with mathematics.		30%	50%	20%			100%
4	Identify application of ancient Indian Mathematical concepts and algorithms in real modern world.		20%	80%				100%

## VIII SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Introduction to Indian Knowledge System: Concepts and Applications	1 <sup>st</sup> Edition	B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R.N.	PHI	2024
2	Pride of India	Latest Edition	Sanskritabharati	Sanskritabharati, New Delhi	2016

### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Geometry in Ancient and Medieval India	Latest Edition	Dr.T.A.SaraswatiAmmma	Motilal Banarsidass Varanasi	2017
2	The History of Ancient Indian Mathematics	Latest Edition	C.N.Srinivasiengar	Motilal Banarsidass Varanasi	1988
3	Meru Prastaar: The Wonder World of Indian Mathematics	Latest Edition	Chandrabhas M. Halai	Garuda Prakashan	2022
4	Vedic Mathematics Inside Out	Latest Edition	Chandrabhas M. Halai	The Write Place	2018

### Online References

Sr. No	Website Name
1	<a href="https://nptel.ac.in/courses/111101080">https://nptel.ac.in/courses/111101080</a> , Mathematics in India - From Vedic Period to Modern Times, IIT Bombay Prof.K.Ramasubramanian, Prof. M.D.Srinivas , Prof.M.S.Sriram;

## I RATIONALE

## II COMPETENCY

### III COURSE OUTCOMES (COs)

Course Outcome Number	Course Outcome Statement
1	Analyze interpersonal skills, communication styles, and personal boundaries essential for life skill development.
2	Apply logical reasoning, structured problem-solving, and goal-setting to create and implement effective decisions.
3	Evaluate personal resilience and adaptability using emotional intelligence, stress coping strategies, and mindset growth techniques.
4	Demonstrate workplace ethics, digital security practices, and financial awareness for effective career development.

				Learning Scheme				Assessment Scheme															
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week				SL	Total	Credits		Theory					Practical				SLA		Total
				Duration in Hrs	CIA						ESE	Total		CIAP	ESEP	Total							
					MSE	CCE						Max	Min			Max	Min	Max	Min	Max	Min		
1	Skills for a Balanced Life	OE-II	CSCOR10E301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75	

## V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>1. Illustrate the importance of life skills by giving examples of how they help in managing real-life situations.</li> <li>2. Use the WHO and UNICEF life skills framework in real-life scenarios.</li> <li>3. Differentiate between thinking, emotional, and social skills. Assess self-awareness, empathy, and communication in interpersonal settings.</li> <li>4. Formulate strategies to improve personal and digital boundaries.</li> </ol>	<b>Foundations of Life Skills &amp; Interpersonal Development</b> 1.1 Introduction and Framework: Meaning and importance of life skills WHO and UNICEF life skills framework 1.2 Basics of Life Skills : Classification: thinking, emotional, and social skills Skills for daily functioning and well-being 1.3 Divisions of Life Skills: Self-awareness, empathy, critical thinking, communication, decision-making, coping skills 1.4 Interpersonal Skills: Verbal and non-verbal communication Respect, empathy, active participation 1.5 Deeds for Communication: Assertiveness Clarity and feedback in conversation 1.6 Boundaries: Personal, emotional, social, and digital boundaries Respecting space and values 1.7 Listen Effectively: Types of listening (active, passive) Barriers and techniques for improvement 1.8 Build Relationships for Self-Learning: Collaborative learning Peer mentorship and support 1.9 Rights and Responsibilities as Citizens: Fundamental rights and duties Civic responsibility and digital citizenship	8

(Continued on next page)



2	CO2	<ol style="list-style-type: none"> <li>1. Demonstrate how critical thinking is used to solve problems</li> <li>2. Implement a step-wise approach to solve structured problems.</li> <li>3. Examine SMART goal-setting for personal and academic contexts.</li> <li>4. Assess outcomes using a decision matrix and brainstorming techniques.</li> <li>5. Develop actionable solutions and convert them into executable plans.</li> </ol>	<b>Cognitive and Problem-Solving Skills</b> 2.1 Critical Thinking: Logic and reasoning Evaluating assumptions and evidence 2.2 Problem Solving: Step-wise approach to solve problems Practical examples and models 2.3 Decision Making: Rational and emotional decision-making Short-term vs long-term decisions 2.4 Goal Setting: SMART goals (Specific, Measurable, Achievable, Relevant, Time-bound) Personal, academic, and career goals 2.5 Identify and Recognize Problems: Identifying root causes Framing problem statements 2.6 Generate and Implement Solutions: Brainstorming, solution trees, decision matrix Evaluating outcomes 2.7 Convert Solutions into Actions: Planning, resource allocation, execution 2.8 Communication to Solve Problems: Group discussions, role-playing Negotiation and conflict resolution 2.9 Creative Thinking: Divergent thinking, idea generation Innovation techniques (e.g., SCAMPER, mind mapping)	8
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3	CO3	<ol style="list-style-type: none"> <li>1. Identify techniques for recognizing and managing emotions.</li> <li>2. Employ stress management strategies for academic resilience.</li> <li>3. Examine the impact of flexibility and resilience on emotional well-being.</li> <li>4. Assess feedback and re-plan actions for self-improvement.</li> <li>5. Develop a growth mindset plan for continuous personal development.</li> </ol>	<b>Emotional Intelligence, Adaptability &amp; Resilience</b> 3.1 Coping with Emotions: Identifying and labeling emotions Expressing and managing emotions 3.2 Stress Management: Academic and personal stressors Coping strategies and relaxation 3.3 Relaxation Techniques: Breathing exercises Guided imagery and meditation 3.4 Positive Thinking: Self-affirmation Reframing negative thoughts 3.5 Coping with Changes and Failures: Acceptance of failure Learning from feedback 3.6 Adaptability and Assertiveness: Flexibility in decision-making Assertive behavior vs aggression 3.7 Flexibility and Resilience: Emotional and psychological resilience Growth through adversity 3.8 Feedback and Setbacks: Receiving, interpreting, and acting on feedback Emotional responses and re-planning 3.9 Growth Mindset: Embracing learning curves Continuous improvement philosophy	8
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4	CO4	<ol style="list-style-type: none"> <li>Design a code of conduct or professional behavior policy for a team or organization to promote ethical practices and workplace harmony.</li> <li>Demonstrate resume writing and LinkedIn portfolio skills for career readiness.</li> <li>Examine basic financial literacy concepts like budgeting and saving.</li> <li>Assess cybersecurity practices and risk reduction techniques.</li> <li>Develop a personal development plan for lifelong career and digital security.</li> </ol>	<b>Career Preparedness, Ethics &amp; Security Awareness</b> 4.1 Career and Work Resilience: Adapting to workplace challenges Lifelong learning and upskilling 4.2 Resume Writing: Resume and cover letter structure LinkedIn profile and career portfolio 4.3 Workplace Ethics and Professionalism: Code of conduct Respect, punctuality, confidentiality 4.4 Financial Literacy: Budgeting, saving, UPI, credit/debit cards Investment basics and financial planning 4.5 Risk Assessment: Personal and professional risks Risk reduction strategies 4.6 Security (Physical and Digital): Passwords, phishing, cybersecurity basics Personal safety protocols 4.7 Integrity: Ethical behavior in academics and workplace Honesty, trust, accountability 4.8 Availability, Reliability and Continuity: Traits of a dependable person Consistency in performance	6
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## VII. SUGGESTED SELF LEARNING ACTIVITIES

- Develop an engaging video tutorial on a fundamental subject topic, suitable for publication on the department's official social media platforms.

OR

- Conduct a simple survey on how friends or family manage work-life balance and present the findings.

OR

- Perform a role play showing everyday situations where life balance is challenged (example: managing studies and family time, handling peer pressure, etc.) and demonstrate positive solutions.

OR

- Work in groups to design and present an innovative IoT-based solution that can help achieve a balanced life, demonstrating creative application of subject skills in real-life scenarios.

OR

- Research and present a real-life case study of a person (student, leader, athlete) who manages a balanced life successfully.

OR

- Write a short story on: How a student successfully balanced studies, hobbies, and personal time. A turning point story on building good habits.

## VI SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Analyze interpersonal skills, communication styles, and personal boundaries essential for life skill development.	-	10%	30%	40%	10%	10%	100%
2	Apply logical reasoning, structured problem-solving, and goal-setting to create and implement effective decisions.	-	10%	40%	30%	10%	10%	100%
3	Evaluate personal resilience and adaptability using emotional intelligence, stress coping strategies, and mindset growth techniques.	-	10%	30%	40%	10%	10%	100%
4	Demonstrate workplace ethics, digital security practices, and financial awareness for effective career development.	-	10%	40%	30%	10%	10%	100%

## VII SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS)

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	<a href="#">Life Skills Education</a>	1 <sup>st</sup> Edition	A.Radhakrishnan Nair	Rajiv Gandhi National Institute of Youth Development (RGNIYD)	2010
2	<a href="#">Emotional Intelligence</a>	1 <sup>st</sup> Edition	Daniel Goleman	Bloomsbury Publishing	2020



#### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	<a href="#">Training in Interpersonal Skills</a>	6 <sup>th</sup> Edition	Stephen P. Robbins and Philip L. Hunsaker	Pearson Education / Prentice Hall	2011

#### Online References

A	<a href="https://www.unesco.org/en/skills-work-life/need-know">https://www.unesco.org/en/skills-work-life/need-know</a>
B	<a href="https://shorturl.at/LaauK">https://shorturl.at/LaauK</a>
C	<a href="https://www.mindtools.com/page8.html">https://www.mindtools.com/page8.html</a>
D	<a href="https://www.cybrary.it/">https://www.cybrary.it/</a>
E	<a href="https://www.mymoney.gov/">https://www.mymoney.gov/</a>
F	<a href="https://www.ncs.gov.in/">https://www.ncs.gov.in/</a>



Program	Third Year B.Tech. Information Technology (Semester V)	CL	TL	LL	SL	C
<b>Course Name:</b> Human Resources Management	<b>Course Code:</b> ITCOR1OE301	2	-	-	2	2
<b>Course Type:</b>	Open Elective -II (OE)					
<b>Pre-requisite:</b>	Nil					

## I RATIONALE

Human Resource Management (HRM) plays a vital role in ensuring that an organization has the right people, with the right skills, at the right time. It focuses on recruiting, developing, and retaining employees to achieve both individual and organizational goals. Effective HRM enhances productivity, fosters a positive work culture, ensures legal compliance, and supports strategic planning, making it essential for organizational success.

## II COMPETENCY

Demonstrate the ability to effectively manage and develop human capital by applying knowledge of recruitment, training, performance management, and employee relations to support organizational goals and promote a productive and compliant workplace.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Evaluate the strategic role of HRM.
2	Analyze the impact of organizational behavior.
3	Design integrated HR strategies for employee development.
4	Formulate OD principles,BPR,and cross-cultural leadership.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme					Assessment Scheme															
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Credits	Exam	Theory					Practical					SLA		Total
				CL	TL	LL						MSE	CCE	ESE	Total	CIAP	ESEP	Total						
																			Max	Max	Max	Min	Min	
1	Human Resources Management	OE-II	ITCOR1OE301	2	-	-	2	60	2	-	-	50	-	50	20	-	-	-	-	25	10	75		

**V THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT**

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	1. Apply the core functions of Human Resource Management to real-life organizational scenarios.  2. Apply human resource planning techniques effectively to adapt to technological and structural changes within an organization.	<b>Introduction to HR</b> 1.1 Human Resource Management- Concept, Scope and Importance, Interdisciplinary Approach Relationship with other Sciences, Competencies of HR Manager, HRM functions. 1.2 Human resource development (HRD): changing role of HRM – Human resource Planning, Technological change, Restructuring and rightsizing, Empowerment, TQM, Managing ethical issues.	05
2	CO2	1. Apply the principles of organizational behavior to enhance organizational effectiveness and address contemporary workplace issues.  2. Use the concepts of perception, attitude, and values to explain individual behavior and decision-making in an organizational context.  3. Demonstrate an understanding of personality traits by using assessment tools to increase self-awareness and improve interpersonal interactions.	<b>Organizational Behavior (OB)</b> 2.1 Introduction to OB Origin, Nature and Scope of Organizational Behavior, Relevance to Organizational Effectiveness and Contemporary issues. 2.2 Personality: Meaning and Determinants of Personality, Personality development, Personality Types, Assessment of Personality Traits for Increasing Self Awareness. 2.3 Perception: Attitude and Value, Effect of perception on Individual Decision-making, Attitude and Behavior.	09

(Continued on next page)

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<ol style="list-style-type: none"> <li>1. Apply recruitment and selection techniques to design effective hiring processes that enhance job satisfaction and employee morale.</li> <li>2. Implement appropriate training methods based on identified training needs to support employee growth and organizational goals.</li> <li>3. Demonstrate the use of traditional and modern performance appraisal methods to evaluate employee performance and plan career development.</li> </ol>	<b>Human resource Planning</b> 3.1 Recruitment and Selection process, Job-enrichment, Empowerment - Job Satisfaction, employee morale. 3.2 Performance Appraisal Systems: Traditional and modern methods, Performance Counseling, Career Planning. 3.3 Training and Development: Identification of Training Needs, Training Methods.	08
4	CO4	<ol style="list-style-type: none"> <li>1. Apply Business Process Reengineering (BPR) techniques to support organizational development and HR transformation.</li> <li>2. Demonstrate cross-cultural communication strategies to manage workplace diversity and promote inclusive decision-making across diverse employee groups.</li> </ol>	<b>Emerging Trends in HR</b> 4.1 Organizational development; Business Process Re-engineering (BPR), BPR as a tool for organizational development, processes management and transformation in HR. Organizational change, culture, environment. 4.2 Cross-cultural leadership and decision making: Cross-cultural communication and diversity at work, Causes of diversity, managing diversity with special reference to handicapped, women and aging people, intra-company cultural difference in employee motivation.	08

## VI SUGGESTED SELF LEARNING ACTIVITIES

1. Enroll in HRM courses on Coursera in HR Analytics, Strategic HRM.
2. Analyze real-life or published HR case studies on Recruitment, Performance Management, Employee Relations, and HR Ethics.
3. Projects and Assignments on Drafting HR policies, job descriptions, and Create a performance appraisal format.
4. Micro Research Projects on Conducting surveys on employee satisfaction, diversity, or workplace culture.



## VII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Evaluate the strategic role of HRM.	-	40%	60%	-	-	-	100%
2	Analyze the impact of organizational behavior.	-	50%	50%	-	-	-	100%
3	Design integrated HR strategies for employee development.	-	50%	50%	-	-	-	100%
4	Formulate OD principles, BPR, and cross-cultural leadership.	-	50%	50%	-	-	-	100%

## VIII SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Fundamentals of Human Resource Management	9 <sup>th</sup> Edition	Raymond Noe, John Hollenbeck, Barry Gerhart, Patrick Wright	McGraw Hill	2024
2	Human Resource Management	18 <sup>th</sup> Edition	Gary Dessler	Pearson	2023

### Reference Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Armstrong's Handbook of Human Resource Management Practice	16 <sup>th</sup> Edition	Michael Armstrong and Stephen Taylor	Kogan Page, London	2023

### Online References

Sr. No	Website Name
A	<a href="https://onlinecourses.nptel.ac.in/noc21_mg21/preview">https://onlinecourses.nptel.ac.in/noc21_mg21/preview</a> , NPTEL Course: Principles of Human Resource Management By Prof. Aradhna Malik – IIT Kharagpur



Program	Third Year B.Tech.Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Full Stack Development Lab	Course Code: ITLOR1PC304	-	-	4	-	2
Course Type:	Program Core (PC)					
Pre-requisite:	HTML,CSS,Javascript					

## I RATIONALE

The rationale for a Full Stack Development Lab is to equip students with comprehensive hands-on experience in building end-to-end web applications, covering both front- and back-end technologies. Through this lab, students can gain an understanding of the entire application development life-cycle, from managing server-side logic and database integration to designing user interfaces and implementing client-side functionality.

## II COMPETENCY

Demonstrate the ability to develop the full lifecycle of application development - from designing user interfaces and implementing client-side functionality to managing server-side logic and database integration ,while working with modern frameworks, tools and version control systems.

## III COURSE OUTCOMES (COs)

After the completion of course-based learning, students will be able to

Course Outcome Number	Course Outcome Statement
1	Construct front-end applications using basic React.
2	Develop front-end applications using functional components of React.
3	Construct back-end web applications using Node.js and Express.
4	Utilize REST API for connecting the front-end with MongoDB back-end.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

				Learning Scheme				Credits	Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Exam	Theory				Practical				SLA		Total	
				CL	TL	LL					Duration in Hrs	CIA		ESE	Total	CIAP	ESEP	Total				
												Max	Min					Max				Min
1	Full Stack Development Lab	PC	ITLOR1PC304	-	-	4	-	60	2	2	Max	Max	Max	Max	Min	Max	Max	Max	Min	Max	Min	100

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 12)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	Install and configure a React development environment using tools such as Node.js	Installation, configuration and setup of React environment.	CO1
2	Utilize components to build reusable UI blocks and Implement event handling and controlled components for form inputs.	Using components, frames, events, lists and forms in React JS.	CO1
3	Develop the ability to build functional components that manage local state, respond to user interactions	Using hooks, refs, usestate(), useeffect().	CO2
4	Install and configure Webpack as a module bundler in REACT web development projects.	Installation of webpacs and using them in projects.	CO2
5	Implement the steps involved in preparing a production-ready build, configuring deployment settings.	Deploy a React frontend to Vercel.	CO2
6	Install Node.js and npm, and configure their development environment using a code editor for Node.js application development.	Set Up Environment for Node.js.	CO3
7	Develop a web application that integrates file handling and streaming functionalities, while managing asynchronous operations and error handling effectively.	Create a web application to handle streams, files in Node.js.	CO3

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
8	Implement user authentication using session-based authentication to securely manage user logins.	Implementing authentication and authorization for web applications.	CO3
9	Integrate external or internal RESTful APIs into a web application, enabling data exchange between client and server.	Create a web application to integrate REST API using Express.	CO3
10	Perform CRUD operations—Create, Read, Update, and Delete—on MongoDB collections using the MongoDB shell or a Node.js-based application.	MongoDB installation and CRUD operations..	CO4
11	Develop an interactive portfolio website using HTML, CSS, JavaScript, and external libraries from npm to enhance functionality and add animations.	Create a portfolio website . Can use external libraries (explore npm). Make it interactive, add animations and integrate a contact us form with MongoDB database to store all contact queries.	CO4
12	Connect and interact with a MongoDB database using Mongoose or the native MongoDB driver to handle data models and schema validation..	RESTful API integration using MongoDB.	CO4
13	Implement a user registration and login system using secure practices such as password hashing with crypt and data validation.	Create a secure user registration and login system.	CO4
14	Develop a full-stack web application by integrating a React frontend with a Node.js and Express backend, enabling dynamic data exchange via RESTful APIs.	Build and Deploy a Web Application With React and Node.js + Express.	CO1,CO3

## VI LABORATORY ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	<ol style="list-style-type: none"> <li>Describe “full stack” meaning and identify the layers (front-end, back end, database, deployment).</li> <li>Set up a development environment with Node.js, npm, and Create React App.</li> <li>Apply best practices for scalable and maintainable code architecture</li> <li>Describe the React component lifecycle (mounting, updating, unmounting).</li> <li>Implement routing in React applications using React Router.</li> <li>Implement interactive forms ,validation, Handle various React events.</li> </ol>	<b>Front-End Development using React</b> 1.1 Overview of Full Stack Development. 1.2 Introduction to Mern Stack Installation of React, Required libraries for installation. 1.3 Structure of React: Folder and file structure. 1.4 Scomponents, Component lifecycle 1.5 State and Props. React Router and Single page applications. 1.6 UI design including Forms, Events and Animations.	15

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Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
2	CO2	<ol style="list-style-type: none"><li>1. Utilize useRef() to create persistent references to DOM elements or mutable values without causing re-renders.</li><li>2. Demonstrate MVC architecture and articulate the responsibilities of the Model, View, and Controller layers.</li><li>3. Explain Flux's unidirectional data flow: Actions → Dispatcher → Store → View, and its advantage over two-way data binding.</li><li>4. Configure Webpack basics: entry point, output, loaders (e.g., Babel for ES6/JSX), and plugins.</li></ol>	<b>Advanced React</b> 2.1 Functional components: Refs, Use effects, Hooks. 2.2 Flow architecture: MVC: Model View Con- troller framework 2.3 Flux, Bundling the application 2.4 Introduction to Web pack:	12

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Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
3	CO3	<p>1. Install Node.js and npm, verify setup, and understand basic CLI commands.</p> <p>2. Explain what asynchronous programming is, including non-blocking I/O and event-driven architecture in Node.js.</p> <p>3. Illustrate callbacks in common Node APIs</p> <p>4. Utilize EventEmitter to create and handle events for custom and built-in modules.</p> <p>5. Build an HTTP server, manage requests and responses, and parse headers and bodies.</p> <p>6. Perform file operations (CRUD) synchronously and asynchronously using the fs module.</p> <p>7. Set up Express routers with modular route handlers and parameters.</p> <p>8. Experiment with sessions and cookies via Express middleware.</p> <p>9. Deploy applications to cloud platforms like Vercel, AWS, Heroku, or Azure.</p>	<b>Back-End Development using Node and Express</b> 3.1 Environment setup, First app 3.2 Asynchronous programming 3.3 Callback concept 3.4 Event loops, REPL, Event emitter 3.5 Networking module 3.6 Buffers, Streams, File system 3.7 Express router 3.8 Authentication, Sessions 3.9 Deployment: Deploying applications to cloud platforms (e.g., Vercel, AWS, Heroku or Azure)	18

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Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
4	CO4	<ol style="list-style-type: none"> <li>1. Demonstrate fundamental MongoDB data types.</li> <li>2. Demonstrate permissions management to secure database operations and restrict user access.</li> <li>3. Perform basic database operations: connect/disconnect, select a database, and query collections.</li> <li>4. Utilize custom and built-in validators to enforce data integrity before storing documents.</li> <li>5. Implement full CRUD endpoints using Express and Mongoose to interact with MongoDB.</li> <li>6. Apply correct HTTP status codes, response bodies, data persistence, and handle validation and error cases .</li> </ol>	<b>MongoDB and REST API</b> 4.1 MongoDB: Understanding MongoDB, MongoDB Data Types. 4.2 Administering User Accounts, Configuring Access Control. 4.3 Adding the MongoDB Driver to Node.js, Connecting to MongoDB from Node.js. 4.4 Using Mongoose for Structured Schema and Validation. 4.5 REST API: Examining the rules of REST APIs, Evaluating API patterns, Handling typical CRUD functions (create, read, update, delete), Using Express and Mongoose to interact with MongoDB. 4.6 Testing API endpoints.	15

## VII SELF LEARNING ACTIVITIES

NA



**VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE**

Sr. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Construct front-end applications using basic React.	-	20%	80 %	-	-	-	100%
2	Develop front-end applications using functional components of React.	-	20%	80 %	-	-	-	100%
3	Construct back-end web applications using Node.js and Express.	-	10 %	90 %	-	-	-	100%
4	Utilize REST API for connecting the front-end with MongoDB back-end.	-	10 %	90 %	-	-	-	100%

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**IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS****Text Books**

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Pro MERN Stack: Full Stack Web App Development with Mongo, Express, React, and Node	2 <sup>nd</sup> Edition	Vasan Subramanian	Apress	2019
2	Learning Node.js Development	1 <sup>st</sup> Edition	Andrew Mead	Packt	2018
3	MongoDB The Definitive Guide	2 <sup>nd</sup> Edition	Kristina Chodorow	O'Reilly	2013

**Reference Books**

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Web Development with Node and Express	1 <sup>st</sup> Edition	Ethan Brown	O'Reilly	2014
2	Learning React Functional Web Development with React and Redux	1 <sup>st</sup> Edition	Alex Banks and Eve Porcello	O'Reilly	2017

**Online References**

Sr. No	Website Name
A	<a href="https://www.mongodb.com/resources/languages/mern-stack-tutorial">https://www.mongodb.com/resources/languages/mern-stack-tutorial</a> , MERN STACK TUTORIAL
B	<a href="https://www.w3schools.com/REACT/DEFAULT.ASP">https://www.w3schools.com/REACT/DEFAULT.ASP</a> , REACT JS TUTORIAL
C	<a href="https://nodejs.org/en/learn/getting-started/introduction-to-nodejs">https://nodejs.org/en/learn/getting-started/introduction-to-nodejs</a> , NODE JS Introduction
D	<a href="https://www.mongodb.com/docs/manual/tutorial/getting-started/">https://www.mongodb.com/docs/manual/tutorial/getting-started/</a> , MONGODB Tutorial

Program	Third Year B.Tech Information Technology (Semester V)	CL	TL	LL	SL	C
Course Name: Research Methodology Lab	Course Code: ITLOR1RM301	-	-	2	-	1
Course Type:	Research Methodology (RM)					
Pre-requisite:	Nil					

## I RATIONALE

The Research Methodology Lab aims to provide hands-on training in planning, executing, and presenting research work. It enables students to practically apply principles of research design, literature review, data collection, analysis, and technical documentation using appropriate tools.

## II COMPETENCY

Ability to systematically apply research methodology concepts and tools to plan, execute, analyze, and document scientific investigations.

## III COURSE OUTCOMES (COs)

After the completion of course based learning Students will be able to,

Course Outcome Number	Course Outcome Statement
1	Analyze scholarly sources relevant to the research problem for reviewing literature.
2	Construct well-organized research paper and report with relevant format, citation practices, and publication guidelines.
3	Adapt ethical research practices by maintaining integrity, avoiding plagiarism, and handling data responsibly during the research process.
4	Develop research presentations using suitable tools to clearly convey research findings.

## IV TEACHING-LEARNING & ASSESSMENT SCHEME

Learning Scheme								Credits	Assessment Scheme													
Sr. No.	Course Title	Course Type	Course Code	Actual Contact Hrs/Week			SL		Total	Exam	Theory					Practical				SLA		Total
				CL	TL	LL					Duration in Hrs	CIA		ESE	Total	CIAP	ESEP	Total				
												Max	Max					Max	Max	Min	Max	
1	Research Methodology Lab	RM	ITLOR1RM301	-	-	2	-	30	1	-	-	-	-	-	-	25	-	25	10	-	-	25

**V LABORATORY LEARNING OUTCOME AND SUGGESTED LIST OF EXPERIMENTS**  
 (Minimum 8)

Sr. No.	Laboratory Learning Outcome	Laboratory Experiment Titles	Relevant COs
1	To identify relevant scholarly articles using proper search strategies and tools.	Conduct a keyword-based search on a research database (e.g., IEEE Xplore, Scopus, Google Scholar)	CO1
2	To analyze research content, showing understanding of its relevance to the research problem.	Summarize at least five key research papers on a specific topic of your choice.	CO1
3	To choose a suitable problem statement aligned with research gaps or unresolved challenges.	Prepare problem statement and propose the solutions based on literature survey.	CO2
4	To organize research papers with proper formatting, citations, and referencing.	Prepare a research paper using a recognized scholarly format.	CO2
5	To compile the written research documents to ensure ethical integrity.	Modify a sample research draft focusing on originality and citations.	CO3
6	To minimise the plaigarism.	Use plagiarism detection software (e.g. Turnitin).	CO3
7	To build technical content clearly using visual aids.	Prepare a presentation on the research paper using suitable tools.	CO4
8	To demonstrate the ability to present research outcomes clearly.	Deliver a presentation that clearly explains and defends your conclusions.	CO4

## VI LABORATORY ALIGNED COURSE CONTENT

Module Number	Mapped Course Outcome	Major Learning Outcomes	Theory Content	No. of Hours
1	CO1	Analyze scholarly sources and conduct effective literature reviews.	<b>Foundations of Research and Literature Review</b> 1.1 Types of research (qualitative, quantitative, applied, fundamental) 1.2 Research databases (IEEE Xplore, Scopus, Google Scholar) 1.3 Keyword-based search strategies 1.4 Literature review process	8
2	CO2	Formulate research problems and construct well-structured research papers.	<b>Problem Identification and Research Writing</b> 2.1 Defining the research problem 2.2 Formulating objectives, research questions, and hypotheses 2.3 Structure of a research paper/report (IMRAD format) 2.4 Academic writing skills 2.5 Formatting and citation practices (APA, IEEE, MLA) 2.6 Reference management tools (Zotero, Mendeley)	8
3	CO3	Apply ethical practices in the research process	<b>Ethics in Research</b> 3.1 Importance of research ethics 3.2 Avoiding plagiarism 3.3 Intellectual property rights and copyright 3.4 Responsible data collection and management 3.5 Use of plagiarism detection tools (e.g., Turnitin)	7
4	CO4	Present research outcomes effectively using digital tools.	<b>Research Presentation and Communication</b> 4.1 Visual communication strategies 4.2 Presentation tools (PowerPoint, Prezi, Canva) 4.3 Creating infographics, charts, and visuals 4.4 Delivering and defending research presentations 4.5 Q&A handling and public speaking tips	7

## VII SUGGESTED SELF LEARNING ACTIVITIES

NA

### VIII SUGGESTED WEIGHTAGE TO ASSESSMENT PURPOSE

CO. No.	Course Outcome	BL1	BL2	BL3	BL4	BL5	BL6	Total
1	Analyze scholarly sources relevant to the research problem for reviewing literature.	-	-	50%	50%	-	-	100%
2	Construct well-organized research paper and report with relevant format, citation practices, and publication guidelines.	-	-	100%	-	-	-	100%
3	Adapt ethical research practices by maintaining integrity, avoiding plagiarism, and handling data responsibly during the research process.	-	-	-	-	-	100%	100%
4	Develop research presentations using suitable tools to clearly convey research findings.	-	50%	50%	-	-	-	100%

### IX SUGGESTED LEARNING MATERIALS / TEXTBOOKS / REFERENCE BOOKS

#### Text Books

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Research Methodology- Methods and Tech niques	4 <sup>th</sup> Edition	C.R. Kothari	TNew Age International	2018
2	Research Methodology	2 <sup>nd</sup> Edition	Panneerselvam R.	PHI learning	2014
3	Intellectual Property Rights	1 <sup>st</sup> Edition	Neeraj Pandey	PHI	2014

**Reference Books**

Sr. No.	Title	Edition	Authors	Publisher	Year
1	Research Methodology-A Step-by-Step Guide for Beginners	2 <sup>nd</sup> Edition	TKumar, Ranjit	Tata Pearson Education	2005
2	Practical Research Methods	2 <sup>nd</sup> Edition	Dawson, Catherine	UBS Publishers	2002

**Online References**

Sr. No	Website Name
A	<a href="https://onlinecourses.nptel.ac.in/noc23_ge36/preview">https://onlinecourses.nptel.ac.in/noc23_ge36/preview</a> , NPTEL Course: Research Methodology By Prof. Prof. Edamana Prasad, Prof. Prathap Haridoss
B	<a href="https://onlinecourses.swayam2.ac.in/cec20_hs17/preview">https://onlinecourses.swayam2.ac.in/cec20_hs17/preview</a> , NPTEL Course: Research Methodology By Prof. G.S.Bajpai



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