



KSR College of
Engineering

AN AUTONOMOUS INSTITUTION



NAAC
ACCREDITED **A++**

NBA
ACCREDITED
PROGRAMMES



B.E. - ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATIONS 2024

(Academic Year 2024-25 Onwards)

**Curriculum & Syllabus
Semester I to IV**





K.S.R. COLLEGE OF ENGINEERING: TIRUCHENGODE - 637 215

(Autonomous)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.E. - Electrical and Electronics Engineering

(REGULATIONS 2024)

Vision of the Institution

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

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|------|---|
| IM 1 | Deliver value-based quality education through modern pedagogy and experiential learning. |
| IM 2 | Enrich Engineering and Managerial Skills through cutting-edge laboratories to meet evolving global demands. |
| IM 3 | Empower research and innovation by integrating collaboration, social responsibility, and commitment to sustainable development. |

Vision of the Department

- | | |
|----|---|
| DV | To produce competent Electrical and Electronics Engineers driving sustainable solutions through quality education and research. |
|----|---|

Mission of the Department

- | | |
|------|---|
| DM 1 | Provide transformative education in Electrical and Electronics Engineering by integrating modern pedagogy and technology-enhanced learning. |
| DM 2 | Deliver holistic, value-driven education through cutting-edge laboratory facilities that meet the evolving needs of global industries. |
| DM 3 | Promote collaborative and interdisciplinary research to develop sustainable solutions. |

Programme Educational Objectives (PEOs): B.E. - Electrical and Electronics Engineering

The graduates of the programme will be able to

- | | |
|-------|---|
| PEO 1 | Core Competency: Graduates will exhibit strong technical knowledge in Electrical and Electronics Engineering to analyze, design and develop sustainable engineering solutions. |
| PEO 2 | Professionalism: Graduates will integrate interdisciplinary knowledge and ethical responsibility to develop innovative solutions addressing societal challenges. |
| PEO 3 | Career Development: Graduates will engage in lifelong learning and research for sustainable development to meet the evolving needs of the industry. |


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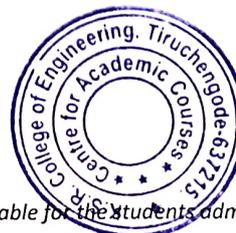


Applicable for the students admitted during 2024-2025

Programme Outcomes (POs) of B.E. - Electrical and Electronics Engineering

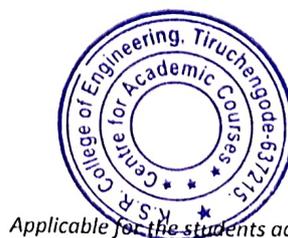
Program Outcomes (POs)	
PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)
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)
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)
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)
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)
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)
PO8	Individual and Collaborative Team work: Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.
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.
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.
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)
Program Specific Outcomes (PSOs)	
PSO1	Power and Energy Systems: Design, operate, maintain efficient and sustainable electrical power systems with renewable energy integration.
PSO2	Embedded System and Automation: Develop embedded, real-time control systems, and power electronic solutions for industrial process automation.


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		K.S.R. COLLEGE OF ENGINEERING Autonomous Institution Approved by AICTE and Affiliated to Anna University, Chennai Accredited by NAAC ('A++' Grade)								Curriculum UG R - 2024		
Department		Department of Electrical and Electronics Engineering										
Programme		B.E - Electrical and Electronics Engineering										
SEMESTER - I												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
Induction Programme			MC	-	-	-	-	-	-	-	-	-
THEORY COURSES												
1.	24ENT19	Professional Communication	HSMC	45	0	0	45	90	3	40	60	100
2.	24ITT16	Programming for Problem Solving	ESC	45	0	0	45	90	3	40	60	100
3.	24GET19	தமிழர் மரபு / Heritage of Tamils	HSMC	15	0	0	15	30	1	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
4.	24MAI19	Matrices and Calculus	BSC	30	15	30	45	120	4	50	50	100
5.	24PHI07	Engineering Physics	BSC	45	0	30	45	120	4	50	50	100
6.	24CHI06	Chemistry for Engineers	BSC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24ITP16	Programming for Problem Solving Laboratory	ESC	0	0	30	0	30	1	60	40	100
8.	24MEP16	Engineering Graphics Laboratory	ESC	15	0	30	15	60	2	60	40	100
9.	24GEP16	Engineering Experience Laboratory	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
10.	24SSP19	Aptitude and Coding Skills – I	EEC	0	0	30	0	30	1	60	40	100
MANDATORY COURSES												
11.	-	Mandatory Course – I	MC	0	0	30	0	30	-	-	-	-
Total				240	15	240	255	750	24	1000		


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SEMESTER - II												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24CST29	Python Programming	ESC	45	0	0	45	90	3	40	60	100
2.	24ECT21	Design Thinking	PCC	30	0	0	30	60	2	40	60	100
3.	24GET29	தமிழரும் தொழில்நுட்பமும் / Tamil and Technology	HSMC	15	0	0	15	30	1	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
4.	24MAI29	Probability and Statistics	BSC	30	15	30	45	120	4	50	50	100
5.	24EEI21	Electric Circuit Analysis	PCC	45	0	30	45	120	4	50	50	100
6.	24EEI22	Analog Electronics	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24ENP29	Professional Communication Laboratory	HSMC	0	0	30	0	30	1	60	40	100
8.	24CSP29	Python Programming Laboratory	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
9.	24SSP29	Aptitude and Coding Skills – II	EEC	0	0	30	0	30	1	60	40	100
Total				210	15	180	225	630	21	900		

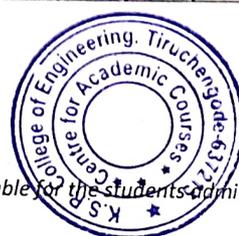
SEMESTER – III												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24MAT38	Transforms and Partial Differential Equations	BSC	45	15	0	60	120	4	40	60	100
2.	24EET31	Electromagnetic Field Theory	PCC	45	15	0	60	120	4	40	60	100
3.	24EET32	Electrical Machines - I	PCC	45	15	0	60	120	4	40	60	100
4.	24EET33	Linear Integrated Circuits	PCC	45	0	0	45	90	3	40	60	100
5.	24EET34	Digital Logic Circuits	PCC	45	15	0	60	120	4	40	60	100
LABORATORY COURSES												
6.	24EEP31	Electrical Machines - I Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
7.	24EEP32	Linear and Digital Circuits Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
8.	24ECP36	Design Studio – I	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
9.	24SDP39	Soft Skills Development – III	EEC	0	0	30	0	30	1	60	40	100
Total				225	60	150	285	720	24	900		


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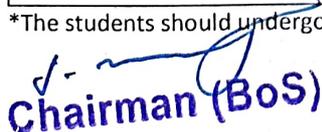
Applicable for the students admitted during 2024-2025



SEMESTER - IV												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24MAT46	Numerical and Computational Techniques	BSC	45	15	0	60	120	4	40	60	100
2.	24EET41	Electrical Machines - II	PCC	45	15	0	60	120	4	40	60	100
3.	24EET42	Generation, Transmission and Distribution	PCC	45	0	0	45	90	3	40	60	100
4.	24EET43	Measurements and Instrumentation	PCC	45	0	0	45	90	3	40	60	100
5.	24GET09	Universal Human Values and Ethics	HSMC	45	0	0	45	90	3	40	60	100
6.	-	Open Elective - I	OEC	45	0	0	45	90	3	40	60	100
LABORATORY COURSES												
7.	24EEP41	Electrical Machines - II Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
8.	24ECP46	Design Studio – II	ESC	0	0	30	0	30	1	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
9.	24EEP42	Seminar Presentation	EEC	0	0	30	0	30	1	100	-	100
10.	24SDP49	Soft Skills Development – IV	EEC	0	0	30	0	30	1	60	40	100
Total				270	30	135	300	735	24.5	1000		

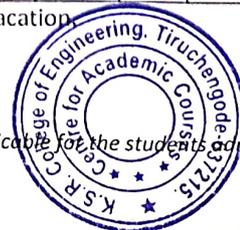
SEMESTER - V												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24EET51	Power System Analysis	PCC	45	15	0	60	120	4	40	60	100
2.	24EET52	Control Systems	PCC	45	15	0	60	120	4	40	60	100
3.	24EET53	Power Electronics	PCC	45	0	0	45	90	3	40	60	100
4.	-	Professional Elective - I	PEC	45	0	0	45	90	3	40	60	100
5.	-	Open Elective - II	OEC	45	0	0	45	90	3	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
6.	24EEI51	Microprocessors and Microcontrollers	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COURSES												
7.	24EEP51	Control and Instrumentation Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
8.	24EEP52	Power Electronics Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
9.	-	Industry Oriented Course – I	EEC	0	0	0	0	0	1	100	-	100
10.	24EEP53	Internship - I*	EEC	0	0	0	0	0	1	100	-	100
MANDATORY COURSE												
11.	-	Mandatory Course – II	MC	30	0	0	0	30	0	100	-	100
Total				300	30	120	300	750	26	1100		

*The students should undergo internship during the IV semester summer vacation.


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Applicable for the students admitted during 2024-2025

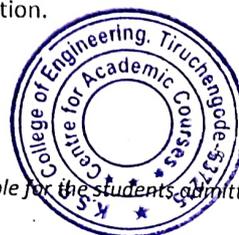


SEMESTER - VI												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24GET69	Entrepreneurship Development	HSMC	45	0	0	45	90	3	40	60	100
2.	24EET61	Protection and Switchgear	PCC	45	0	0	45	90	3	40	60	100
3.	-	Professional Elective - II	PEC	45	0	0	45	90	3	40	60	100
4.	-	Professional Elective - III	PEC	45	0	0	45	90	3	40	60	100
5.	-	Open Elective - III	OEC	45	0	0	45	90	3	40	60	100
THEORY COURSES WITH LABORATORY COMPONENT												
6.	24EEI61	Embedded Systems	PCC	45	0	30	45	120	4	50	50	100
LABORATORY COMPONENT												
7.	24EEP61	Power System Simulation Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
EMPLOYABILITY ENHANCEMENT COURSES												
8.	24EEP62	Mini Project	EEC	0	0	60	0	60	2	60	40	100
9.	24EEP63	Technical Comprehension	EEC	0	0	30	0	30	1	100	-	100
10.	-	Industry Oriented Course - II	EEC	0	0	0	0	0	1	100	-	100
MANDATORY COURSE												
11.	-	Mandatory Course - III	MC	30	0	0	0	30	0	100	-	100
Total				300	0	165	270	735	24.5	1100		

SEMESTER - VII												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
THEORY COURSES												
1.	24EET71	Electric Power Utilization and Conservation	PCC	45	0	0	45	90	3	40	60	100
2.	24EET72	Standards in Electrical Engineering	PCC	15	0	0	15	30	1	100	-	100
3.	-	Professional Elective - IV	PEC	45	0	0	45	90	3	40	60	100
4.	-	Professional Elective - V	PEC	45	0	0	45	90	3	40	60	100
5.	-	Professional Elective - VI	PEC	45	0	0	45	90	3	40	60	100
EMPLOYABILITY ENHANCEMENT COURSES												
6.	24EEP71	Project Phase - I	EEC	0	0	60	0	60	2	60	40	100
Total				195	0	60	195	450	15	600		

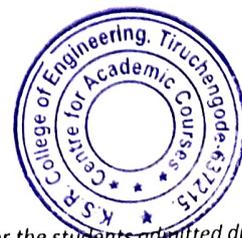
*The students should undergo internship during the VI semester summer vacation.


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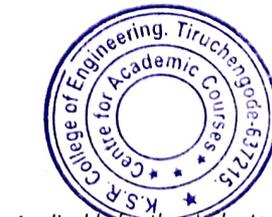
SEMESTER – VIII												
S. No.	Course Code	Course Title	Category	Periods per semester					Credit C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
EMPLOYABILITY ENHANCEMENT COURSES												
1.	24EEP81	Project Phase - II	EEC	0	0	240	0	240	8	60	40	100
Total				0	0	240	0	240	8	100		
Total Credits									169			
Total Number of Credits to be Earned for the Award of the Degree = 169												
Note: HSMC – Humanities and Social Sciences including Management Courses, BSC – Basic Science Courses, ESC – Engineering Sciences Courses, PCC – Professional Core Courses, PEC – Professional Elective Courses, OEC – Open Elective Courses, EEC – Employability Enhancement Courses & MC – Mandatory Courses.												


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S. No.		Course Code	Course Title	Category	Periods per semester					C= T/30	Max. Marks		
					L	T	P	SL	Tot.		CA	ES	Total
HUMANITIES, SOCIAL SCIENCE AND MANAGEMENT COURSES (HSMC)													
1	24ENT19	Professional Communication	HSMC	45	0	0	45	90	3	40	60	100	
2	24GET19	தமிழர் மரபு / Heritage of Tamils	HSMC	15	0	0	15	30	1	40	60	100	
3	24GET29	தமிழரும் தொழில்நுட்பமும் / Tamils and Technology	HSMC	15	0	0	15	30	1	40	60	100	
4	24ENP29	Professional Communication Laboratory	HSMC	0	0	30	0	30	1	60	40	100	
5	24GET09	Universal Human Values and Ethics	HSMC	45	0	0	45	90	3	40	60	100	
6	24GET69	Entrepreneurship Development	HSMC	45	0	0	45	90	3	40	60	100	
Total				165	0	30	165	360	12	-			
BASIC SCIENCE COURSES (BSC)													
S. No.		Course Code	Course Title	Category	Periods per Semester					C= T/30	Max. Marks		
					L	T	P	SL	Tot.		CA	ES	Total
1	24MAI19	Matrices and Calculus	BSC	30	15	30	45	120	4	50	50	100	
2	24PHI07	Engineering Physics	BSC	45	0	30	45	120	4	50	50	100	
3	24CHI06	Chemistry for Engineers	BSC	45	0	30	45	120	4	50	50	100	
4	24MAI29	Probability and Statistics	BSC	30	15	30	45	120	4	50	50	100	
5	24MAT38	Transforms and Partial Differential Equations	BSC	45	15	0	60	120	4	40	60	100	
6	24MAT46	Numerical and Computational Techniques	BSC	45	15	0	60	120	4	40	60	100	
Total				240	60	120	300	720	24	-	-	-	


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ENGINEERING SCIENCES COURSES (ESC)												
S. No.	Course Code	Course Title	Category	Periods per Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
1	24ITT16	Programming for Problem Solving	ESC	45	0	0	45	90	3	40	60	100
2	24ITP16	Programming for Problem Solving Laboratory	ESC	0	0	30	0	30	1	60	40	100
3	24MEP16	Engineering Graphics Laboratory	ESC	15	0	30	15	60	2	60	40	100
4	24GEP16	Engineering Experience Laboratory	ESC	0	0	30	0	30	1	60	40	100
5	24CST29	Python Programming	ESC	45	0	0	45	90	3	40	60	100
6	24CSP29	Python Programming Laboratory	ESC	0	0	30	0	30	1	60	40	100
7	24ECP36	Design Studio – I	ESC	0	0	30	0	30	1	60	40	100
Total				105	0	150	105	360	12	-	-	-

EMPLOYABILITY ENHANCEMENT COURSES (EEC)												
S. No.	Course Code	Course Title	Category	Periods per Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
1.	24SSP19	Aptitude and Coding Skills – I	EEC	0	0	30	0	30	1	60	40	100
2.	24SSP29	Aptitude and Coding Skills – II	EEC	0	0	30	0	30	1	60	40	100
3.	24SDP39	Soft Skills Development – III	EEC	0	0	30	0	30	1	60	40	100
4.	24EEP42	Seminar Presentation	EEC	0	0	30	0	30	1	100	-	100
5.	24SDP49	Soft Skills Development – IV	EEC	0	0	30	0	30	1	60	40	100
6.	-	Industry Oriented Course – I	EEC	0	0	0	0	0	1	100	-	100
7.	24EEP53	Internship - I*	EEC	0	0	0	0	0	1	100	-	100
8.	24EEP62	Mini Project	EEC	0	0	60	0	60	2	60	40	100
9.	24EEP63	Technical Comprehension	EEC	0	0	30	0	30	1	100	-	100
10.	-	Industry Oriented Course - II	EEC	0	0	0	0	0	1	100	-	100
11.	24EEP71	Project Phase - I	EEC	0	0	60	0	60	2	60	40	100
12.	24EEP81	Project Phase - II	EEC	0	0	240	0	240	8	60	40	100
Total				0	0	540	0	540	21	-	-	-


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PROFESSIONAL CORE COURSES (PCC)												
S. No.	Course Code	Course Title	Category	Periods / Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
1.	24ECT21	Design Thinking	PCC	30	0	0	30	60	2	40	60	100
2.	24EEI21	Electric Circuit Analysis	PCC	45	0	30	45	120	4	50	50	100
3.	24EEI22	Analog Electronics	PCC	45	0	30	45	120	4	50	50	100
4.	24EET31	Electromagnetic Field Theory	PCC	45	15	0	60	120	4	40	60	100
5.	24EET32	Electrical Machines - I	PCC	45	15	0	60	120	4	40	60	100
6.	24EET33	Linear Integrated Circuits	PCC	45	0	0	45	90	3	40	60	100
7.	24EET34	Digital Logic Circuits	PCC	45	15	0	60	120	4	40	60	100
8.	24EEP31	Electrical Machines - I Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
9.	24EEP32	Linear and Digital Circuits Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
10.	24EET41	Electrical Machines - II	PCC	45	0	0	45	90	3	40	60	100
11.	24EET42	Generation, Transmission and Distribution	PCC	45	15	0	60	120	4	40	60	100
12.	24EET43	Measurements and Instrumentation	PCC	45	0	0	45	90	3	40	60	100
13.	24EEP41	Electrical Machines - II Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
14.	24ECP46	Design Studio – II	PCC	0	0	30	0	30	1	60	40	100
15.	24EET51	Power System Analysis	PCC	45	15	0	60	120	4	40	60	100
16.	24EET52	Control Systems	PCC	45	15	0	60	120	4	40	60	100
17.	24EET53	Power Electronics	PCC	45	0	0	45	90	3	40	60	100
18.	24EEI51	Microprocessors and Microcontrollers	PCC	45	0	30	45	120	4	50	50	100
19.	24EEP51	Control and Instrumentation Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
20.	24EEP52	Power Electronics Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
21.	24EET61	Protection and Switchgear	PCC	45	0	0	45	90	3	40	60	100
22.	24EEI61	Embedded Systems	PCC	45	0	30	45	120	4	50	50	100
23.	24EEP61	Power System Simulation Laboratory	PCC	0	0	45	0	45	1.5	60	40	100
24.	24EET71	Electric Power Utilization and Conservation	PCC	45	0	0	45	90	3	40	60	100
25.	24EET72	Standards in Electrical Engineering	PCC	15	0	0	15	30	1	100	-	100
Total				765	90	420	855	2130	71	-	-	-


Chairman (BoS)

S.No.	<u>VERTICAL – 1</u> <u>Electric Vehicle</u> <u>Technology</u>	<u>VERTICAL – 2</u> <u>Embedded Systems and</u> <u>IOT</u>	<u>VERTICAL – 3</u> <u>Power Engineering</u>	<u>VERTICAL – 4</u> <u>Converters and Drives</u>	<u>VERTICAL – 5</u> <u>Advanced Control</u>	<u>VERTICAL – 6</u> <u>Industrial Automation</u>
1.	Electric and Hybrid Vehicles	Microcontroller Based System Design	Power Plant Engineering	Industrial Electronics	Signals and Systems	Soft Computing
2.	Special Electrical Machines	Embedded Control for Electric Drives	Power System Operation and Control	Solid State Drives	Digital Signal Processing	Intelligent Control of Electric Vehicles
3.	Batteries and Charging Management Systems	Smart System Automation	High Voltage Engineering	Power Electronics for Renewable Energy Sources	Digital Image Processing	Energy Auditing and Management
4.	Electric Vehicle Architecture	Industrial IoT	High Voltage Direct Current Transmission	Design of Power Converters	Advanced Control System	Robotics Engineering
5.	Testing of Electric Vehicles	Embedded Processors	Smart Grid	Multilevel Power Converters	Artificial Intelligence and Machine Learning	PLC Programming
6.	Energy Storage Systems	Embedded System Design	Power Quality	Installation of Solar and Wind Power Generation Systems	Virtual Instrumentation	Sensor Concepts and Techniques



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S. No.	Course Code	Course Title	Category	Periods / Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
VERTICAL 1: ELECTRIC VEHICLE TECHNOLOGY												
1	24EEE01	Electric and Hybrid Vehicles	PEC	45	0	0	45	90	3	40	60	100
2	24EEE02	Special Electrical Machines	PEC	45	0	0	45	90	3	40	60	100
3	24EEE03	Batteries and Charging Management Systems	PEC	45	0	0	45	90	3	40	60	100
4	24EEE04	Electric Vehicle Architecture	PEC	45	0	0	45	90	3	40	60	100
5	24EEE05	Testing of Electric Vehicles	PEC	45	0	0	45	90	3	40	60	100
6	24EEE06	Energy Storage Systems	PEC	45	0	0	45	90	3	40	60	100
VERTICAL 2: EMBEDDED SYSTEMS AND IOT												
1	24EEE07	Microcontroller Based System Design	PEC	45	0	0	45	90	3	40	60	100
2	24EEE08	Embedded Control for Electric Drives	PEC	45	0	0	45	90	3	40	60	100
3	24EEE09	Smart System Automation	PEC	45	0	0	45	90	3	40	60	100
4	24EEE10	Industrial IoT	PEC	45	0	0	45	90	3	40	60	100
5	24EEE11	Embedded Processors	PEC	45	0	0	45	90	3	40	60	100
6	24EEE12	Embedded System Design	PEC	45	0	0	45	90	3	40	60	100
VERTICAL 3: POWER ENGINEERING												
1	24EEE13	Power Plant Engineering	PEC	45	0	0	45	90	3	40	60	100
2	24EEE14	Power System Operation and Control	PEC	45	0	0	45	90	3	40	60	100
3	24EEE15	High Voltage Engineering	PEC	45	0	0	45	90	3	40	60	100
4	24EEE16	High Voltage Direct Current Transmission	PEC	45	0	0	45	90	3	40	60	100
5	24EEE17	Smart Grid	PEC	45	0	0	45	90	3	40	60	100
6	24EEE18	Power Quality	PEC	45	0	0	45	90	3	40	60	100
VERTICAL 4: POWER ENGINEERING												
1	24EEE19	Industrial Electronics	PEC	45	0	0	45	90	3	40	60	100
2	24EEE20	Solid State Drives	PEC	45	0	0	45	90	3	40	60	100
3	24EEE21	Power Electronics for Renewable Energy Sources	PEC	45	0	0	45	90	3	40	60	100
4	24EEE22	Design of Power Converters	PEC	45	0	0	45	90	3	40	60	100
5	24EEE23	Multilevel Power Converters	PEC	45	0	0	45	90	3	40	60	100
6	24EEE24	Installation of Solar and Wind Power Generation Systems	PEC	45	0	0	45	90	3	40	60	100

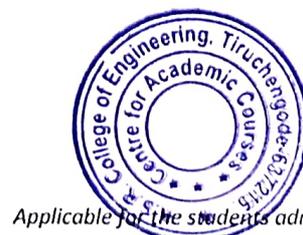
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K.S.R. College of Engineering



S. No.	Course Code	Course Title	Category	Periods / Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
VERTICAL 5: ADVANCED CONTROL												
1	24EEE25	Signals and Systems	PEC	45	0	0	45	90	3	40	60	100
2	24EEE26	Digital Signal Processing	PEC	45	0	0	45	90	3	40	60	100
3	24ECE13	Digital Image Processing	PEC	45	0	0	45	90	3	40	60	100
4	24EEE27	Advanced Control System	PEC	45	0	0	45	90	3	40	60	100
5	24EEE28	Artificial Intelligence and Machine Learning	PEC	45	0	0	45	90	3	40	60	100
6	24EEE29	Virtual Instrumentation	PEC	45	0	0	45	90	3	40	60	100
VERTICAL 6: INDUSTRIAL AUTOMATION												
1	24EEE30	Soft Computing	PEC	45	0	0	45	90	3	40	60	100
2	24EEE31	Intelligent Control of Electric Vehicles	PEC	45	0	0	45	90	3	40	60	100
3	24EEE32	Energy Auditing and Management	PEC	45	0	0	45	90	3	40	60	100
4	24EEE33	Robotics Engineering	PEC	45	0	0	45	90	3	40	60	100
5	24EEE34	PLC Programming	PEC	45	0	0	45	90	3	40	60	100
6	24EEE35	Sensor Concepts and Techniques	PEC	45	0	0	45	90	3	40	60	100
MANDATORY COURSE – I, II & III												
1.	24MCP09	Yoga for Stress Management	MC	0	0	30	0	30	0	-	-	-
2.	24MCT01	Constitution of India	MC	30	0	0	0	30	0	100	-	100
3.	24MCT02	Environmental Science and Sustainability	MC	30	0	0	0	30	0	100	-	100
4.	24MCT03	Introduction to Gender Studies	MC	30	0	0	0	30	0	100	-	100
5.	24MCT04	Life Science for Engineers	MC	30	0	0	0	30	0	100	-	100
6.	24MCT05	Industrial Safety	MC	30	0	0	0	30	0	100	-	100
7.	24MCT06	Essence of Indian Knowledge System	MC	30	0	0	0	30	0	100	-	100
8.	24MCT07	Elements of Literature	MC	30	0	0	0	30	0	100	-	100
9.	24MCT08	Disaster Management	MC	30	0	0	0	30	0	100	-	100


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S. No.	Course Code	Course Title	Category	Periods / Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
OPEN ELECTIVES OFFERED BY OTHER DEPARTMENTS												
1	24AUO01	Basics of Automobile Engineering	OEC	45	0	0	45	90	3	40	60	100
2	24AUO02	Hybrid Vehicles	OEC	45	0	0	45	90	3	40	60	100
3	24BMO01	Basics of Biomedical Instrumentation	OEC	45	0	0	45	90	3	40	60	100
4	24BMO02	Biometric Systems	OEC	45	0	0	45	90	3	40	60	100
5	24CEO01	Smart Buildings	OEC	45	0	0	45	90	3	40	60	100
6	24CEO02	Climate Change	OEC	45	0	0	45	90	3	40	60	100
7	24CSO01	Data Structures and Algorithms using C	OEC	45	0	30	45	120	4	50	50	100
8	24CSO02	Fundamentals of Java Programming	OEC	15	0	90	15	120	4	50	50	100
9	24CSO03	Full Stack Framework	OEC	45	0	0	45	90	3	40	60	100
10	24CSO04	Digital Marketing	OEC	45	0	0	45	90	3	40	60	100
11	24CBO01	Ethical Hacking	OEC	45	0	0	45	90	3	40	60	100
12	24CBO02	Digital and Mobile Forensics	OEC	45	0	0	45	90	3	40	60	100
13	24CBO03	Applied Java Programming	OEC	15	0	90	15	120	4	50	50	100
14	24CSO06	Data Science Fundamentals	OEC	45	0	0	45	90	3	40	60	100
15	24CSO07	Artificial Intelligence and Machine learning	OEC	45	0	0	45	90	3	40	60	100
16	24CSO08	Data Exploration and Visualization	OEC	45	0	0	45	90	3	40	60	100
17	24IOO01	Industrial Internet of things	OEC	45	0	0	45	90	3	40	60	100
18	24IOO02	Introduction to Sensors and IoT	OEC	45	0	0	45	90	3	40	60	100
19	24ECO01	Drone Technology	OEC	45	0	0	45	90	3	40	60	100
20	24ECO02	Wearable Devices	OEC	45	0	0	45	90	3	40	60	100
21	24ECO03	5G /6G Communication	OEC	45	0	0	45	90	3	40	60	100
22	24ECO04	Embedded IoT	OEC	45	0	0	45	90	3	40	60	100
23	24ITO01	Introduction to Mobile Application Development	OEC	45	0	0	45	90	3	40	60	100
24	24ITO02	Fundamentals of Big Data Analytics	OEC	45	0	0	45	90	3	40	60	100
25	24ITO03	Augmented Reality / Virtual Reality (AR/VR)	OEC	45	0	0	45	90	3	40	60	100
26	24MEO01	3D Printing	OEC	45	0	0	45	90	3	40	60	100
27	24MEO02	Robotics and Automation	OEC	45	0	0	45	90	3	40	60	100
28	24MEO03	Lean Manufacturing	OEC	45	0	0	45	90	3	40	60	100
29	24SFO01	Occupational Health and Safety	OEC	45	0	0	45	90	3	40	60	100
30	24SFO02	Electrical Safety	OEC	45	0	0	45	90	3	40	60	100

S. No.	Course Code	Course Title	Category	Periods / Semester					C= T/30	Max. Marks		
				L	T	P	SL	Tot.		CA	ES	Total
31	24SFO03	Building Fire Safety	OEC	45	0	0	45	90	3	40	60	100
32	24SFO04	Construction Safety	OEC	45	0	0	45	90	3	40	60	100
OPEN ELECTIVES OFFERED TO OTHER DEPARTMENTS												
33	24EEO01	Solar and Wind Energy System	OEC	45	0	0	45	90	3	40	60	100
34	24EEO02	Hydrogen and Hybrid Energy Storage Systems	OEC	45	0	0	45	90	3	40	60	100
35	24EEO03	Electric Vehicle Technology	OEC	45	0	0	45	90	3	40	60	100
36	24EEO04	Energy Conservation and Management	OEC	45	0	0	45	90	3	40	60	100

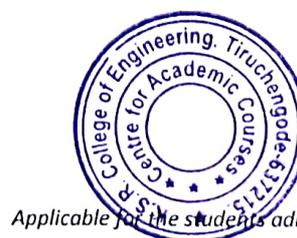
COURSE COMPONENT SUMMARY

S. No.	Category	Credits Per Semester								Credits Total	Percentage Credits
		I	II	III	IV	V	VI	VII	VIII		
1.	HSMC	4	2	-	3	-	3	-	-	12	7.19
2.	BSC	12	4	4	4	-	-	-	-	24	14.37
3.	ESC	7	4	1	1	-	-	-	-	13	7.78
4.	PCC	-	10	18	11.5	18	8.5	4	-	70	41.92
5.	PEC	-	-	-	-	3	6	9	-	18	10.78
6.	OEC	-	-	-	3	3	3	-	-	9	5.39
7.	EEC	1	1	1	2	2	4	2	8	21	12.57
8.	MC	√	-	-	-	√	√	-	-	0	0.00
TOTAL		24	21	24	24.5	26	24.5	15	8	167	100

Total No. of Credits = 167

Total No. of Credits for the Lateral Entry Student = 122


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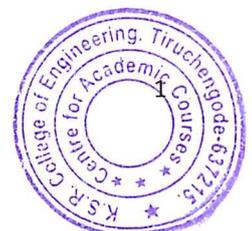



Chairman (BoS)



24ENT19	PROFESSIONAL COMMUNICATION	Category	L	T	P	SL	C
		HSMC	45	0	0	45	3
(Common to All Branches)							
PRE-REQUISITE: A comprehensive understanding of basic English grammar, vocabulary, and sentence structure with familiarity in Communication and Technical Writing are considered as pre-requisite for the course.							
OBJECTIVE: To equip learners with essential verbal and written communication skills, including technical writing, necessary for academic, professional, and workplace success.							
UNIT - I	UNDERSTANDING COMPARISONS AND CONTRASTS	(9)					
Reading: Technical brochures, telephone messages, social media messages. Writing: Emails/letters introducing oneself, Compare and Contrast Essay. Grammar: Present Tenses, Framing WH and Yes-No questions. Vocabulary: Portmanteau words, One-word substitutions.							
UNIT - II	WRITING REPORTS AND PARAGRAPHS	(9)					
Reading: Technical texts, biographies, travelogues, travel & technical blogs. Writing: Paragraph writing, Short Report on an event/industrial visit. Grammar: Past Tenses, Active & Passive Voice transformations, Prepositions. Vocabulary: Word formations using Prefixes & Suffixes.							
UNIT - III	DESCRIBING THE PROCESS/PRODUCT	(9)					
Reading: Advertisements, gadget reviews, user manuals, news reports. Writing: Definitions, Instructions, Product/Process description, Checklists. Grammar: Future Tenses, If clauses, Concord. Vocabulary: Nominal Compounds, Discourse Markers (connectives & sequence words).							
UNIT - IV	TRANSCODING AND RECOMMENDATIONS	(9)					
Reading: Newspaper articles, Journal reports. Writing: Recommendations, Transcoding.(Conversion of non-verbal to verbal information) Grammar: Articles, Relative pronouns, Modals. Vocabulary: Collocations, Homonyms.							
UNIT - V	SUMMATION AND DESCRIPTION	(9)					
Reading: Editorials and Opinion blogs, Company profiles. Writing: Descriptive/Narrative Essays, Job/Internship Application with Resume. Grammar: Numerical adjectives, Relative Clauses. Vocabulary: Cause & Effect Expressions, Homophones.							
TOTAL (T:45 , SL:45) = 90 PERIODS							

Praveen
Chairman (Bos)



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

COs	Course Outcome	Cognitive Level
CO1	Recognize the structure of comparison texts using correct tenses and appropriate vocabulary.	Understand
CO2	Construct short paragraphs and reports using past tense and clear expressions.	Understand
CO3	Comprehend processes and products using future forms and appropriate vocabulary.	Understand
CO4	Interpret visuals like charts or graphs to produce well-structured written content.	Understand
CO5	Draft essays and job applications clearly, using proper grammar and structure.	Understand

TEXT BOOKS:

- English for Engineers & Technologists, Orient Blackswan Private Ltd. Department of English, Anna University, 2023.
- Nitin Bhatnagar, Communicative English for Engineers and Professionals, Pearson, 2024.

REFERENCES:

- Dr. K.N. Shoba, and Dr. Lourdes Joevani, English for Science & Technology-II Cambridge University Press. Francis, Department of English, Anna University, 2023.
- Lakshminarayanan, A Course Book on Technical English, Scitech Publications (India) Pvt. Ltd.2022.
- Kulbhusan Kumar, RS Salaria, Effective Communication Skill, Khanna Publishing House, 2023.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	-	-	2	3	-	3	-	-
CO2	-	-	-	-	-	-	-	2	3	-	3	-	-
CO3	-	-	-	-	-	-	-	2	3	-	3	-	-
CO4	-	-	-	-	-	-	-	2	3	-	3	-	-
CO5	-	-	-	-	-	-	-	2	3	-	3	-	-

1-Low, 2-Medium, 3-High

M. Srinivas
Chairman (BoS)



24ITT16	PROGRAMMING FOR PROBLEM SOLVING	Category	L	T	P	SL	C
		ESC	45	0	0	45	3
(Common to AUTO, BME, CSE, CSE(CS), CSD, CSE (IoT), IT, ECE, EEE, MECH & SFE)							
PREREQUISITE: Students must have basic computer literacy, including familiarity with operating systems, file management, and software usage. A Basic understanding of algorithms and flowcharts are required to design and visualize problem solving strategies. Students must have basic knowledge on programming principles, such as variables, simple data types, control structures, problem solving and logical thinking skills.							
OBJECTIVE: The course introduces fundamental programming concepts using the C language, covering computer organization, algorithm representation, and basic syntax. Students will learn control structures, functions, arrays, pointers, and string handling. The course also covers complex data types like structures and unions, storage classes, and file operations. By the end, students will be able to analyze problems, design algorithms, and implement solutions using C programming.							
UNIT - I	INTRODUCTION TO COMPUTING AND C	(9)					
Introduction to Computing: Organization of computer – Hardware and Software – Number system and Conversions – Representation of an algorithm: pseudo code, flowchart with examples. Introduction to C –features of C – Structure of C program – Character set – C tokens – Keywords – Identifiers – Constants – Variables – Data types – Operators – Precedence and Associativity.							
UNIT - II	CONTROL STRUCTURES	(9)					
Decision Making and Branching: Introduction – decision making with if statement – simple if statement – if-else statement – nested if-else statements – if-else-if ladder statement – switch statement – goto statement – conditional operator – Decision making and looping: Introduction – while statement – do-while statement – for statement.							
UNIT - III	FUNCTIONS AND ARRAY	(9)					
Functions: Declaration and definition – Function prototype – parameter and arguments – Return type – passing argument by value and by reference – Function scope and lifetime – Function pointer – Arrays: array declaration and initialization – One dimensional array and Two dimensional array with example.							
UNIT - IV	POINTERS AND STRINGS	(9)					
Pointers: Definition – Initialization – Pointer’s arithmetic – Pointers to pointers – Pointers and arrays. String: Declaring and initializing string variables – String handling functions and operations.							
UNIT - V	STRUCTURE, UNION AND FILE	(9)					
Structures: Declaration – Definition – Structure within a structure – Union – Storage classes – Preprocessor directives – Files: Defining and opening a file – Closing a file – input/output operations on files – Command line arguments.							
L= 45, T=0, P=0, SL=45, TOTAL: 90 PERIODS							

S.

Chairman (BoS)
 K.S.R. College of Engineering



COURSE OUTCOMES:		
At the end of the course, the learners will be able to:		
COs	Course Outcome	Cognitive Level
CO1	Discuss about number systems and perform conversions between different number systems and depict about basic structure of C program.	Understand
CO2	Apply the concept of Looping and conditional statements to solve real-world programming problems efficiently. .	Apply
CO3	Develop modular programs using functions and implement single and two-dimensional arrays for efficient data storage and manipulation.	Apply
CO4	Apply pointer concepts with arrays and functions, and develop efficient C programs using string operations for effective memory management and text processing.	Apply
CO5	Implement user-defined data types using structures and unions, manage memory with storage classes and perform file operations and command-line processing in C programs.	Apply

TEXT BOOKS:

1. Herbert Schildt, C - The Complete Reference, Tata McGraw-Hill, New Delhi, Fourth Edition, 2017.
2. Byron S Gottfried and Jitendar Kumar Chhabra, "Programming with C", Tata McGraw Hill Publishing Company, Third Edition, 2011.

REFERENCES:

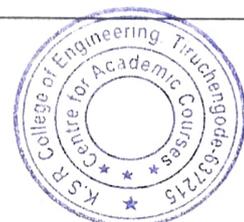
1. Yashavant Kanetkar, "Let Us C: Authentic guide to C programming language", BPB Publication, Nineteenth Edition, 2022.
2. Robert C. Seacord, "Effective C", No Starch Press, 2020.
3. E Balagurusamy, "Programming In Ansi C", McGraw Hill Education, Eighth Edition, 2019.
4. Ashok N. Kamathane, 'Computer Programming, Pearson Education, India, Third Edition, 2015.
5. <https://archive.nptel.ac.in/courses/106/105/106105171/>

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	-	-	2
CO2	3	3	3	-	-	-	-	1	1	-	-	-	2
CO3	3	3	3	-	-	-	-	1	1	-	-	-	2
CO4	3	3	3	-	-	-	-	1	1	-	-	-	2
CO5	3	3	3	-	-	-	-	1	1	-	-	-	2

1 - Low, 2 - Medium, 3 - High


Chairman (BoS)



24GET19	தமிழர்மரபு	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(அனைத்து துறைகளுக்கும் பொதுவானது)							
முன்கூட்டிய துறைசார் அறிவு: தேவை இல்லை							
அலகு - I	மொழி மற்றும் இலக்கியம்						[03]
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலயக்கிகியங்கள் - சங்க இலக்கியத்தின் சமயச்சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ் காப்பியங்கள், தமிழகத்தில் சமணபௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலகியங்கள் தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.							
அலகு - II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக் கலை						[03]
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனியில் திருவள்ளுவர் சிலை - இசை கருவிகள் - மிருதங்கம், பறை. வீணை. யாழ். நாதஸ்வரம் - தமிழர்களின் சமூகபொருளாதார வாழ்வில் கோவில்களின் பங்கு.							
அலகு - III	நாட்டுப் புறக் கலைகள் மற்றும் வீர விளையாட்டுக்கள்						[03]
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஓயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.							
அலகு - IV	தமிழர்களின் திணைக் கோட்பாடுகள்						[03]
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்கக்காலத்தில் தமிழகத்தில் எழுத்தறிவும் கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி.							
அலகு - V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு						[03]
இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிற்பகுதிகளில் தமிழ் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில் சித்தமருத்துவத்தின் பங்கு கல்வெட்டுகள் கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்கள்களின் அச்ச வரலாறு.							
Total (L= 15, SL=15)=30 Periods							


Chairman (BoS)



பாடம் கற்றத்தின் விளைவுகள்: பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்		அறிவாற்றல் நிலை
CO1:	தமிழ்மொழியின் செந்தன்மை மற்றும் இலக்கியம் குறித்த தெரிதல்	புரிதல்
CO2:	தமிழர்களின் சிற்பக்கலை, ஓவியக்கலை மற்றும் இசைக் கருவிகள் குறித்த தெளிவு.	புரிதல்
CO3:	தமிழர்களின் நாட்டுப் புரைக் கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு	புரிதல்
CO4:	தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககாலவணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.	புரிதல்
CO5:	இந்திய தேசிய இயக்கம், சுயமரியாதை இயக்கம் மற்றும் சித்த மருத்தவம் பற்றிய புரிதல்.	புரிதல்

Text Books:

1	தமிழகவரலாறு-மக்களும்பண்பாடும்-கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்) ,உலகத் தமிழாராய்ச்சி நிறுவனம், சென்னை, 2002
2	கணினித்தமிழ்முனைவர் இல. சுந்தரம், விகடன் பிரசுரம், 2016

Reference Books :

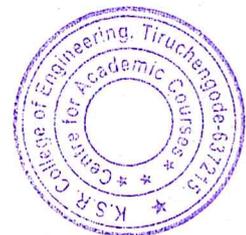
1	கீழடி-வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல்துறைவெளியீடு)
2	பொருளை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
3	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL - (in print)
4	Social Life of the Tamils - The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-

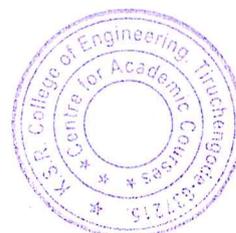
1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)

Chairman (BoS)



24GET19	HERITAGE OF TAMILS	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(Common to all branches)							
<i>Prerequisite(s): No prerequisites are needed for enrolling into the course</i>							
UNIT - I	LANGUAGE AND LITERATURE					[03]	
Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.							
UNIT - II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE					[03]	
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yash and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.							
UNIT - III	FOLK AND MARTIAL ARTS					[03]	
Therukoothu, Karagattam, VilluPattu, KaniyanKoothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.							
UNIT - IV	THINAI CONCEPT OF TAMILS					[03]	
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas.							
UNIT - V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE					[03]	
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.							
Total (L= 15, SL=15) =30 Periods							
Course Outcomes:						Cognitive Level	
At the end of the course, the student will be able to							
CO1:	Recognize the extensive literature of Tamil and its classical nature.					Understand	
CO2:	Apprehend the heritage of sculpture, painting and musical instruments of ancient people.					Understand	
CO3:	Review on folk and martial arts of Tamil people.					Understand	
CO4:	Insight thinai concepts, trade and victory of Chozha dynasty.					Understand	
CO5:	Realize the contribution of Tamil in Indian freedom struggle, self-esteem movement and siddha medicine.					Understand	

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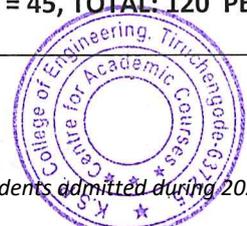
Text Books:	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
Reference Books:	
1	Social Life of the Tamils – The. Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
2	The Contribution of the Tamil to Indian Culture (Dr.M.Valarmathi) (Puplished by International Institute of Tamil Studies).
3	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology & Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by: The Author)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)													

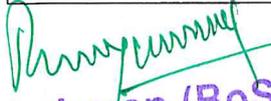
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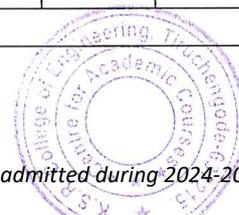


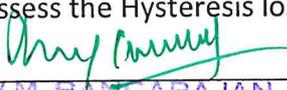
24MAI19	MATRICES AND CALCULUS	Category	L	T	P	SL	C
		BSC	30	15	30	45	4
SEMESTER I - B.E / B.TECH (Common to All Branches)							
PREREQUISITE The Students should have a basic understanding of calculus, matrices, and differential equations to effectively follow the concepts in this course.							
OBJECTIVES: Build a strong foundation in eigen values, eigen vectors, quadratic forms, and higher-order linear differential equations. Develop skills in differential and vector calculus to analyze curves, optimize multivariable functions, and interpret vector fields.							
UNIT - I	LINEAR ALGEBRA						(9)
Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (Excluding proof) – Cayley Hamilton theorem (excluding proof) – Quadratic forms – Reduction of quadratic form to canonical form by orthogonal transformation.							
UNIT - II	ORDINARY DIFFERENTIAL EQUATIONS						(9)
Linear differential equations of second and higher order with constant coefficients – Differential equations with variable coefficients – Cauchy’s and Legendre’s linear equations – Method of variation of parameters.							
UNIT - III	DIFFERENTIAL CALCULUS						(9)
Curvature - Radius of curvature (Cartesian co-ordinates only) – Centre of curvature and Circle of curvature – Involutives and Evolutives (Parabola, Ellipse, Hyperbola and Rectangular hyperbola).							
UNIT - IV	FUNCTIONS OF SEVERAL VARIABLES						(9)
Partial derivatives – Euler’s theorem for homogenous functions – Taylor’s series expansion - Maxima and Minima for functions of two variables – Method of Lagrangian multipliers.							
UNIT - V	VECTOR CALCULUS						(9)
Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Green’s theorem in plane, Gauss divergence theorem and Stoke’s theorem (Cube, Cuboid and Rectangular Paralleopiped only).							
List of Exercise/Experiments(MAT LAB):							
<ol style="list-style-type: none"> 1. Calculate the characteristic equation and eigenvalues 2. Find the eigenvector and diagonalization of a given matrix. 3. Solving ODE with constant coefficients 4. Detect the solution of ODE with variable coefficients 5. Identify the radius of curvature 6. Establish the Evolute of curve. 7. Reckon the Taylor’s series for functions of two variables. 8. Compute the maxima and minima. 9. Estimate the directional derivative, divergence and curl. 10. Determine line integral, surface integral and volume integral. 							
L = 30 , T = 15 & P = 30 & SL = 45, TOTAL: 120 PERIODS							



COURSE OUTCOMES: At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply eigen values, eigen vectors, and the Cayley-Hamilton theorem to solve matrix problems and diagonalize quadratic forms into canonical form.											Apply	
CO2	Apply methods to solve second and higher-order linear differential equations with constant and variable coefficients.											Apply	
CO3	Apply concepts of differential calculus to find curvature, center of curvature, and evolutes of standard Cartesian conic sections.											Apply	
CO4	Apply partial derivatives, Jacobians, and lagrangian multipliers to determine local extremum of multivariable functions.											Apply	
CO5	Apply vector differential operators to the vector fields and verify Green's, Gauss divergence, and Stokes' theorems for geometries.											Apply	
TEXT BOOKS: 1.Ravish R Singh and Mukul Bhatt, "Engineering Mathematics – I", Mc-Graw Hill Publications, New Delhi, 2 nd Edition, 2020. 2.B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 40 th Edition, 2020.													
REFERENCES: 1. Bali N. P and Manish Goyal, "Engineering Mathematics", Laxmi Publications Pvt Ltd., 7 th Edition, 2020. 2.Dass H.K, "Advance Engineering Mathematics", S. Chand and company, 11 th Edition, 2014. 3. Jain R.K. and Iyengar S.R.K," Advanced Engineering Mathematics", Narosa Publications, 8 th Edition, 2012. 4.Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, New Delhi, 10 th Edition 2016. 5. https://archive.nptel.ac.in/courses/111/108/111108157/ 6. https://archive.nptel.ac.in/courses/111/105/111105122/													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	-	-	1	-	-	2	-	-
CO2	3	3	3	3	2	-	-	1	-	-	2	-	-
CO3	3	3	3	3	2	-	-	1	-	-	2	-	-
CO4	3	3	3	3	2	-	-	1	-	-	2	-	-
CO5	3	3	3	3	2	-	-	1	-	-	2	-	-
Avg.	3	3	3	3	2	0	0	1	0	0	2	0	0
1-low, 2-medium, 3-high													


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K.S.R. College of Engineering



24PHI07	ENGINEERING PHYSICS	Category	L	T	P	SL	C
		BSc	45	-	30	45	4
(Common to AIDS, BME,CSE,CSE(IoT),CS,ECE,EEE &IT)							
PREREQUISITE: The students must have knowledge about basic concepts of light sources, dual nature of radiation, conductivity of metals, semiconducting materials, different types of magnetic materials, super conducting materials and their applications.							
OBJECTIVES: To provide a comprehensive understanding of the fundamental principles, mechanisms, applications of lasers, fiber optics, quantum physics, semiconductors, magnetic materials and superconductors in modern Science and technology.							
UNIT – I	LASER AND FIBRE OPTICS						(9)
<p>Lasers: Principles of spontaneous emission and stimulated emission - Einstein's co-efficient A & B- population inversion – CO₂ laser – semiconductor diode laser – homo – junction & hetero – junction (qualitative analysis only) – applications.</p> <p>Fibre Optics: propagation of light in optical fibre– numerical aperture and acceptance angle – types of optical fibre (materials, refractive index profile and modes of propagation) – applications -fibre optic sensors: pressure and displacement sensors.</p>							
UNIT – II	QUANTUM MECHANICS						(9)
Introduction – black body radiation– Planck's theory (derivation) – deduction of Wien's displacement law and Rayleigh – Jean's Law from Planck's theory– Compton effect (derivation) – de-Broglie concept of matter waves – physical significance of a wave function – Schrödinger wave equations (Time dependent & time independent) – particle in a box (one dimensional).							
UNIT – III	CONDUCTING MATERIALS						(9)
Classical free electron theory – expression for electrical conductivity – thermal conductivity – Wiedemann-Franz law – drawbacks of classical free electron theory – quantum theory – Fermi energy – Fermi -Dirac distribution function – density of states and carrier concentration of metals.							
UNIT – IV	SEMICONDUCTING MATERIALS						(9)
Introduction – Intrinsic semiconductor: carrier concentration in an intrinsic semiconductor– Fermi level of an intrinsic semiconductor– variation of Fermi energy level with temperature – Extrinsic semiconductors: carrier concentration in n– type and p-type semiconductors (qualitative analysis only)– Fermi level of extrinsic semiconductors– variation of Fermi energy level with temperature and carrier concentration in an extrinsic semiconductors – Hall effect – determination of Hall co-efficient for n – and p – type semiconductors– applications.							
UNIT – V	MAGNETIC AND SUPERCONDUCTING MATERIALS						(9)
<p>Magnetic Materials: Introduction – origin of magnetic moment – dia, para and ferromagnetic materials– domain theory of ferro-magnetism – Hysteresis – soft and hard magnetic materials.</p> <p>Superconducting Materials: Introduction to superconductivity – properties and types of superconductor – application of superconductors: magnetic levitation– SQUIDS– cryotron.</p>							
<p>List of exercises/experiments:</p> <ol style="list-style-type: none"> Determine the thickness of the given thin paper using Air wedge method. Find the acceptance angle and numerical aperture of a given optical fibre. Evaluate the wavelength of semiconductor laser. Estimate the particle size of the lycopodium powder using semiconductor laser Enumerate the thermal conductivity of a bad conductor by Lee's disc method. Compute the band gap of an intrinsic semiconductor. Calculate the width of the CD groove with a help of semiconductor laser. Assess the Hysteresis loss of magnetic materials using B-H curve. 							
 D. R.V.M. RANGARAJAN CHAIRMAN				Lecture: 45, Laboratory: 30, SL:45, TOTAL: 120 PERIODS			



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

COs	Course Outcome	Cognitive level
CO1	Elucidate laser principles, types, light propagation and the applications of optical fibers.	Understand
CO2	Apply quantum theory for Planck's theory, Compton Effect and Schrödinger's equation of matter waves.	Apply
CO3	Calculate electrical conductivity and Fermi energy by considering quantum free electron theory.	Apply
CO4	Infer charge carrier behavior in intrinsic, extrinsic semiconductors and Hall effect.	Understand
CO5	Describe principles, classifications, applications of magnetic materials and superconductors.	Understand

Text Books :

1. M.N. Avadhanulu and P.G. Kshirsagar, "A text book of Engineering Physics", S. Chand and Company, New Delhi, 11th Edition, 2018.
2. R.K. Gaur & S.L. Gupta, "Engineering Physics", Dhanpat Rai Publication, New Delhi, 7th Edition, 2014.

Reference Books :

1. R. Murugesan and Kiruthiga Sivaprasath, "Modern Physics", S. Chand & Company, New Delhi, 17th Edition, 2014.
2. V. Rajendran, "Engineering Physics", Tata McGraw-Hill, New Delhi, 1st Edition, 2011.
3. S.O. Pillai, "Solid State Physics", New Age Publication, Chennai, 10th Edition, 2023.
4. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, "Concepts of Modern Physics", McGraw-Hill, New Delhi, 7th Edition, 2015.

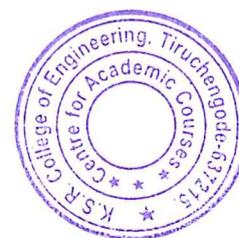
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	-	-	-	-	1	2	2	-	2	-	-
CO2	3	3	2	-	-	-	1	2	2	-	2	-	-
CO3	3	3	2	-	-	-	1	2	2	-	2	-	-
CO4	3	2	-	-	-	-	1	2	2	-	2	-	-
CO5	3	2	-	-	-	-	1	2	2	-	2	-	-
Avg.	3	2	-	-	-	-	1	2	2	-	2	-	-

1-low, 2-medium, 3-high

[Signature]
BoS chairman

Chairman (BoS)

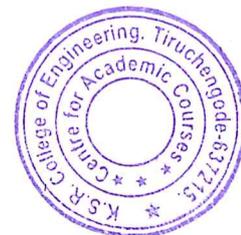


24PHI07 - ENGINEERING PHYSICS
I Year B.E (AIDS, BME, CSE, CSE (IOT), CS, ECE, EEE & B.Tech IT)
Requirements for a batch of 30 students
Regulation (2024)

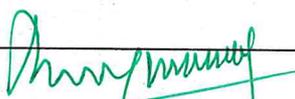
S.No.	Description of Equipment	Quantity required
1.	Air wedge apparatus. (with traveling microscope and accessories)	5 Nos
2.	Acceptance angle and numerical aperture of an optical fibre. (with accessories)	5 Nos
3.	Wavelength of semiconductor laser beam. (with accessories)	5 Nos
4.	Particle size of Lycopodium powder. (with accessories)	5 Nos
5.	Lee's disc apparatus. (with accessories)	5 Nos
6.	Band gap apparatus. (with accessories)	5 Nos
7.	Width of the groove of CD using laser. (with accessories)	5 Nos
8.	B-H curve apparatus. (with accessories)	5 Nos

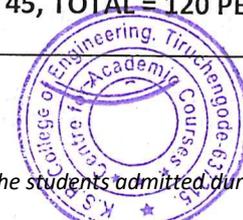
BoS chairman

Chairman (BoS)



24CHI06	CHEMISTRY FOR ENGINEERS	Category	L	T	P	SL	C
		BSC	45	0	30	45	4
(Common to AI&DS, BME, CSE, CSE(CS), CSE(CSD), CSE(IoT), ECE, EEE and IT)							
PREREQUISITE The students must have knowledge about the basic concepts of water parameters, electro chemistry, organic reactions and their applications.							
OBJECTIVES: To equip the learners to apply the chemical principles and their applications in the engineering fields.							
UNIT - I	WATER TREATMENT						(9)
Hardness – types, units – estimation of hardness by EDTA method; Boiler feed water – requirements, disadvantages of using hard water in boilers – scale and sludge – priming and foaming – caustic embrittlement – boiler corrosion. Softening methods – internal conditioning – calgon, phosphate – external conditioning – zeolite process and ion exchange process; Desalination – reverse osmosis. Domestic water treatment (Sterilisation process Only).							
UNIT - II	ELECTROCHEMISTRY AND CORROSION						(9)
Introduction – electrode potential – Nernst equation – EMF series and its significance; E – Vehicles - Need - Types – Advantages and Disadvantages; Corrosion – causes, consequences – classification – chemical corrosion – electro chemical corrosion – mechanism; Galvanic & differential aeration corrosion – factors influencing corrosion – corrosion control (Sacrificial anode and Impressed Current Cathodic protection method).							
UNIT - III	ENERGY STORAGE DEVICES						(9)
Batteries – primary battery – Dry cell, secondary batteries – lead-acid and lithium-ion batteries. Fuel cells – H ₂ -O ₂ fuel cell, solar cells – principle, applications and advantages; Nuclear energy: Light water Nuclear power plant - breeder reactor.							
UNIT - IV	POLYMER CHEMISTRY						(9)
Polymer – definition – degree of polymerization – functionality. Polymerization – addition, condensation and co-polymerization – free radical mechanism of addition polymerization; Preparation properties & uses of PVC, Nylon – 6,6 & Teflon. Plastics – classification – thermosetting and thermoplastics. Fabrication of polymers – compression and Injection moulding.							
UNIT - V	NANO CHEMISTRY AND COMPOSITES						(9)
Introduction – basics of nanochemistry – distinction between nanoparticles, molecules and bulk materials - synthesis of nanomaterials [CVD, laser evaporation, pyrolysis] - applications of nanomaterials. Composite – Introduction: Definition and need for composite – Types of composites: Properties and application of FRP and MMC.							
List of Exercise/Experiments: 1. Estimation of total, permanent and temporary hardness of water sample By EDTA method 2. Estimation of chloride content in water by Argentometric method [Mohr's Method] 3. Conductometric titration of strong acid with strong base (HCl Vs NaOH) 4. Estimation of dissolved oxygen in water (Winkler's Method) 5. Conductometric titration of mixture of acids (HCl & CH ₃ COOH) with strong base 6. Estimation of Fe ²⁺ ion by potentiometric titration 7. Estimation of HCl by pH- Metry 8. Conductometric precipitation titration using BaCl ₂ -Na ₂ SO ₄							
L = 45, P = 30, SL = 45, TOTAL = 120 PERIODS							


Chairman (BoS)

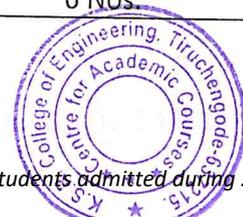


COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Interpret the treatment solutions for drinking water, boiler feed water, and wastewater reuse.											Understand	
CO2	Describe different types of electrochemical cells, including galvanic and electrolytic cells.											Understand	
CO3	Categorize different energy storage methods, such batteries, fuel cell and solar cell for the production of electricity.											Understand	
CO4	Summarize the basics concepts of polymer chemistry in designing the materials for engineering and technology.											Understand	
CO5	Illustrate the nano materials and composites for engineering and technology.											Understand	
TEXT BOOKS:													
1. S S. Dara and S. S. Umare, "A Text book of Engineering Chemistry", S.Chand & Co.Ltd., 12 th Edition, 2015.													
2. P.C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub. Co., 16 th Edition, 2013.													
3. Wiley, "Engineering Chemistry", Wiley India Pvt. Ltd., 2 nd Edition, 2013.													
REFERENCES:													
1. Dr. A. Ravikrishnan, "Engineering Chemistry", Srikrishna Hi-tech Publishing Company Pvt. Ltd., 21 st Edition, 2022.													
2. J. Mendham, R. C. Denney, J. D. Barnes, M. J. K. Thomas and B. Sivasankar, "Vogel's Text book of Quantitative Chemical Analysis", Pearson Education Pvt., Ltd., 6 th Edition, 2019.													
3. Shashi Chala, "A Text book of Engineering Chemistry", Dhanpat Rai Pub. Co., 2015.													
4. S. K. Bhasin and Sudha Rani, "Laboratory Manual of Engineering Chemistry", Dhanpat Rai Publishing Company Private Limited, 3 rd Edition, 2012.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2
CO1	3	2	-	-	-	1	-	2	1	-	1	-	-
CO2	3	2	-	-	-	1	-	2	1	-	1	-	-
CO3	3	2	-	-	-	1	-	2	1	-	1	-	-
CO4	3	2	-	-	-	1	-	2	1	-	1	-	-
CO5	3	2	-	-	-	1	-	2	1	-	1	-	-
1-low, 2-medium, 3-high													

Laboratory Equipment Details
(Requirements for a batch of 30 students)

S.No.	Description of Equipment	Quantity required
1.	Electronic balance	1 No.
2.	pH meter	6 Nos.
3.	Conductivity meter	6 Nos.
4.	Potentiometer	6 Nos.

Chairman
Chairman (BoS)



24ITP16	PROGRAMMING FOR PROBLEM SOLVING LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to AUTO, BME, CSE, CSE(CS), CSD, CSE (IoT), IT, ECE, EEE, MECH and SFE)							
PREREQUISITE:							
Students are expected to have foundational knowledge of basic programming principles. This includes an understanding of variables and data types such as integers, floats, and characters, as well as familiarity with fundamental control structures like conditional statements (if-else) and loops (for, while).							
OBJECTIVE:							
The lab is designed to provide hands-on experience with fundamental computer applications like MS Word, Excel, PowerPoint, and MS Access. It also aims to develop practical programming skills in C, enabling students to write, debug, and execute programs that incorporate core concepts such as control flow, functions, strings, pointers, and file handling. The lab will help students apply theoretical knowledge to real-world problems, enhancing their problem-solving and programming proficiency.							
LIST OF EXPERIMENTS:							
<ol style="list-style-type: none"> 1. Prepare a Bio-data using MS Word with appropriate page, text and table formatting options and send the same to too many recipients using mail merge. 2. Prepare a mark sheet with five subjects for five students in MS Excel File using Formulas, Functions and charts. 3. i) Prepare a Power Point presentation for your organization with varying animation effects using timer. ii) Prepare a Student Database in MS Access, manipulate the data and generate report. 4. Design an algorithm and flowchart with example. 5. Program using I/O statements and expressions. 6. Programs using decision-making constructs: if-else, goto, switch-case, break-continue. 7. Loops: for, while, do-while. 8. Arrays: 1D and 2D 9. Functions: passing parameters by (value, reference), Recursion. 10. Strings: operations. 11. Pointers. 12. Structures and File operations. 							
L = 0, T = 0, P = 30, SL = 0, TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome	Experiment	Cognitive Level				
CO1	Apply the basic concept of MS word, Excel, Power Point presentation and MS Access.	1,2,3,4	Apply				
CO2	Develop the program using the concept of control statements.	5,6,7	Apply				
CO3	Demonstrate the use of functions and arrays in Programming.	8,9	Apply				
CO4	Apply the concepts of pointers and strings.	10,11	Apply				
CO5	Develop the program using the files and structure operations.	12	Apply				

G. G. J. J.
 K.S.R. College of Engineering
 Chairman (BOS)


 Applicable for the students admitted during 2024-2025

REFERENCES:

1. Jeff Szuha, "Learn C Programming", Packt Publishing, United Kingdom, Second Edition, 2022.
2. E Balagurusamy, "Programming In Ansi C", McGraw Hill Education, Eighth Edition, 2019.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	1	1	-	-	-	-
CO2	3	3	2	-	-	-	-	1	1	-	-	-	-
CO3	3	3	2	-	-	-	-	1	1	-	-	-	-
CO4	3	3	2	-	-	-	-	1	1	-	-	-	-
CO5	3	3	2	-	-	-	-	1	1	-	-	-	-

1 - Low, 2 - Medium, 3 - High

LIST OF EQUIPMENTS (For a Batch of 30 Students)		
Sl. No	Name of the Equipment's	Qty.
1.	A computer with a modern processor and sufficient RAM.	30 Nos.
2.	Microsoft Office Suite (preferably MS Office 2016 or later) including: <ul style="list-style-type: none"> • MS Word (for document preparation and mail merge) MS Excel (for mark sheet creation, formulas, functions, and charts). • MS PowerPoint (for presentations with animations and timers). • MS Access (for database creation, data manipulation, and report generation). • Email Client (e.g., Outlook or any configured email system) for sending mail merge outputs. 	30 Nos.
3.	Turbo C software or any standard C Compiler (e.g., GCC, Code Blocks)	30 Nos.

S. Anantha
 Chairman (BoS)



24MEP16	ENGINEERING GRAPHICS LABORATORY	Category	L	T	P	SL	C
		ESC	15	0	30	15	2

(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), IT, ECE, EEE)

PREREQUISITE

Engineering Graphics Laboratory requires a good understanding of geometry. This includes knowledge of shapes, angles, dimensions, and spatial reasoning. The ability to visualize and interpret three-dimensional objects from two-dimensional drawings is crucial.

OBJECTIVES:

Instruct the utility of drafting & modeling packages in orthographic and isometric drawings and train the usage of 2D and 3D modeling

List of Exercise/Experiments:

1. Study of drawing tools, commands and coordinate systems in 2D software.
2. Cycloid and Conic curves.
3. Orthographic projections of pictorial views.
4. Orthographic views of straight lines.
5. Orthographic views of planes.
6. Orthographic views of simple solids.
7. The sectional view and the true shape of simple solids.
8. Development of lateral surfaces of simple solids.
9. Isometric projection of simple solids.
10. Drafting the 2D multi-view drawings from 3D model.

LIST OF EQUIPMENT (for a batch of 30 Students)

S.No.	Name of the Equipment	Quantity
1.	Intel i3 Processor, 8 GB RAM with 2 GB Graphics Card	30 Nos
2.	Licensed software for drafting and modeling	30 Nos

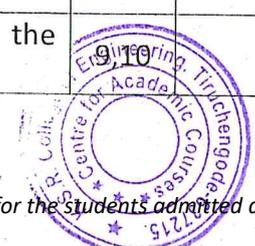
L:15 P:30 SL:15 TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

COs	Course Outcome	Exp. No.	Cognitive Level
CO1	Explain the fundamentals of engineering drawing and AutoCAD tool.	1	Understand
CO2	Construct projections of points, lines, and planes, then develop a virtual drawing using AutoCAD tool.	2,3 & 4	Apply
CO3	Apply projection principles to convert pictorial views into orthographic drawings	5,6	Apply
CO4	Model the Solid Projections and Sectioning of the solids by the AutoCAD tool.	7,8	Apply
CO5	Develop isometric drawings of simple objects reading the orthographic projections of those objects.		Apply

(Signature)
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REFERENCES:

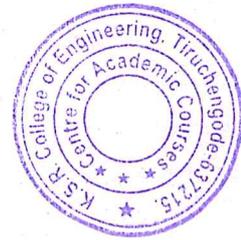
1. Bhatt. N. D., Engineering Drawing, Charotar Publishing House, Fifty Third Edition, 2014.
2. Basant Agarwal and Agarwal. C. M., Engineering Drawing, Tata McGraw Hill Publishing Company Limited, 2018.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	3	-	-	-	-	-	-	-	-
CO2	3	3	2	-	3	-	-	-	-	-	-	-	-
CO3	3	3	2	-	3	-	-	-	-	-	-	-	-
CO4	3	3	2	-	3	-	-	-	-	-	-	-	-
CO5	3	3	2	-	3	-	-	-	-	-	-	-	-

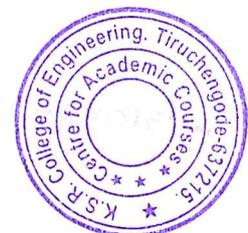
1-low, 2-medium, 3-high


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24GEP16	ENGINEERING EXPERIENCE LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to BME, CSE, CSE(CS), CSD, CSE(IoT), ECE, EEE, IT)							
PREREQUISITE:							
A solid foundation in basic electrical components such as switches, wires, fuses, and light bulbs, including the roles of line, neutral, and ground wires. Basic understanding of physics and core principles of electrical and mechanical engineering.							
OBJECTIVE:							
To develop practical skills in basic electrical wiring, electronic interfacing with Arduino and IoT, and fundamental mechanical tools and systems.							
LIST OF EXPERIMENTS							
GROUP - A (ELECTRICAL)							
<ol style="list-style-type: none"> 1. Fluorescent lamp wiring. 2. Stair-case wiring. 3. Residential house wiring using switches, fuse, indicator and lamp. 4. Measurement of Energy in single phase system. 							
GROUP - B (ELECTRONICS)							
<ol style="list-style-type: none"> 1. Study of Electronic Components, Instruments, Internet of Things (IoT) and Arduino IDE. 2. Controlling the Light Emitting Diode (LED) with a push button using Arduino. 3. Interfacing of a Sensor (Ultrasonic, Rain, Voltage, Current & PIR) with Arduino Uno. 4. Controlling of LED through Wi-Fi using ESP8266. 							
GROUP - C (MECHANICAL)							
<ol style="list-style-type: none"> 1. Study of plumbing line sketches for water supply and carpentry tools. 2. Study of welding tools and centrifugal pump. 							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome						Bloom's Taxonomy Level
CO1	Construct different types of wiring used in residential houses.						Apply
CO2	Measure the energy in single-phase system.						Apply
CO3	Demonstrate different electronic components, instruments, IoT and Arduino IDE.						Apply
CO4	Construct the control circuit with the help of Arduino and sensors.						Apply
CO5	Describe the plumbing, carpentry, welding components and centrifugal pump works for engineering practices and applications.						Understand


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REFERENCES:

1. Gupta J.P., "A Course in Electrical Installation Estimating and Costing", S.K. Kataria and Sons, Delhi, Reprint 2013 Edition, 2013.
2. Mike Cheich, "Arduino Book for Beginners", Programming Electronics Academy, 2021.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	2	2	3	2	-	3	-	-
CO2	3	3	2	-	-	2	2	3	2	-	3	-	-
CO3	3	3	2	-	-	-	2	3	2	-	3	-	-
CO4	3	3	2	-	-	-	2	3	2	-	3	-	-
CO5	3	3	2	-	-	-	2	3	2	-	3	-	-

LIST OF EQUIPMENT (For a Batch of 30 Students)

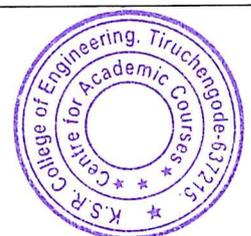
S.No.	Name of the Equipment	Qty.
1.	Single-phase house wiring setup	2 Nos.
2.	Staircase wiring setup	2 Nos.
3.	Fluorescent lamp wiring setup	2 Nos.
4.	Energy Meter	5 Nos.
5.	Electrical Measuring Instruments	10 Nos.
6.	Ultrasonic Sensor	5 Nos.
7.	Rain Sensor	5 Nos.
8.	Voltage Sensor	5 Nos.
9.	Current Sensor	5 Nos.
10.	PIR Sensor	5 Nos.
11.	ESP8266 & Cable	15 Nos.
12.	Arduino UNO & Cable	15 Nos.
13.	DHT 11	5 Nos.
14.	Temperature sensor	5 Nos.
15.	Red LED	15 Nos.
16.	2-leg push Button	15 Nos.
17.	4-leg push Button	15 Nos.
18.	Personal Computer	15 Nos.


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24SSP19	APTITUDE AND CODING SKILLS – I	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES: The course aims to introduce students to the fundamentals of aptitude, highlighting its importance and real-world applications. It is designed to build proficiency in verbal reasoning, thereby enhancing analytical and problem-solving skills. The curriculum also focuses on developing a strong foundation in English grammar, essential for effective communication.							
UNIT - I	BASIC OF NUMBER SYSTEMS & FOUNDATION	(6)					
Introduction to Number System and its Classification - Divisibility Rules and Problems –Place Value & Face Value - HCF & LCM and its properties.							
UNIT - II	BASICS OF SHARE BASED CONCEPTS	(6)					
Introduction to Average – Basics of Ratio and proportion – Basics of Partnership–Introduction to Percentage							
UNIT - III	LOGICAL REASONING	(4)					
Analogies - Alpha and numeric series - Number Series - Coding and Decoding - Direction and distance							
UNIT - IV	VERBAL ABILITY	(7)					
Introduction to Grammar – Tenses – Parts of Speech – Preposition – Articles – Modal Verbs							
UNIT - V	C PROGRAMMING	(7)					
C Basics-Control Statements Decision making – Functions – Arrays & Strings – Pointers - User Defined Data Types - Storage Classes - Memory Management - Preprocessor.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Explain the classification of number systems, apply divisibility rules to identify number properties	Understand					
CO2	Apply the concepts of averages, ratios, and proportions to solve real-life problems and interpret data effectively.	Apply					
CO3	Solve number series problems by identifying and applying suitable numerical patterns or rules.	Apply					
CO4	Apply the rules of grammar to enhance written and spoken communication.	Apply					
CO5	Apply the fundamental concepts of C programming to develop efficient and structured programs.	Apply					

Chairman (BOS)
Chairman (BOS)

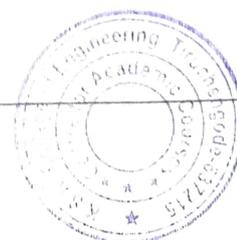


TEXT BOOKS:													
<ol style="list-style-type: none"> 1. R S Aggarwal, Quantitative Aptitude for Competitive Examinations. 2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning 3. Wren & Martin, High School English Grammar & Composition 4. Brian W. Kernighan and Dennis Ritchie, The C Programming Language 2e, Pearson Education, 2015. 5. Yashavant Kanetkar, The C Programming Language 2e, BPB publications, 15th Edition, 2016 													
REFERENCES:													
<ol style="list-style-type: none"> 1. https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm 2. Stephen G. Kochana, Programming in C, 3rd Edition. 3. K. N. King, C Programming: A Modern Approach, 2e, 2008. 4. Aaron M. Tenenbaum, Yedidiah Langsam, and Moshe J. Augenstein, Data Structures Using C, Pearson Education India, 1990. 5. Robert L. Kruse and Bruce P. Leung, Data Structures and Program Design in C, Pearson Education 2007. 6. https://www.geeksforgeeks.org/c-programming-language/ 7. https://www.geeksforgeeks.org/data-structures/ 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
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CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	3	2	-	2	-	-	2	-	-	3	-	-
Avg.	3	3	3	-	2	-	-	2	-	-	3	-	-

Anurag
Chairman (BoS)

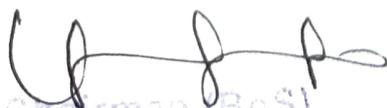


24CST29	PYTHON PROGRAMMING	Category	L	T	P	SL	C	
		ESC	45	0	0	45	3	
(Common to All Branches)								
PREREQUISITE: A basic understanding of programming principles such as variables and loops, paired with good problem-solving abilities is required. Logical thinking and analytical skills are critical for effective programming.								
OBJECTIVE: <ul style="list-style-type: none"> To provide a comprehensive foundation in Python programming, covering core concepts, data structures, OOP principles, file and database handling as well as web and GUI development using frameworks like Django and Tkinter. 								
UNIT – I	FUNDAMENTALS OF PYTHON							(9)
Introduction to Python – Advantages of Python programming – Variables and Data types – Comments – Indentation – I/O function – Operators – Selection control structures – Looping control structures – Functions: Declaration – Types of arguments – Anonymous functions: Lambda.								
UNIT – II	HANDLING STRINGS AND EXCEPTIONS							(9)
Strings – List – Tuples – Dictionaries – Sets – Exception Handling: Built-in Exceptions – User-defined exception – Modules and Packages.								
UNIT – III	OBJECT ORIENTED PROGRAMMING CONCEPTS							(9)
Object Oriented Programming basics –Inheritance and Polymorphism – Operator Overloading and Overriding – Get and Set Attribute Values – Name Mangling – Duck Typing – Relationships.								
UNIT– IV	FILES AND DATABASES							(9)
File I/O operations – Directory Operations – Reading and Writing in Structured Files: CSV and JSON – Data manipulation using MySQL.								
UNIT – V	WEBPROGRAMINGAND GUI USING PYTHON							(9)
Frameworks: Introduction to Django – Django CRUD – Socket Programming – Sending email – UI design: Tkinter – Events – CGI: Introduction to CGI Programming, GET and POST Methods.								
L = 45, SL = 45, TOTAL: 90 PERIODS								



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COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Describe Python syntax to write code using data types, operators, loops and conditionals.											Understand	
CO2	Interpret string manipulation, data structures and exception handling to build robust applications.											Understand	
CO3	Implement object-oriented programming principles including inheritance and polymorphism to design effective solutions.											Apply	
CO4	Apply file I/O operations and database management techniques to efficiently manage and manipulate data.											Apply	
CO5	Develop web applications and graphical user interfaces using Python frameworks and libraries.											Apply	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. Yashwant Kanetkar, Aditya Kanetkar, "Let Us Python", BPB Publications, Fifth Edition, 2023. 2. Wesley J.Chun, "Core Python Programming", Pearson Education, Second Edition, 2017. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Robert Oliver, "Python Quick Start Guide: The Simplified Beginner's Guide to Python Programming Using Hands-On Projects and Real-World Applications", Clyde Bank Media LLC,1st Edition, 2023 2. Allen B. Downey, "Think Python", O'Reilly Media, Second Edition, 2016. 3. David Beazley, Brian K. Jones, "Python Cookbook", O'Reilly Media, Third Edition, 2013 4. Mark Lutz, "Python Pocket Reference", O'Reilly Media, Fifth Edition, 2014 5. www.python.org 6. https://onlinecourses.swayam2.ac.in/cec22_cs20/preview 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	2	-	1
CO2	3	2	-	-	-	-	-	1	1	-	2	-	1
CO3	3	3	2	-	-	-	-	1	1	-	2	-	1
CO4	3	3	2	-	-	-	-	1	1	-	2	-	1
CO5	3	3	2	-	-	-	-	1	1	-	2	-	1
1 - Low, 2 - Medium, 3 - High													


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24ECT21	DESIGN THINKING	Category	L	T	P	SL	C
		PCC	30	0	0	30	2
(COMMON TO BME, EEE & ECE)							
PRE-REQUISITE: Nil							
OBJECTIVE: To equip learners with a structured, human-centered approach to problem-solving using the principles and stages of Design Thinking, including empathy, problem definition, ideation, prototyping, and effective communication.							
UNIT - I	FUNDAMENTALS OF DESIGN THINKING						(6)
What is Design Thinking? - When to use Design Thinking? - How to do it? - Who are involved in this? – Design Thinking™– Personal Visualization, The Wheel of Life & Balancing Priorities – Appreciating ‘Design’ – The 3 Laws of Design Thinking.							
UNIT - II	STEP 1: THE ‘FEEL’ STAGE						(6)
What is this stage about? – What role does a Design Thinker play in this stage? Tools – What is the purpose in this stage? – Persona – Journey Mapping – Stakeholder Mapping & CATWOE Analysis - Cartographic Perspective (L0) – Empathy Map – Case Study: Understanding the Stakeholders.							
UNIT - III	STEP 2: THE ‘DEFINE’ STAGE						(6)
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – Five-Whys – Anti-Pattern – Paraphrasing the Problem – Challenge Mapping – LORD: Definitive skill set for a Design Thinker – Case Study: Relooking at the Problem.							
UNIT - IV	STEP 3: THE ‘DIVERGENCE’ & ‘CONVERGENCE’ STAGE						(6)
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – Brainstorming – Metaphor – Random Association Technique – End-State Visualization - 10gm-100gm-1000gm – Prototyping – Wire framing for digital products – Case Study: Prototyping and Communicating for Effective Outcome.							
UNIT - V	STEP 5: THE ‘COMMUNICATION’ STAGE						(6)
What is this stage about? – What role does a Design Thinker play in this stage? – What is the most important aspect of this stage? – Tools – What is the purpose in this stage? – The 4Cs Framework – Naming – Packaging – Story boarding – Presentation – Distribution.							
TOTAL (L:30, SL:30): 60 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome						Cognitive Level
CO1	Demonstrate an understanding of Design Thinking concepts and principles by explaining their relevance in real-world contexts.						Understand
CO2	Articulate the significance of a Design Mindset and its impact on creative problem-solving.						Understand
CO3	Apply Design Thinking methods effectively at each stage of the problem-solving process.						Apply

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CO4	Identify and implement the phases of Design Thinking to address complex challenges systematically.	Apply
CO5	Use a variety of Design Thinking tools to develop innovative solutions and refine ideas through iteration.	Apply

TEXT BOOKS:

1. UnMukt – The Science & Art of Design Thinking, Arun Jain
2. Don Norman ,The Design of Everyday Things, MIT Press, 2013
3. Tim Brown, Change by Design: How Design Thinking Transforms Organizations and inspires innovation, Harper Collins Publishers Ltd, New York, First Edition, 2009.

REFERENCES:

1. Chrisitan Mueller-Roterberg, Handbook of Design Thinking – Tips & Tools for how to design thinking, kindle Direct Publishing, First Edition, 2018.
2. Johnny Schneider, Understanding Design Thinking, Lean and Agile, O’Reilly Media, California, First Edition, 2017
3. Roger Martin, The Design of Business, Why Design Thinking is the next competitive advantage, Harvard Business Press, United States, First Edition, 2009.
4. Idris Mootee, Design Thinking for Strategic Innovation, John Wiley & Sons Inc, New Jersey, First Edition, 2013.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	2	2	2	2	3	2	3	3	-	-
CO2	3	3	2	2	2	2	2	3	2	3	3	-	-
CO3	3	3	3	3	3	2	2	3	2	3	3	-	-
CO4	3	3	3	3	3	2	2	3	2	3	3	-	-
CO5	3	3	3	3	3	2	2	3	2	3	3	-	-

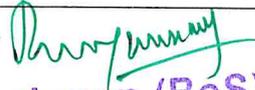
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24GET29	தமிழரும் தொழில் நுட்பமும்	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(அனைத்து துறைகளுக்கும் பொதுவானது)							
முன் கூட்டிய துறைசார் அறிவு : தேவை இல்லை							
அலகு - I	நெசவு மற்றும் பாணைத் தொழில்நுட்பம்						[03]
சங்ககாலத்தில் நெசவுத் தொழில் - பாணைத் தொழில்நுட்பம் கருப்பு சிவப்பு பாண்டங்கள்- பாண்டங்களில் கீறல் குறியீடுகள்							
அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்						[03]
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும்-சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள்-மாமல்லபுரச் சிற்பங்களும், கோவில்களும்- சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள்-நாயக்கர் காலக்கோயில்கள்-மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன்ஆலயம் மற்றும் திருமலைநாயக்கர்மஹால் - செட்டிநாட்டுவீடுகள்-பிரிட்டிஷ்காலத்தில் சென்னை இந்தோ-சாரோசெனிக் கட்டிடக்கலை.							
அலகு - III	உற்பத்தித் தொழில்நுட்பம்						[03]
கப்பல் கட்டும் கலை-உலோகவியல்-இரும்புத்தொழிற்சாலை-இரும்பை உருக்குதல், எஃகு- வரலாற்றுச்சான்றுகளாக செம்பு மற்றும் தங்கநாணயங்கள்-நாணயங்கள் அச்சடித்தல்-மணி உருவாக்கும் தொழிற்சாலைகள்-கல் மணிகள்-கண்ணாடி மணிகள்-சுடு மண்மணிகள்- சங்குமணிகள்-எலும்புத்துண்டுகள்-தொல்லியல் சான்றுகள்-சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.							
அலகு - IV	வேளாண்மை மற்றும் நீர்ப் பாசனத் தொழில்நுட்பம்						[03]
அணை, ஏரி, குளங்கள், மதகு-சோழர்காலகுமிழித்தாம்பின் முக்கியத்துவம்-கால்நடை பராமரிப்பு- கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள்-வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள்-கடல்சார் அறிவு - மீன் வளம்-முத்து மற்றும் முத்துக் குளித்தல்-பெருங்கடல் குறித்த பண்டைய அறிவு-அறிவுசார் சமூகம்.							
அலகு - V	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்						[03]
அறிவியல் தமிழின் வளர்ச்சி- கணினித்தமிழ் வளர்ச்சி-தமிழ் நூல்களை மின்பதிப்பு செய்தல்- தமிழ் மென் பொருட்கள் உருவாக்கம்-தமிழ் இணையக்கல்விக் கழகம்-தமிழ் மின்நூலகம்- இணையத்தில் தமிழ் அகராதிகள் சொற்குவைத் திட்டம்.							
Total (L= 15, SL=15) =30 Periods							

பாடம் கற்றத்தின் விளைவுகள் : பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்		அறிவாற்றல் நிலை
CO1	சங்ககாலத் தமிழர்களின் நெசவு மற்றும் பாணைவனைதல் தொழில் நுட்பம் குறித்து கற்றுணர்தல்.	புரிதல்
CO2	சங்ககாலத் தமிழர்களின் கட்டிட தொழில் நுட்பம் கட்டுமான பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்து அறிவு.	புரிதல்
CO3	சங்ககாலத் தமிழர்களின் உலோகத் தொழில், நாணயங்கள் மற்றும் மணிகள் சார்ந்த தொல்லியல் சான்றுகள் பற்றிய அறிவு.	புரிதல்
CO4	சங்ககாலத் தமிழர்களின் வேளாண்மை, நீர்ப்பாசன முறைகள் மற்றும் முத்து குளித்தல் குறித்த தெளிவு.	புரிதல்
CO5	நவீன அறிவியல் தமிழ் மற்றும் கணினி தமிழ் குறித்த புரிந்துகொள்ளலும் மற்றும் பயன்படுத்தலும்.	பகுப்பாய்வு


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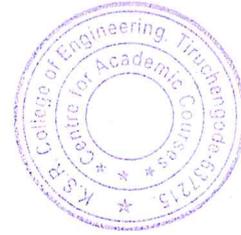


Text Books :	
1	தமிழகவரலாறு- மக்களும் பண்பாடும்- கேகேபிள்ளை (வெளியீடு தமிழ்நாடு பாடநூல் மற்றும் கல்வியில் பணிகள் கழகம்)
2	கணினித்தமிழ் - முனைவர் இல. சுந்தரம் (விகடன் பிரசுரம்)
Reference Books :	
1	கீழடி- வைகை நதிக்கரையில் சங்ககால நகரநாகரிகம்.(தொல்லியல் துறை வெளியீடு)
2	பொருறை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
3	Studies in the History of India with Special Reference to Tamilnadu (Dr.K.K.Pillay) (Published by : The Author)
4	Porunai Civilization (Jointly Published by: Department of Archaeology &Tamilnadu Textbook and Educational Services Corporation, Tamilnadu)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1. சிறிது (குறைந்த) 2. மிதமான (நடுத்தர) 3. கணிசமான (உயர்)													

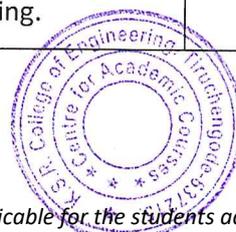
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24GET29	TAMILS AND TECHNOLOGY	CATEGORY	L	T	P	SL	C
		HSMC	15	0	0	15	1
(Common to All Branches)							
<i>Prerequisite(s): No prerequisites are needed for enrolling into the course</i>							
UNIT - I	WEAVING AND CERAMIC TECHNOLOGY	[03]					
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.							
UNIT - II	DESIGN AND CONSTRUCTION TECHNOLOGY	[03]					
Designing and Structural construction House & Designs in household materials during Sangam Age – Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram– Sculptures and Temples of Mamallapuram– Great Temples of Cholas and other worship places – Temples of Nayaka Period – Type study (Madurai Meenakshi Temple) – ThirumalaiNayakar Mahal –Chetti Nādu Houses, Indo –Saracenic architecture at Madras during British Period.							
UNIT - III	MANUFACTURING TECHNOLOGY	[03]					
Art of Ship Building – Metallurgical studies – Iron industry – Iron smelting, steel – Copper and gold – Coins as source of history – Minting of Coins – Beads making – industries Stone beads – Glass beads –Terracotta beads –Shell beads/ bone beats – Archeological evidences – Gem stone types described in Silappathikaram.							
UNIT - IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	[03]					
Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry – Wells designed for cattle use – Agriculture and Agro Processing – Knowledge of Sea – Fisheries – Pearl – Conche diving – Ancient Knowledge of Ocean – Knowledge Specific Society.							
UNIT - V	SCIENTIFIC TAMIL & TAMIL COMPUTING	[03]					
Development of Scientific Tamil – Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.							
Total (L= 15, SL=15) =30 Periods							
Course Outcomes:							Cognitive Level
At the end of the course, the student will be able to							
CO1	Understand the weaving and ceramic technology of ancient Tamil People nature.						Understand
CO2	Comprehend the construction technology, building materials in sangam Period and case studies.						Understand
CO3	Infer the metal process, coin and beads manufacturing with relevant archeological evidence						Understand
CO4	Realize the agriculture methods, irrigation technology and pearl diving.						Understand
CO5	Apply the knowledge of scientific Tamil and Tamil computing.						Apply

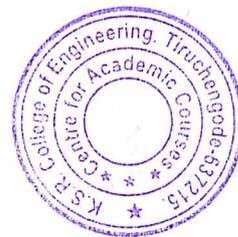
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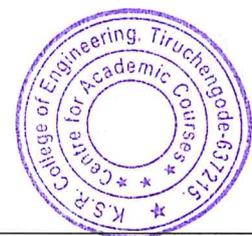
Text Books:	
1	Social Life of Tamils (Dr.K.K.Pillay) A joint Publication of TNTB & ESC and RMRL – (in print)
2	Social Life of the Tamils – The Classical Period (Dr.S.Sigaravelu) (Published by: International Institute of Tamil Studies).
Reference Books:	
1	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukarasu) (Published by : International Institute of Tamil Studies)
2	The Contribution of the Tamils to Indian Culture (Dr.M.Valarmathi)(Puplished by International Institute of Tamil Studies).
3	Keeladi – ‘Sangam City Civilization on the banks of river Vaigai; (Jointly Published by: Department of Archaeology &Tamilnadu Text Book and Educational Services Corporation, Tamilnadu)
4	Studies in the History of India with Special Reference to Tamilnadu (dr.K.K.Pillay) (Published by.: The Author)

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	3	3	-	2	-	3	-	-
CO2	-	-	-	-	-	3	3	-	2	-	3	-	-
CO3	-	-	-	-	-	3	3	-	2	-	3	-	-
CO4	-	-	-	-	-	3	3	-	2	-	3	-	-
CO5	-	-	-	-	-	3	3	-	2	-	3	-	-
Avg.	-	-	-	-	-	3	3	-	2	-	3	-	-
1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)													


Chairman (BoS)



24MAI29	PROBABILITY AND STATISTICS	Category	L	T	P	SL	C
		BSC	30	15	30	45	4
SEMESTER II - B.E / B.TECH (Common to All Branches)							
PREREQUISITE: A basic understanding of algebra, calculus, and introductory statistics is required to grasp the concepts of probability, hypothesis testing, and statistical methods used in engineering and quality control.							
OBJECTIVES: To build a foundational understanding of probability and random variables, enable the application of two-dimensional random variables in engineering contexts, develop the ability to perform hypothesis testing for both small and large samples, introduce the principles of experimental design in agricultural studies, and provide knowledge of statistical quality control techniques.							
UNIT - I	ONE DIMENSIONAL RANDOM VARIABLES						(9)
One dimensional Random Variable - Discrete and continuous random Variables -Expectations - Moment generating functions and their properties - Binomial, Poisson, Uniform and Normal distributions.							
UNIT - II	TWO - DIMENSIONAL RANDOM VARIABLES						(9)
Joint distributions – Marginal and conditional distributions – Covariance – Karl Pearson's Coefficient of Correlation - Spearman's Rank Correlation - Regression Analysis.							
UNIT - III	TESTING OF HYPOTHESIS						(9)
One sample and two sample test for means of large samples (Z- test), One sample and two sample test for means of small samples (t-test), Chi-square - Independent of Attributes - F test for equality of variances.							
UNIT - IV	DESIGN OF EXPERIMENTS						(9)
Analysis of variance - One way and two way classifications - Completely Randomized Design - Randomized Block Design - Latin Square Design.							
UNIT - V	STATISTICAL QUALITY CONTROL						(9)
Control charts for measurements (\bar{X} and R charts) – Control charts for C and P charts – Acceptance sampling for construction of an OC curve.							
<p>List of Exercise/Experiments (R Software):</p> <ol style="list-style-type: none"> Determine the probability by using binomial distribution. Find the probability with the help of normal distribution. Determine the correlation co-efficient between X and Y. Calculate and plot the regression lines. Test the significance of difference between experimental and theoretical values of the data by using chi-square test. Examine the small samples using F distribution. Analyze the data using Randomized Block Design (RBD). Inspect the data using Latin Square Design (LSD). Find the \bar{X} and R charts. Compute c and p charts. 							
L = 30 , T = 15 & P = 30 & SL = 45, TOTAL: 120 PERIODS							



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

COs	Course Outcome	Cognitive Level
CO1	Apply the concepts of one dimensional random variables to compute expectations and analyze the standard distributions.	Apply
CO2	Apply statistical methods to compute marginal and conditional distributions, and perform correlation and regression analysis.	Apply
CO3	Apply Z-test, t-test, Chi-square test, and F-test to analyze sample data and draw inferences on independence of attributes.	Apply
CO4	Apply analysis of variance techniques for one-way and two-way classifications, and implement experimental designs using CRD, RBD and LSD.	Apply
CO5	Construct control charts for measurements Mean and Range charts and attributes charts to assess process control and product quality.	Apply

TEXT BOOKS:

1. S.P. Gupta, "Statistical Methods", Sulthan Chand & Sons, 46th Edition ,2021.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, 2007.

REFERENCES:

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 2004.
3. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 9th Edition, 2010.
4. R.C.Gupta, "Statistical Quality Controls", Khanna Publishers, Delhi, 8th Edition , 2008.

Mapping of COs with POs and PSOs

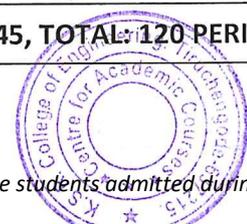
COs/ POs	PO1	PO2	PO3	PO4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	2	-	-	1	-	-	2	-	-
CO2	3	3	3	3	2	-	-	1	-	-	2	-	-
CO3	3	3	3	3	2	-	-	1	-	-	2	-	-
CO4	3	3	3	3	2	-	-	1	-	-	2	-	-
CO5	3	3	3	3	2	-	-	1	-	-	2	-	-
Avg.	3	3	3	3	2	-	-	1	-	-	2	-	-

1-low, 2-medium, 3-high

Chairman (BoS)



24EEI21	ELECTRIC CIRCUIT ANALYSIS	Category	L	T	P	SL	C
		PCC	45	0	30	45	4
PREREQUISITE:							
Basic knowledge of electrical quantities, circuit laws, and algebra/trigonometry for analyzing DC and AC circuits.							
OBJECTIVE:							
<ul style="list-style-type: none"> To develop a comprehensive understanding of analysis techniques for DC and AC circuits, network theorems, three-phase systems, resonance, and two-port network parameters. 							
UNIT - I	DC CIRCUITS	(9)					
Basic definitions – Circuit terminologies – Ohm’s law and its limitations – Kirchoff’s laws – Series and parallel resistive circuits – Voltage and current division techniques – Source transformation – Mesh current and Node voltage methods (Independent Sources).							
UNIT - II	REDUCTION TECHNIQUES AND NETWORK THEOREMS	(9)					
Star to delta and delta to star conversion – Thevenin’s Theorem – Norton Theorem – Superposition Theorem – Maximum Power Transfer Theorem – Reciprocity Theorem (DC Circuits only).							
UNIT - III	STEADY-STATE ANALYSIS OF AC CIRCUITS	(9)					
Characteristics of Sinusoids – Average and RMS Value – Form Factor – Peak Factor – Phase Difference – Phasor Representation. Analysis of Purely Resistive Circuit – Purely Inductive Circuit – Purely Capacitive Circuit – Series RL, RC and RLC Circuit: Phasor diagram – Voltage triangle, Impedance triangle, Power factor, Power triangle.							
UNIT - IV	THREE PHASE CIRCUITS AND RESONANCE	(9)					
Three Phase Circuits: Advantages of Three Phase System – Star and Delta connected balanced and unbalanced loads – Two wattmeter method of power measurements. Series Resonance Circuit: Phasor diagram – Properties – Variation of X_L , X_C , and Z with frequency – Q Factor – Half-power frequencies – Selectivity – Bandwidth.							
UNIT - V	TWO PORT NETWORKS	(9)					
Introduction – Impedance, admittance, hybrid and transmission Parameters – Reciprocity and Symmetry – Relationship between different parameters – Interconnections of Two-Port Networks (Quantitative Approach Only).							
LIST OF EXPERIMENTS:							
<ol style="list-style-type: none"> Simulation and verification of Ohm’s Law. Simulation and verification of Kirchoff’s Laws. Simulation and verification of Mesh analysis. Simulation and verification of Nodal analysis. Simulation and verification of Superposition theorem. Simulation of the frequency response of RL circuit. Simulation of the frequency response of RC circuit. Measurement of power in the three-phase circuit by two-wattmeter method. Simulation of Two-port impedance network. 							
LECTURE: 45, PRACTICAL: 30, SELF LEARNING: 45, TOTAL: 120 PERIODS							



COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Solve the problems of DC circuits using fundamental laws.											Apply	
CO2	Apply various network reduction techniques, including network theorems for simplifying the electric circuits.											Apply	
CO3	Determine the parameters of series RL, RC and RLC AC circuits.											Apply	
CO4	Compute the parameters of three-phase systems and series resonance circuits.											Apply	
CO5	Determine the different parameters of two-port networks.											Apply	
TEXT BOOKS:													
1 Sudhakar, A., and Shyam Mohan S.P., "Circuits and Network Analysis and Synthesis", Tata McGraw Hill Publishing Company Limited, New Delhi, Fifth Edition, 2017.													
2 Mahadevan K., and Chitra C., "Electrical Circuit Analysis", PHI Learning Pvt. Ltd, Second Edition, 2018.													
REFERENCES:													
1 Charles K.Alexander, Matthew N.O.Sadiku, "Fundamentals of Electric Circuits", McGraw Hill, Sixth Edition, 2019.													
2 William, H., HaytJr, Jack E., Kemmerly, Steven M. Durbin, Jamie Phillips, "Engineering Circuit Analysis", McGraw Hill, New Delhi, Tenth Edition, 2023.													
3 Chakrabarti, A, "Circuit Theory Analysis and Synthesis", Dhanpat Rai & Co, New Delhi, Seventh Edition, 2018.													
4 Chattopadhyay D., Rakshit P.C., "Fundamentals of Electric Circuit Theory", S. Chand and Company Limited, Ninth Edition, 2020.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	-	1	2	-	-	-	-	2	3	2
CO2	3	3	1	-	1	2	-	-	-	-	2	3	2
CO3	3	3	1	-	1	2	-	-	-	-	2	3	2
CO4	3	3	1	-	1	2	-	-	-	-	2	3	2
CO5	3	3	1	-	1	2	-	-	-	-	2	3	2
1- Low, 2 - Medium, 3 - High													

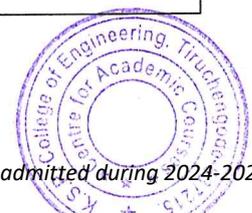
List of Equipment (For a Batch of 30 Students)

S. No.	Description of Equipment	Qty.
1.	Regulated Power Supply (0-30V)	10 Nos.
2.	Function Generator (MHz Range)	5 Nos.
3.	Oscilloscope (20 MHz)	10 Nos.
4.	AC/DC - Voltmeters of required rating	10 Nos.
5.	AC/DC - Ammeters of required rating	10 Nos.
6.	Decade Resistance Box, Decade Inductance Box, Decade Capacitance Box	6 Nos. each
7.	Three phase star & delta connected load / Single phase load bank of suitable rating	2 Nos.
8.	Resistors of various range	50 Nos.
9.	Capacitors of various ranges	25 Nos. each
10.	MultiSim software (Multi user)	01


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24EEI22	ANALOG ELECTRONICS	Category	L	T	P	SL	C
		PCC	45	0	30	45	4
PREREQUISITE: Basic understanding of semiconductor physics, electronic components, and fundamental of electric circuit are essential.							
OBJECTIVE: <ul style="list-style-type: none"> To understand the principles, characteristics, and applications of semiconductor devices, amplifiers, oscillators, operational amplifiers, and timer circuits. 							
UNIT - I	SEMICONDUCTOR DEVICES	(9)					
PN junction diode: structure, operation and V-I characteristics, dynamic resistance, temperature coefficients, drift and diffusion currents – Rectifiers: half-wave and full-wave bridge rectifiers – Zener diode: structure, operation and V-I characteristics – Zener diode as voltage regulators.							
UNIT - II	TRANSISTOR AND ITS APPLICATIONS	(9)					
Bipolar Junction Transistor: structure, operation – Configurations: CE, CB and CC – Applications as switch and amplifier – H-parameter analysis of CE configuration – Junction Field Effect Transistor: structure, operation and characteristics – Application as voltage variable resistor.							
UNIT - III	FEEDBACK AMPLIFIERS AND OSCILLATORS	(9)					
Introduction to feedback amplifiers – Effect of positive and negative feedbacks – voltage series, current series, voltage shunt, current shunt feedback amplifiers. Oscillator: condition for oscillation, RC phase shift, Wein bridge, Crystal oscillator, UJT Relaxation Oscillator.							
UNIT - IV	IC FABRICATION AND CHARACTERISTICS OPERATIONAL AMPLIFIERS	(9)					
Basic planar process for IC fabrication – Op Amp: Ideal characteristics – inverting and non-inverting operational amplifiers – DC and AC characteristics of op-amp– differential amplifiers – CMRR.							
UNIT - V	APPLICATIONS OF OPAMP AND 555 TIMER	(9)					
Differentiator, Integrator, V to I and I to V converters – DAC: R-2R ladder, Weighted resistor types – ADC: Flash type, Successive approximation type – 555 timers: Mode of operations and its applications.							
LIST OF EXPERIMENTS:							
<ol style="list-style-type: none"> Real-time verification of V-I Characteristics of PN Junction diode. Real-time verification of single-phase full-wave rectifiers with and without capacitive filters. Real-time verification of V-I Characteristics of Zener diode. V-I characteristics of the transistor under common emitter configuration. Simulation of V-I Characteristics of FET. Simulation of RC phase shift Oscillator using BJT. Simulation of inverting and non-inverting operational amplifiers. Implement an Op-Amp-based digital-to-analog converter. Implement an Op-Amp-based analog-to-digital converter. Design an Astable and Monostable multivibrator using an NE/SE 555 timer. 							
LECTURE: 45, PRACTICAL: 30, SELF-LEARNING: 45, TOTAL: 120 PERIODS							



COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Illustrate the V-I characteristics of different diodes and their applications in rectification and voltage regulation.											Understand	
CO2	Describe the characteristics of FET and various configurations of transistors.											Understand	
CO3	Interpret the various oscillatory and feedback amplifier circuits.											Understand	
CO4	Infer the DC and AC characteristics of op-amp and its effect on output.											Understand	
CO5	Describe the various applications of linear ICs like 741 and 555 timers.											Understand	
TEXTBOOKS:													
1. Sedha, R.S, "A textbook of Applied Electronics", S.Chand and Company, New Delhi Ltd., Revised Edition, 2022.													
2. Roy Choudhary D and Shell B. Jani, "Linear Integrated Circuits", New Age International, Seventh Edition, 2025.													
REFERENCES:													
1. Albert Malvino and David Bates, "Electronic Principles", Tata McGraw Hill, Eighth Edition, 2016.													
2. David A Bell, "Fundamentals of Electronic Devices and Circuits", Oxford University Press India, Fifth Edition, PHI. 2009.													
3. David A. Bell, "Op-amp & Linear ICs", Oxford University Press India, Third Edition, 2011.													
4. Gray and Mayer, "Analysis and design of Analog Integrated Circuits", Wiley International, Fifth Edition, 2009.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	2	-	-	-	-	3	2	-	-	2	-
CO2	3	2	2	-	-	-	-	3	2	-	-	2	-
CO3	3	2	2	-	2	-	-	3	2	-	-	2	-
CO4	3	2	2	-	2	-	-	3	2	-	-	2	-
CO5	3	2	2	-	-	-	-	3	2	-	-	2	-
1 - Low, 2 - Medium, 3 - High													

List of Equipment (For a Batch of 30 Students)

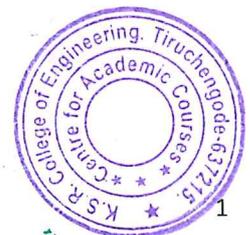
S. No.	Description of Equipment	Qty.
1.	CRO	5 Nos.
2.	Components and bread boards	10 each
3.	Chip IC – 555	10 Nos.
4.	Work tables	13 Nos.
5.	Semiconductor diode – IN4007	10 Nos.
6.	Transistor – BC107	10 Nos.
7.	Various Range of Ammeter	15 Nos.
8.	Low Range Voltmeter	15 Nos.
9.	Various Range of Resistor	40 Nos.
10.	Various Range of Capacitor	40 Nos.
11.	Multisim software (Multiuser)	01 Nos.


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24ENP29	PROFESSIONAL COMMUNICATION LABORATORY	Category	L	T	P	SL	C	
		HSMC	0	0	30	0	1	
(Common to All Branches)								
OBJECTIVE: To enhance learners' proficiency in listening, speaking, reading, and writing through structured activities and professional communication practices relevant to academic and workplace settings.								
UNIT - I	VERBAL AND CRITICAL REASONING							(6)
Syllogism – Drawing conclusions from given logical statements, Assertion and Reason – Judging the link between a claim and its reason, Verbal Analogies – Completing word pairs based on relationships, Statement and Assumption – Identifying hidden assumptions in statements, Statement and Conclusion – Choosing valid conclusions from given data, Critical Reasoning – Evaluating arguments for logic and consistency.								
UNIT - II	LISTENING							(6)
Listening to Announcement – Understanding key details and context from public messages, Short Conversation – Extracting specific information from brief dialogues, Motivational Speech – Grasping main ideas, tone, and speaker's intent, Telephone Conversation – Comprehending spoken exchanges over the phone.								
UNIT - III	SPEAKING							(6)
Talking about Oneself – Sharing personal details clearly and confidently, Oral-presentation on a General Topic – Presenting ideas briefly with clarity and structure, Group Discussion on Current Affairs – Expressing and support opinions in group settings, Role Play – Performing situational conversations using appropriate language, Mock & HR Interview – Answering common interview questions with clarity and confidence.								
UNIT - IV	READING							(6)
Reading Short Texts – Understanding the main message and key ideas, Reading for General and Specific Information – Locating relevant details in various texts, Case Studies on Problem Solving – Analyzing real-life scenarios to identify issues and solutions.								
UNIT - V	WRITING							(6)
Written communication: Letters (Apology & Complaint) – Writing formal letters using appropriate tone and structure, E-mails (Appreciation & Permission) – Composing clear and courteous emails, Technical Report – Using standard format for preparing structured technical report, Agenda / Minutes – Preparing format for meeting agendas and recording minutes.								
TOTAL (P:30) = 30 PERIODS								

Shreyas
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List of Experiments:

1. Syllogism, Assertion & Reason and Verbal Analogies
2. Statement & Assumption, Statement & Conclusion and Critical Reasoning
3. Listening: Announcement and Short Conversation
4. Listening: Motivational Speech and Telephone Conversation
5. Speaking: Taking about oneself, Mock & HR Interview and Mini-presentation
6. Speaking: Group Discussion and Role Play
7. Reading: Multiple Choice & Fill in the Blanks
8. Reading: Analyzing Case Studies on Problem Solving
9. Writing: Complaint/Apology Letter and Appreciation/Permission Email
10. Writing: Format of Technical Report and Format of Agenda/Minutes

COURSE OUTCOMES:

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

COs	Description	Ex. No.	Cognitive Level
CO1	Comprehend assumptions and draw conclusions from verbal reasoning tasks.	1 & 2	Understand
CO2	Understand spoken texts to identify key points and the speaker's intent.	3 & 4	Understand
CO3	Use appropriate language and tone in personal, group, and interview conversations.	5 & 6	Understand
CO4	Recognize main ideas and supporting points in short texts and case studies.	7 & 8	Understand
CO5	Draft formal letters, emails, reports, and meeting notes in the correct format.	9 & 10	Understand

TEXT BOOKS:

1. Bhatnagar Nitin, Communicative English for Engineers and Professionals, Pearson India, 2010.
2. Kulbhusan Kumar, RS Salaria, Effective Communication Skill, Khanna Publishing House, 2018.

REFERENCES:

1. Jack C Richards, Interchange, Cambridge University Press, 2022.
2. RS Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning, S Chand, 2024.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	2	-	-	-	-	-	-	2	3	-	-	-	-
CO2	2	-	-	-	-	-	-	2	3	-	-	-	-
CO3	2	-	-	-	-	-	1	2	3	-	-	-	-
CO4	2	-	-	-	-	-	1	-	3	-	-	-	-
CO5	2	-	-	-	-	-	1	-	3	-	-	-	-

1-Low, 2-Medium, 3-High

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Chairman (BoS)



Lab Requirement for a batch of 30 Students

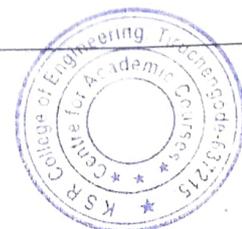
Sl. No.	Description of Equipment / Software	Quantity required
1.	Server	1
	Intel core i3 - 2120	
	4 GB RAM / 240 GB SSD	
	OS: Windows 2011	
	Headphones with mike	
2.	Client Systems	30
	Intel core i3 - 2120	
	4 GB RAM / 240 GB SSD	
	OS: Windows 2011	
	Headphones with mike	
3.	Software	1
	a) Interactive Teacher control software	
	b) English Language Lab Software	
	c) Career Lab Software	

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24CSP29	PYTHON PROGRAMMING LABORATORY	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to All Branches)							
PREREQUISITE: Students must have basic knowledge on programming principles, such as variables, simple data types, control structures, problem solving and logical thinking skills.							
OBJECTIVE: To develop programming skills in Python by performing string operations using functions for mathematical problem-solving, applying conditionals and loops, exploring sets and dictionaries for data handling and gaining foundational knowledge in polymorphism, exception handling, GUI design and web development.							
LIST OF EXERCISE/EXPERIMENTS:							
<ol style="list-style-type: none"> 1. Implementing programs using Strings. (reverse, palindrome, character count, replacing characters). 2. Implementing programs using Functions (GCD of two numbers, Factorial). 3. Scientific problems using conditional statements and loops. (Largest among three numbers, Number series, Number Patterns). 4. Implementing real-time applications using Sets, Dictionaries (Sorting, Searching, Remove Duplicates). 5. Implementing real-time/technical applications using Lists, Tuples. (Swapping two elements, Reversing a List / Sorting Tuples). 6. Create a Python program to demonstrate polymorphism with inheritance. (Single, Multilevel Inheritance, Hierarchical). 7. Implement a simple calendar in python program without using the calendar module using string array or list. 8. Write a program to demonstrate the user-defined exception handling mechanism in Python. 9. Design and implement a graphical user interface to perform any arithmetic operation. 10. Implementing a web application with MySQL database integration for CRUD operations (Flask / Django Framework). 							
L = 0, T = 0, P = 30, TOTAL: 30 PERIODS							

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Chairman (BoS)



COURSE OUTCOMES:

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

COs	Course Outcome	Exp.	Cognitive Level
CO1	Apply string operations and functions to solve problems like reversing text, palindrome check, GCD, and factorial.	1,2	Apply
CO2	Solve problems and manage data efficiently using conditionals, loops, sets, and dictionaries.	3,4	Apply
CO3	Develop applications using lists, tuples, and demonstrate polymorphism through inheritance in Python.	5,6	Apply
CO4	Build programs in Python that effectively use arrays or lists along with custom exception handling.	7,8	Apply
CO5	Implement GUI applications and web-based systems with MySQL integration to perform CRUD operations.	9,10	Apply

REFERENCES:

1. Yashwant Kanetkar, Aditya Kanetkar, "Let Us Python", BPB Publications, Fifth Edition, 2023.
2. Wesley J.Chun, "Core Python Programming", Pearson Education, Second Edition, 2017.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	1	-	1	-	2	-	2
CO2	3	3	2	-	-	-	1	-	1	-	2	-	2
CO3	3	3	2	-	-	-	1	-	1	-	2	-	2
CO4	3	3	2	-	-	-	1	-	1	-	2	-	2
CO5	3	3	2	-	-	-	1	-	1	-	2	-	2

1 - Low, 2 - Medium, 3 - High

LIST OF EQUIPMENTS (For a Batch of 30 Students)

SI.No	Name of the Equipment's	Qty.
1.	A computer with a modern processor, RAM and Windows or Linux.	30 Nos.
2.	Programming Tools: Python 2.7.11 / 3.x with IDLE	30 Nos.
3.	IDEs: Eclipse (PyDev), VS Code, Jupyter Notebook	30 Nos.


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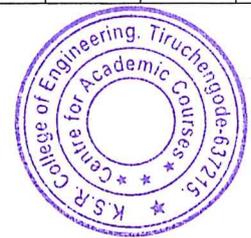
24SSP29	APTITUDE AND CODING SKILLS –II	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES:							
This course aims to expose students to various concepts of aptitude problem solving, enabling them to tackle problems effectively and enhance their analytical skills in alignment with company-specific requirements. It also focuses on developing proficiency in verbal reasoning to strengthen critical thinking abilities.							
UNIT - I	NUMBERS AND SHARE BASED CONCEPTS						(6)
Problems on Numbers – Unit Digits – Squares and Cubes – Remainder Theorem – Averages - Ratio Proportions and Partnership – Percentage – Profit and Loss.							
UNIT - II	BASICS OF WORK BASED CONCEPTS						(6)
Introduction to time and work –Introduction to Time, Speed and Distance, Problems on Trains.							
UNIT - III	LOGICAL REASONING						(4)
Blood Relations – Ranking and Ordering – Inequalities – Cause and Effect.							
UNIT - IV	VERBAL ABILITY						(7)
Yes or No and “WH” Questions – Conjunctions – Count / Uncounted Nouns – Direct and Indirect Speech – Active and Passive Voice.							
UNIT - V	PYTHON PROGRAMMING FUNDAMENTALS						(7)
Introduction-Features-Environment setup; Basic syntax: variable-data types-operators-control statements-if-if-else- loop-break-continue, etc. List- operations on list; String operations- access; Tuple: operations on tuple; Dictionaries: Accessing dictionaries, working with dictionaries; Functions- Exception Handling-Input & Output-Modules-OOPs concepts-Numerical Programming.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome						Cognitive Level
CO1	Interpret fundamental concepts to analyse and approach basic quantitative problems effectively.						Understand
CO2	Apply the concepts of time and work, time, speed and distance, to solve real-time quantitative aptitude problems effectively.						Apply
CO3	Apply logical reasoning techniques to solve problems related to ranking and ordering, decision-making and analytical skills.						Apply
CO4	Apply grammatical concepts to construct grammatically correct and contextually appropriate sentences.						Apply
CO5	Apply fundamental Python programming concepts to develop and implement basic computational solutions.						Apply

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TEXT BOOKS:													
<ol style="list-style-type: none"> 1. R S Aggarwal, Quantitative Aptitude for Competitive Examinations. 2. R.S. Aggarwal, A Modern Approach to Verbal & Non-Verbal Reasoning. 3. Wren & Martin, High School English Grammar & Composition 4. Allen B. Downey, Think Python: How to Think like a Computer Scientist, 2nd Edition, O'Reilly Publishers, 2016 5. Karl Beecher, Computational Thinking: A Beginner's Guide to Problem Solving and Programming, 1st Edition, BCS Learning & Development Limited, 2017. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Paul Deitel and Harvey Deitel, Python for Programmers, Pearson Education, 1st Edition, 2021. 2. Martin C. Brown, Python: The Complete Reference, 4th Edition, Mc-Graw Hill, 2018. 3. https://www.python.org/ 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	2	-	-	2	-	-	3	-	-
CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	3	2	-	2	-	-	2	-	-	3	-	-
Avg.	3	3	3	-	2	-	-	2	-	-	3	-	-

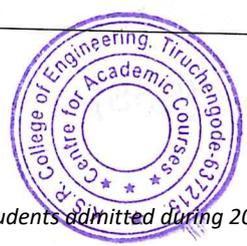
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24MAT38	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	Category	L	T	P	SL	C
		BSC	45	15	0	60	4
SEMESTER III - (Common to Bio-Medical and EEE Branches)							
PREREQUISITE The students must have the knowledge on the basic concepts of differentiation, integration and partial derivatives.							
OBJECTIVES: To equip students with the knowledge of Fourier series, Laplace and Z-transforms, build a strong understanding of the underlying mathematics, and develop the skills to apply these methods in solving engineering problems such as heat transfer and wave motion.							
UNIT - I	FOURIER SERIES						(12)
Dirichlet's conditions – General Fourier series - Odd and even functions – Half range sine and cosine series - Parseval's theorem – Harmonic analysis.							
UNIT - II	LAPLACE TRANSFORMS						(12)
Laplace transforms – Conditions for existence – Transform of elementary functions – Basic properties– Transform of Derivatives – Transform of periodic functions. Inverse Laplace transforms – Partial fraction method – Solution of linear ordinary differential equations of second order with constant coefficients.							
UNIT - III	Z - TRANSFORMS						(12)
Z transform – Elementary properties – Initial and final value theorem – Inverse Z transform (Partial fraction method) – Convolution theorem – Solution of difference equation by using Z transform.							
UNIT - IV	PARTIAL DIFFERENTIAL EQUATIONS						(12)
Formation of partial differential equations by eliminating of arbitrary constants and arbitrary functions - Lagrange's linear equation – Solutions of linear partial differential equations of the second and higher order with constant coefficient.							
UNIT - V	APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS						(12)
Classification of second order partial differential equations – Solutions of One dimensional wave equation – One dimensional heat equation – Two dimensional heat equation (insulated edges only).							
L = 45, T = 15, SL = 60, TOTAL = 120 PERIODS							

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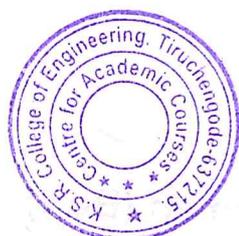


COURSE OUTCOMES: At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply Fourier Series concepts to solve practical engineering problems in signal processing, communication, and control systems.											Apply	
CO2	Solve the linear differential equations using Laplace Transforms for circuit and system analysis.											Apply	
CO3	Apply Z-transform techniques to solve partial differential equations in discrete-time systems.											Apply	
CO4	Apply methods to form partial differential equations and solve Lagrange's linear equation and higher-order linear PDE's with constant coefficients.											Apply	
CO5	Apply analytical techniques to solve one-dimensional wave and heat equations and the two-dimensional heat equations.											Apply	
TEXT BOOKS:													
1. Grewal B.S., "Higher Engineering Mathematics", 44 th Edition, Khanna Publishers, New Delhi, 2018.													
2. Kreyszig E, "Advanced Engineering Mathematics ", 10 th Edition, John Wiley, New Delhi, India, 2016.													
REFERENCES:													
1. Andrews. L.C and Shivamoggi. B, "Integral Transforms for Engineers" SPIE Press, 1999.													
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 10 th Edition, Laxmi Publications Pvt. Ltd, 2015.													
3. James. G., "Advanced Modern Engineering Mathematics", 4 th Edition, Pearson Education, New Delhi, 2016.													
4. Narayanan. S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.													
5. Ramana. B.V., "Higher Engineering Mathematics", Mc Graw Hill Education Pvt. Ltd, New Delhi, 2018.													
6. Wylie. R.C. and Barrett . L.C., "Advanced Engineering Mathematics" Tata Mc Graw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	-	-	-	1	-	-	2	-	-
CO2	3	3	3	3	-	-	-	1	-	-	2	-	-
CO3	3	3	3	3	-	-	-	1	-	-	2	-	-
CO4	3	3	3	3	-	-	-	1	-	-	2	-	-
CO5	3	3	3	3	-	-	-	1	-	-	2	-	-
1-Low, 2-Medium, 3-High													

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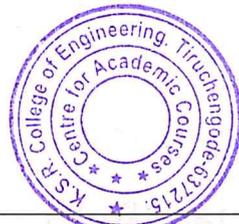


24EET31	ELECTROMAGNETIC FIELD THEORY	Category	L	T	P	SL	C
		PCC	45	15	0	60	4
PREREQUISITE: Basic knowledge of vector calculus, electromagnetic field concepts, and fundamental laws of electricity and magnetism is required.							
OBJECTIVE: <ul style="list-style-type: none"> To understand and apply vector calculus and coordinate systems to analyse electrostatics, magnetostatics, electrodynamic fields, and electromagnetic wave propagation in various media. 							
UNIT - I	VECTOR CALCULUS AND CO-ORDINATE SYSTEMS	(9+3)					
Sources and effects of electromagnetic fields – Scalar and Vector fields – Different Co-ordinate Systems: Rectangular, Cylindrical and Spherical – Relationship between Coordinate systems – Vector Calculus – Gradient, Divergence and Curl – Divergence theorem – Stoke's theorem.							
UNIT - II	ELECTROSTATICS	(9+3)					
Coulomb's Law – Electric field intensity (E) – Field due to point and continuous charges – Electric field due to finite line charge, circular disc and infinite sheet of charge – Electric flux density (D) – Gauss's law and its applications – Electrical potential – Electric field in dielectric and Electric Dipole, Electric field in multiple dielectrics – Boundary conditions between dielectric media – Capacitance: Two dielectric media, concentric spheres, co-axial cables.							
UNIT - III	MAGNETOSTATICS	(9+3)					
Lorentz Law of force, magnetic field intensity (H) – Biot-Savart's Law – Ampere's Law – Magnetic field intensity due to straight conductors, infinite sheet of current, at the centre of the toroid, along the axis of the circular loop and solenoid – Magnetic flux density (B) – Magnetic field in multiple media – Boundary conditions – Magnetic force – Torque – Inductance: Toroid, co-axial cable, two transmission line – Applications: Magnetic Levitation.							
UNIT - IV	ELECTRODYNAMIC FIELDS	(9+3)					
Faraday's laws, Induced EMF – Transformer and Motional EMF, Maxwell's Equations (differential and integral forms) – Conduction and Displacement Current – Continuity Equation of Current – Ohm's law in point form – Relation between field theory and circuit theory. Applications: Time-varying Electric and Magnetic Fields.							
UNIT - V	ELECTROMAGNETIC WAVES	(9+3)					
Generation – Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – uniform plane wave and its properties – Waves in free space, lossy and lossless dielectrics – Skin depth, Poynting vector and Poynting Theorem.							
LECTURE: 45, TUTORIAL: 15, SELF LEARNING: 60, TOTAL: 120 PERIODS							
 Chairman (BoS)							
							

COURSE OUTCOMES:													
At the end of the course, the learners will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Recognize spatial variations of physical quantities using coordinate systems and outline the concepts of divergence and curl.											Understand	
CO2	Apply electrostatic laws and principles to determine electric fields, potentials, and capacitance in various dielectric configurations.											Apply	
CO3	Interpret the laws and principles governing magnetic fields, forces, and inductance in various physical and engineering contexts.											Understand	
CO4	Summarize the fundamental laws and equations governing time-varying electric and magnetic fields.											Understand	
CO5	Recognize the electromagnetic wave propagation in different media using the Poynting vector and theorem.											Understand	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. Mathew N.O. Sadiku, Elements of Electromagnetics, Oxford University Press, Seventh Edition, 2020. 2. William. H. Hayt, Engineering Electromagnetics, Tata McGraw-Hill, Seventh Edition, 2019. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Gangadhar, K.A, Field Theory, Khanna Publishers, New Delhi, Sixteenth Edition, 2020. 2. Ghosh, S.P and Lipika Datta, Electromagnetic Field Theory, Tata McGraw-Hill Educational Private Limited, New Delhi, First Edition, 2017. 3. Joseph. A. Edminister, Theory and problems of Electromagnetics, Schaum Series, Tata McGraw-Hill, Second Edition, 2018. 4. David J. Griffiths, Introduction to Electrodynamics, Pearson Education, Fifth Edition, 2023. 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	-	-	1	1	2	1	-	1	2	2
CO2	3	2	2	-	-	1	1	2	1	-	1	2	2
CO3	3	2	1	-	-	1	1	2	1	-	2	2	2
CO4	3	2	1	-	-	1	1	2	1	-	2	2	2
CO5	3	2	1	-	-	1	1	2	1	-	2	2	2
1 - Low, 2 - Medium, 3 - High													


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24EET32	ELECTRICAL MACHINES - I	Category	L	T	P	SL	C
		PCC	45	15	0	60	4
PREREQUISITE: Basic knowledge of electrical circuits, electromagnetic principles and fundamental laws of electromagnetism and energy conversion is required.							
OBJECTIVE: <ul style="list-style-type: none"> To understand the principles, construction, operation, and performance analysis of magnetic circuits, transformers, DC generators, and DC motors. 							
UNIT - I	MAGNETIC CIRCUITS	(9+3)					
Introduction to Electrical Machines – Review of magnetic circuit: MMF, flux, Reluctance and Inductance – Series and Parallel Magnetic Circuits – Magnetic Vs Electric Circuits – Statically and Dynamically Induced EMF – Hysteresis and Eddy Current losses – BH curve – AC Operation: Single and Multiple Excited Magnetic System.							
UNIT - II	SINGLE-PHASE TRANSFORMERS	(9+3)					
Constructional Details: Shell type and Core Type – Principle of Operation – EMF Equation – Transformation Ratio – Ideal transformer – Transformer on load – Regulation, Losses and Efficiency – All day Efficiency – Equivalent Circuit – Parallel Operation – Testing of Transformer: Load Test, Open and Short Circuit Test, Sumpner's Test.							
UNIT - III	THREE-PHASE AND AUTO TRANSFORMER	(9+3)					
Three Phase Transformer: Construction and working – Three Phase Transformer Connections: Star-Star, Delta-Delta, Star-Delta, Delta-Star – Scott Connection – Parallel Operation of Transformer. Auto Transformer: Construction and working – Copper Saving – Comparison with two winding transformers – Applications of autotransformer.							
UNIT - IV	DC GENERATORS	(9+3)					
Constructional Details – Lap and wave winding – Principle of Operation – EMF Equation – Types of DC generator – Characteristics of DC Generators – Applications of DC Generator – Armature Reaction – Commutation – Methods for Improving Commutation – Losses and Efficiency – Parallel Operation of DC Generator.							
UNIT - V	DC MOTORS	(9+3)					
Principle of Operation – Back EMF – Types of DC Motor – Characteristics of DC Motors – Torque Equation – Losses and Efficiency – Speed control of DC Shunt and Series Motor – Necessity of Starters – Starters: Three Point and Four Point Starters – Testing of DC Motor: Brake Test, Swinburne Test and Hopkinson's Test.							
LECTURE: 45, TUTORIAL: 15, SELF LEARNING: 60, TOTAL: 120 PERIODS							
 Chairman (BoS)							
							

COURSE OUTCOMES:		
At the end of the course, the learners will be able to:		
COs	Course Outcome	Cognitive Level
CO1	Interpret the concepts of magnetic circuits and electromagnetic phenomena and classification of electrical machines.	Understand
CO2	Apply the principles of single-phase transformers to evaluate their efficiency and regulation.	Apply
CO3	Expound the construction, working, and connections of three-phase and autotransformers, including their operation, comparisons, and applications.	Understand
CO4	Interpret the construction, operation, and characteristics of DC generators, including winding types, commutation, and performance aspects.	Understand
CO5	Apply the basic principles of DC motors to analyze their operational characteristics, torque, speed control and performance testing.	Apply

TEXT BOOKS:

1. Nagrath I.J and Kothari D. P, "Electrical machines", Tata McGraw-Hill Publishing Company Ltd, Fifth Edition, 2017.
2. Bhimbhra, P.S, "Electrical Machinery", Khanna Publishers, Fully Revised Edition, 2021.

REFERENCES:

1. Fitzgerald, A.E. Charles Kingsly Jr, Stephen D. Umans, "Electric Machinery", McGraw-Hill Books Company, Seventh Edition, 2013.
2. Murugesh Kumar, K, "Electric Machines", Vikas Publishing House Pvt Ltd, Second Edition, 2010.
3. Theraja B.L. and Theraja, A.K, "A Textbook of Electrical Technology", S. Chand Publishing, First Multicolor Edition 2005, Reprint 2015.
4. Samarajit Ghosh, "Electrical Machines", Pearson Education, Second Edition, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	2	1	-	3	3	-
CO2	3	3	2	-	-	-	-	2	1	-	3	3	-
CO3	3	2	-	-	-	-	-	2	1	-	3	3	-
CO4	3	3	-	-	-	-	-	2	1	-	3	3	-
CO5	3	3	2	-	-	-	-	2	1	-	3	3	-

1 - Low, 2 - Medium, 3 - High


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24EET33	LINEAR INTEGRATED CIRCUITS	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: A knowledge in semiconductor devices such as diodes and transistors, and fundamental knowledge of circuit analysis techniques and basic mathematics are essential.							
OBJECTIVE: <ul style="list-style-type: none"> To understand monolithic IC fabrication, operational amplifier applications, and the functions of specialized ICs like 555 Timer, VCO (IC-566), and PLL (IC-565). 							
UNIT - I	IC FABRICATION						(9)
IC classification – Fundamental of monolithic IC technology – Basic planner process: epitaxial growth, masking and etching – Diffusion of impurities – Realization of monolithic ICs and packaging – Fabrication of diodes, capacitors, resistors, monolithic transistors and FETs.							
UNIT - II	CHARACTERISTICS OF OP-AMP						(9)
Op-amp circuit symbol, terminals, packages, power supply connections and specifications – Ideal Op-amp – Open loop operation of op-Amp – Feedback in ideal and practical op-amp: inverting amplifier, non-inverting amplifier – Differential amplifier, CMRR – DC characteristics – AC characteristics.							
UNIT - III	APPLICATIONS OF OP-AMP						(9)
Basic Op-amp applications: Scale changer, Summing amplifier, Subtractor – Instrumentation amplifier – AC amplifier, AC voltage follower – V-to-I & I-to-V converter – Op-Amp circuits using diodes: rectifier, peak detector, clipper, clamper – Sample and Hold circuit – Differentiator – Integrator – Comparators and its applications – Schmitt trigger.							
UNIT - IV	SPECIAL ICs						(9)
IC 555 Timer: Functional block diagram, Monostable operation and its applications, Astable operation and its applications – Phase locked loop: Basic principles, Phase detector/Comparator, voltage-controlled oscillator (IC566), Low pass filter – Monolithic PLL (IC 565) – PLL applications.							
UNIT - V	APPLICATION ICs						(9)
IC Voltage regulators: Fixed voltage series regulators (78XX/79XX) – LM723 general purpose voltage regulator – LM317 adjustable voltage regulators – ICL8038 Function generator IC – D/A converter: (R-2R ladder and weighted resistor types) – A/D converters: (flash type and successive approximation).							
LECTURE: 45, SELF LEARNING: 45, TOTAL: 90 PERIODS							
							

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

COs	Course Outcome	Cognitive Level
CO1	Explain the fabrication process of monolithic ICs including the creation of passive and active components.	Understand
CO2	Interpret the structure, characteristics, and basic configurations of ideal and practical operational amplifiers with and without feedback.	Understand
CO3	Apply operational amplifier configurations in various analog circuits.	Apply
CO4	Discuss the functional blocks and real-time applications of special ICs, including the 555 Timer, 566 VCO, and 565 PLL.	Understand
CO5	Describe the working principles and applications of commonly used application-specific ICs.	Understand

TEXT BOOKS:

1. D. Roy Choudhary, Sheil B. Jani, "Linear Integrated Circuits", New Age, Fourth Edition, 2018.
2. Ramakant A. Gayakward, "Op-amps and Linear Integrated Circuits", Fourth Edition, Pearson Education, PHI 2021.

REFERENCES:

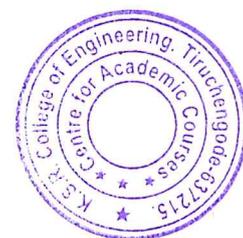
1. David A. Bell, "Op-amp & Linear ICs", Oxford, Third Edition, 2011.
2. Fiore, "Op-amps, Linear Integrated Circuits Concepts & Applications", Cengage, 2010.
3. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
4. Jacob Millman, Christos C. Halkias, "Integrated Electronics - Analog and Digital circuits system", McGraw Hill, Second Edition, 2017.

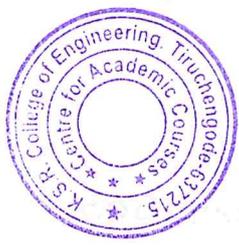
Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	2	2	2
CO2	3	2	-	-	-	-	-	1	1	-	2	2	3
CO3	3	3	2	-	-	-	-	1	1	-	2	2	3
CO4	3	2	-	-	-	-	-	1	1	-	2	2	3
CO5	3	3	-	-	-	-	-	1	1	-	2	2	3

1 - Low, 2 - Medium, 3 - High


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24EET34	DIGITAL LOGIC CIRCUITS	Category	L	T	P	SL	C
		PCC	45	15	0	60	4
PREREQUISITE: Basic understanding of number systems, elementary algebra, and logical reasoning is essential for analyzing digital systems.							
OBJECTIVE: <ul style="list-style-type: none"> To apply Boolean algebra for logic minimization and design of sequential circuits, asynchronous counters, memory devices, and implement digital systems using VHDL. 							
UNIT - I	BOOLEAN ALGEBRA AND GATE MINIMIZATION	(9+3)					
Number Systems – Conversions – Digital Logic Gates: AND, OR, NOT, NAND, NOR and Exclusive-OR operations – NAND – NOR Implementation – Binary Arithmetic – One’s and Two’s complements Arithmetic – Boolean postulates and laws – De-Morgan’s Theorem – Principle of Duality – Boolean expression – Gate Minimization: Standard representation for logic functions – Karnaugh map Minimization – Don’t care conditions – Quine-McCluskey method.							
UNIT - II	COMBINATIONAL CIRCUITS	(9+3)					
Introduction – Half adder – Full adder – Half subtractor – Full subtractor – Multiplexer and Demultiplexer – Encoder and Decoders – Parity checker/ generator – Magnitude Comparator – Code Converters: Binary to Gray, BCD to Excess-3, Gray to Binary.							
UNIT - III	SEQUENTIAL CIRCUITS	(9+3)					
Introduction – Storage Elements: Latches, Flip-Flop: SR, D, JK & T – operation and excitation tables – Realization using other flip flops – Analysis of Clocked Sequential Circuits – State Equation, State Table, State Diagram, State reduction and Assignment – Registers: Shift registers and its types.							
UNIT - IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS AND COUNTERS	(9+3)					
Analysis of Asynchronous sequential circuits – Fundamental mode sequential circuit. Races and Cycles – Hazards: Static Hazards – Dynamic Hazards – Hazard-free Realization – Essential Hazards; Asynchronous counter: Up, Down and Up/Down counter – Modulo-n counter.							
UNIT - V	MEMORY AND VHDL	(9+3)					
Classification of memories – ROM: ROM organization, PROM, EPROM, EEPROM. RAM: Static RAM cell – Dynamic RAM cell – Programmable Logic Devices: PAL, PLA – Implementation of combinational logic circuits – Introduction to field Programmable Gate Arrays; Introduction to VHDL, VHDL data flow modelling for adder, subtractor, multiplexer and Demultiplexer.							
LECTURE: 45, TUTORIAL: 15, SELF LEARNING: 60, TOTAL: 120 PERIODS							
 Chairman (BoS)							
							

COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Analyze different methods used for the simplification of Boolean expressions.	Analyze
CO2	Construct the different types of combinational circuits.	Apply
CO3	Implement the sequential circuits using flip-flops, registers.	Apply
CO4	Design the asynchronous sequential circuits and various counters.	Apply
CO5	Apply the knowledge of memory devices and construct digital models using VHDL for basic logic components.	Apply

TEXT BOOKS:

1. Morris Mano M., "Digital Design", Prentice Hall of India Pvt. Ltd, Sixth Edition, 2018.
2. Salivahanan, S, and Arivazhagan, S, "Digital Circuits and Design", Oxford University Press, New Delhi, Fifth Edition, 2023.

REFERENCES:

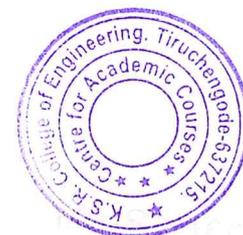
1. Samir Palnitkar, "Verilog HDL: Guide to Digital Design and Synthesis", Pearson Education, New Delhi, Seventh Edition, 2017.
2. Donald P. Leach, Albert Paul Malvino and Goutam Saha, "Digital Principles and Applications", McGraw-Hill Education, Eighth edition, 2015.
3. Thomas L. Floyd, "Digital Fundamentals", Pearson India, New Delhi, Eleventh Edition, 2018.
4. Anand Kumar, A., "Fundamentals of Digital Circuits", PHI Publication, New Delhi, Fourth Edition, 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	2	-	-	1	1	-	2	-	2
CO2	3	3	2	-	2	-	-	1	1	-	2	-	2
CO3	3	3	2	-	2	-	-	1	1	-	2	-	2
CO4	3	3	2	-	2	-	-	1	1	-	2	-	2
CO5	3	3	2	-	2	-	-	1	1	-	2	-	2

1 - Low, 2 - Medium, 3 - High


Chairman (BoS)



24EEP31	ELECTRICAL MACHINES – I LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	45	0	1.5
PREREQUISITE: Basic knowledge of transformer construction, working principles, and equivalent circuits is essential. Familiarity with DC machines, their types, and fundamental electrical testing methods is required for a better understanding of performance and control techniques.							
OBJECTIVE: <ul style="list-style-type: none"> To experimentally evaluate the performance, characteristics, and control methods of DC machines and single-phase and three-phase transformers. 							
LIST OF EXPERIMENTS: <ol style="list-style-type: none"> Load test on single-phase transformer. Open circuit and short circuit tests on a single-phase transformer. Sumpner's Test on single-phase transformer. Load test on three-phase transformers. Open circuit and load characteristics of a separately excited DC generator. Load characteristics of DC compound generator with differential and cumulative connection. Load characteristics of DC shunt and DC Compound motor. Load characteristics of DC series motor. Swinburne's tests on DC shunt motor. Speed control of DC shunt motor. 							
PRACTICAL: 45, TOTAL: 45 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level	Exp.				
CO1	Conduct transformer tests such as load test, open circuit, and short circuit tests to determine efficiency, regulation, and equivalent circuit parameters.	Analyze	1, 2, 3, 4				
CO2	Analyze the open-circuit and load characteristics of various DC generators, including separately excited, self-excited, and compound types.	Analyze	5, 6				
CO3	Analyze the performance of DC motors by conducting load tests on shunt, series, and compound motors under different operating conditions.	Analyze	7, 8				
CO4	Perform Swinburne's test on DC shunt motor to estimate efficiency under different load conditions.	Analyze	9				
CO5	Demonstrate speed control techniques of DC shunt motor and analyze its performance at varying speeds.	Analyze	10				
 							

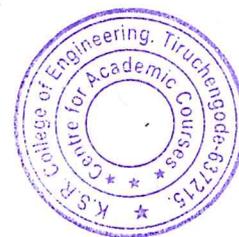
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	2	-	-	1	2	1	-	2	3	-
CO2	3	3	3	2	-	-	1	2	1	-	2	3	-
CO3	3	3	3	2	-	-	1	2	1	-	2	3	-
CO4	3	3	3	2	-	-	1	2	1	-	2	3	-
CO5	3	3	3	2	-	-	1	2	1	-	2	3	-

1 - Low, 2 - Medium, 3 - High

List of Equipment (For a Batch of 30 Students)

S. No.	Description of Equipment	Qty.
1.	D.C motor – Shunt Generator	2 set
2.	D.C motor – Compound Generator	2 set
3.	D.C. Shunt Motor	2 Nos.
4.	D.C. Series Motor	1 No.
5.	D.C. Compound Motor	1 No.
6.	Single-phase transformers	3 Nos.
7.	Three-phase transformers	2 Nos.
8.	Resistive load (Three-Phase: 2, Single Phase: 3)	5 Nos.
9.	Single-phase Auto transformer	5 Nos.
10.	Three-phase Auto transformer	3 Nos.
11.	Wire-wound Rheostats of different ratings	30 Nos.


Chairman (BoS)



24EEP32	LINEAR AND DIGITAL CIRCUITS LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	45	0	1.5
PREREQUISITE: Basic knowledge of analog and digital electronics, including op-amps, logic gates, number systems, and flip-flops is essential for designing and implementing electronic circuits.							
OBJECTIVE: <ul style="list-style-type: none"> To design and implement analog and digital electronic circuits using op-amps, timers, logic gates, and flip-flops for fundamental signal processing and logic operations. 							
LIST OF EXPERIMENTS: <ol style="list-style-type: none"> Implement inverting and non-inverting amplifiers using IC 741 op-amp. Design and implement the applications of op-amp as Integrator and Differentiator. Design a Schmitt trigger using an op-amp. Design Astable and Monostable multivibrators using NE555 Timer. Design a Variable Voltage Regulator using IC LM317. Design and implementation of Boolean expression using basic gates. Design and implement Full adder and Full subtractor. Design and implement the following code converter: Binary to Gray, Gray to Binary. Implementation and verification of the truth table for S-R and T flip-flop. Design and implementation of synchronous counters using J-K flip-flops. 							
PRACTICAL: 45, TOTAL: 45 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level	Exp.				
CO1	Design Op-Amp circuits for various applications.	Apply	1, 2, 3				
CO2	Analyze the applications of 555 IC in waveform generation, timing, and pulse modulation.	Analyze	4				
CO3	Implement a regulated power supply circuit using LM317 to provide a variable DC output voltage.	Apply	5				
CO4	Apply the principles of Boolean algebra to design and implement simplified logic expressions and combinational circuits using basic logic gates.	Apply	6, 7, 8				
CO5	Reveal the behavior of sequential circuits by implementing S-R and T flip-flops, and design synchronous counters using J-K flip-flops.	Analyze	9, 10				



Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	1	2	1	-	2	-	3
CO2	3	3	2	2	2	-	1	2	1	-	2	-	3
CO3	3	3	2	-	2	-	1	2	1	-	2	-	2
CO4	3	3	2	-	-	-	1	2	1	-	2	-	2
CO5	3	3	2	2	-	-	1	2	1	-	2	-	2

1 - Low, 2 - Medium, 3 - High

List of Equipment (For a Batch of 30 Students)

S. No.	Description of Equipment	Qty.
1.	Op-Amp IC 741	20 Nos.
2.	Timer IC NE555	20 Nos.
3.	Voltage Regulator IC LM317	10 Nos.
4.	AND Gate IC 7408	15 Nos.
5.	OR Gate IC 7432	15 Nos.
6.	NOT Gate IC 7404	15 Nos.
7.	XOR Gate IC 7486	15 Nos.
8.	NAND Gate IC 7400	15 Nos.
9.	JK Flip Flop	10 Nos.
10.	Resistors various range	20 Nos.
11.	Capacitors various range	20 Nos.
12.	Breadboards	15 Nos.
13.	Dual Power Supply (± 12 V)	6 Nos.
14.	Regulated Power Supply	10 Nos.
15.	Dual Channel Oscilloscope	5 Nos.
16.	Function Generator	5 Nos.
17.	Multimeter	5 Nos.
18.	Trainer Kit	8 Nos.


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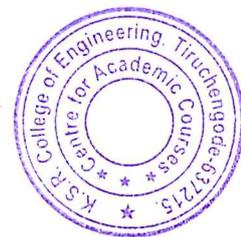
24ECP36	DESIGN STUDIO – I	Category	L	T	P	SL	C
		ESC	0	0	30	0	1
(Common to BME, CSE (IoT), ECE, EEE)							
<p>PREREQUISITE: Basic understanding of design thinking principles, including empathy, problem identification, and user-centered design, is essential for engaging in the Design Studio.</p>							
<p>OBJECTIVE: To apply design thinking and system design principles to develop, prototype, and present user-centered electronic solutions through hands-on projects.</p>							
<p>Identification of components Ex: 1 Resistor colour coding, Capacitors etc Ex: 2: Soldering Practice</p> <p>Realizing the functionality of components Ex: 3: Connecting LED with fixed resistor, variable resistors Ex: 4: LED Go- No Go using Diode Ex: 5: Multiple LED Circuit Ex: 6: Switch on LED using Transistor Ex: 7: Electronic LED Lantern Ex: 8: Light Detector Ex: 9: IC555 LED Flasher / Beeper Ex: 10: LED Blinking Ex: 11: Autodesk Fusion - Simulation</p> <p>Prototyping Ex: 11: Mini project (Choose the problem and apply Design Thinking Concepts - empathy, Define, Ideation, Prototype to solve the problem)</p>							
TOTAL(P:30) : 30 PERIODS							

C. Guntur
Chairman (BoS)



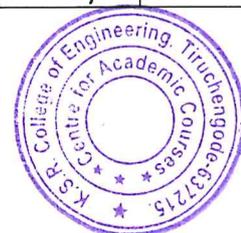
COURSE OUTCOMES:													
At the end of the course, the students will be able :													
COs	Course Outcome											Cognitive Level	
CO1	To identify and interpret the characteristics of basic electronic components such as resistors, capacitors, diodes, LEDs, transistors, and LDRs through visual inspection and standard coding schemes.											Analyze	
CO2	To experience hands-on training in soldering techniques and assembling electronic circuits using discrete components on breadboards and PCBs.											Apply	
CO3	To understand the working principles of passive and active components by constructing basic circuits and observing their electrical behavior under different conditions.											Apply	
CO4	To design and implement functional circuits including switching, blinking, and multiple output systems using fundamental electronics											Create	
CO5	To document and effectively communicate the design process, implementation, and outcomes of a project through formal reporting and presentations.											Evaluate	
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	3	-	3	3	3	3	3	3	3	3
CO2	-	3	3	3	-	3	3	3	-	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	-	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3
1 - Low, 2 - Medium, 3 - High													

C. Guha
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24SDP39	SOFT SKILLS DEVELOPMENT – III	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES:							
To the concept of aptitude and its relevance in various fields. It highlights the need for aptitude skills and emphasizes their importance in academic and career development. It also focuses on building a strong foundation in English grammar to improve communication skills.							
UNIT - I	TIME SPEED AND DISTANCE						(6)
Relationship Between Time Speed and Distance Time Conversion – Relative Speed – Chasing – Problems on Late, Early and Usual Time							
UNIT - II	PROBLEMS ON TRAINS						(6)
Crossing a Static objects – Crossing a Moving Object: Same and Opposite Direction – Time Difference based Problems.							
UNIT - III	BOATS AND STREAM						(6)
Introduction to Boat in Still Water and Current – Down Stream Speed – Upstream Speed – Speed in Still Water – Rate of Stream.							
UNIT - IV	LOGICAL REASONING						(6)
Seating Arrangements: Circular and Linear Arrangements – Inequalities – Assertion & reasoning.							
UNIT - V	VERBAL ABILITY						(6)
Parts of Speech – Sentence Completion – Idioms and Phrases – Reading Comprehension.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome					Cognitive Level	
CO1	Apply time, speed, and distance concepts to solve problems involving relative speed, time conversion, and punctuality scenarios.					Apply	
CO2	Solve problems on trains with object crossing and time differences using concepts of relative speed and direction.					Apply	
CO3	Solve problems involving boats and streams using concepts of upstream, downstream, and current speed.					Apply	
CO4	Apply logical reasoning to solve problems on seating arrangements, inequalities, and assertion-reasoning statements.					Apply	
CO5	Demonstrate understanding of grammar, vocabulary, and comprehension to complete sentences and interpret texts effectively.					Understand	

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TEXT BOOKS:

1. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations".
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations".
3. Nishit K. Sinha, "Logical Reasoning and Data Interpretation for CAT".
4. R.S. Agarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning".
5. Wren & Martin, "High School English Grammar & Composition".

REFERENCES:

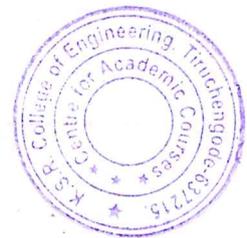
1. Arun Sharma, Quantitative Aptitude for CAT, 11e, 2025.
2. Arun Sharma, Logical Reasoning for CAT, 7e, 2025.
3. English for Competitive Examinations – by Edgar Thorpe & Showick Thorpe.
4. <https://prepinsta.com/>.
5. <https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm>.
6. <https://www.youtube.com/@FeelFreetoLearn/playlists>.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	2	-	-	3	-	-
CO2	3	3	2	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	3	2	-	2	-	-	2	-	-	3	-	-
CO5	3	2	-	-	2	-	-	3	3	-	3	-	-
Avg.	3	3	2	-	2	-	-	2	3	-	3	-	-

Shreyansh

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24MAT46	NUMERICAL AND COMPUTATIONAL TECHNIQUES	Category	L	T	P	SL	C
		BSC	45	15	0	60	4

SEMESTER - IV
(COMMON TO II B.E. / B.Tech., - AE, BME, CE, CSE, CSD, CS, EEE, IOT,IT, MECH & SFE)

PREREQUISITE:

A fundamental knowledge of algebra, linear algebra, calculus, and differential equations is required for this course.

OBJECTIVES:

To develop the ability to apply numerical methods for solving algebraic and transcendental equations, systems of linear equations, interpolation, numerical differentiation and integration, and initial and boundary value problems.

UNIT - I	SOLUTIONS OF EQUATIONS AND EIGEN VALUE PROBLEMS	(12)
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Solutions to polynomial and transcendental equations - Newton Raphson Method - Solutions to simultaneous linear system of equations by Gauss Elimination Method - Gauss Seidel Method - Eigen value of a matrix by power method.

UNIT - II	INTERPOLATION AND APPROXIMATION	(12)
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Interpolation - Newton's Forward and Backward difference Interpolation Techniques (Equal intervals) - Newton's divided difference method - Lagrange's interpolation and Inverse Lagrange's interpolation methods (Unequal intervals).

UNIT - III	NUMERICAL DIFFERENTIATION AND INTEGRATION	(12)
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Numerical differentiation using Newton's Forward and Backward difference interpolation methods - Numerical integration by Trapezoidal rule - Simpson's 1/3rd rule and Simpson's 3/8th rule- Double integration using Trapezoidal and Simpson's rules.

UNIT - IV	INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS	(12)
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Ordinary Differential Equations (for solving first order equations) - Taylor's Series Method - Euler's Method - Modified Euler's Method - Fourth order Runge-Kutta method- Milne's Predictor and Corrector Method.

UNIT - V	BOUNDARY VALUE PROBLEMS IN PARTIAL DIFFERENTIAL EQUATIONS	(12)
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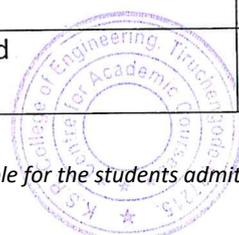
Classification of Partial Differential Equations - One dimension heat equation by Crank Nicolson's method - One dimensional wave equation - Two Dimensional Laplace and Poisson equations.

Lecture = 45, Tutorial = 15, Self Learning = 60; Total = 120 Periods

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

COs	Course Outcome	Cognitive Level
CO1	Implement numerical techniques to solve equations, systems of linear equations and Eigen value problems	Apply
CO2	Assess Newton's interpolation methods to select the most suitable technique based on data spacing and the location of the interpolation point.	Analyze
CO3	Apply numerical methods to perform differentiation and integration	Apply
CO4	Apply numerical techniques to obtain approximate solutions of first order ordinary differential equations	Apply
CO5	Analyze and solve partial differential equations of heat and wave equations by using numerical approaches.	Analyze

Dr. R.V.M. Rangarajan
Dr. R.V.M. RANGARAJAN
 CHAIRMAN



TEXT BOOKS:

1. Dr. B. S.Grewal, "Numerical Methods in Engineering and Science" Khanna Publishers, New Delhi, 12th edition, 2016.
2. Dr. M.K. Venkataraman, "Numerical Methods in Science and Engineering", National Publishing Company, 4th edition, 2012.

REFERENCES:

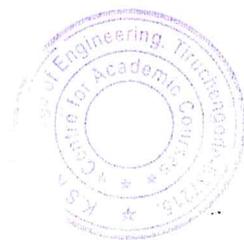
1. Sukhendu Dey and Shishir Gupta "Numerical Methods", Tata McGraw Hill Publishing Company, 1st edition 2013.
2. V. Gerald 'Applied Numerical Analysis' Pearson Education, 6th edition, 2013.
3. P. Kandasamy, K. Thilagavathy, K. Gunavathy "Numerical Methods", S. Chand Company ,5th Edition.
4. S.R.K. Iyengar, R.K.Jain, "Numerical Methods", New Age International Publishers, 1st edition , 2014.
5. Rajasekaran.S, "Numerical Methods in Science and Engineering A Practical Approach", A.H.Wheeler and Company Private Limited, 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	-	2	-	-	2	-	-
CO2	3	3	3	2	-	-	-	2	-	-	2	-	-
CO3	3	3	2	-	-	-	-	2	-	-	2	-	-
CO4	3	3	2	-	-	-	-	2	-	-	2	-	-
CO5	3	3	3	2	-	-	-	2	-	-	2	-	-

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


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24EET41	ELECTRICAL MACHINES – II	Category	L	T	P	SL	C
		PCC	45	15	0	60	4
<p>PREREQUISITE: Solid understanding of the concepts includes basic electromagnetic principles, magnetic circuits, transformer theory, and the construction, operation, and characteristics of DC machines and single-phase transformers.</p>							
<p>OBJECTIVE:</p> <ul style="list-style-type: none"> To enable students to understand the construction, operation, performance, and control of synchronous machines and induction motors, including special machines, and to develop the ability to analyze their characteristics and practical applications. 							
UNIT - I	SYNCHRONOUS GENERATOR	(9+3)					
<p>Constructional details – Types of rotors – working – EMF equation – Effect of chording and distribution of winding – Synchronous reactance – Armature reaction – Voltage regulation: EMF, MMF and ZPF methods – Synchronizing and parallel operation – Synchronizing power – Effect of excitation and mechanical input.</p>							
UNIT - II	THREE PHASE INDUCTION MOTOR	(9+3)					
<p>Constructional details – Types of rotors – Principle of operation – Rotating Magnetic field – Slip – Torque equations – Torque-Slip characteristics – Equivalent circuit – Types of starters: DOL, Rotor resistance, Auto transformer and Star-delta starters – crawling and cogging – Double cage rotors – Induction generators.</p>							
UNIT - III	TESTING AND SPEED CONTROL OF A THREE-PHASE INDUCTION MOTOR	(9+3)					
<p>Power flow and performance calculations – Load test – No load and blocked rotor tests – Circle diagram – Separation of no-load losses – Speed control: Change of voltage, frequency, number of poles and slip – Slip power recovery scheme.</p>							
UNIT - IV	SYNCHRONOUS MOTOR	(9+3)					
<p>Principle of operation – Starting methods – Torque equation – V and Inverted V curves – Power input and power developed equations – constant excitation and constant power developed – damper windings – Hunting – synchronous condenser – Applications.</p>							
UNIT - V	SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES	(9+3)					
<p>Constructional details – Double revolving field theory – Equivalent Circuit – Types: Split-Phase, Capacitor Start, Capacitor Start and Capacitor Run and Shaded Pole – Working Principles: Stepper motor, Hysteresis motor, Reluctance motor and Universal Motor – Applications.</p>							
<p>LECTURE: 45, TUTORIAL: 15, SELF-LEARNING: 60, TOTAL: 120 PERIODS</p>							
							

COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply EMF, MMF, and ZPF methods to compute voltage regulation of synchronous generators.											Apply	
CO2	Apply equivalent circuit and torque equations to evaluate performance of three-phase induction motors.											Apply	
CO3	Determine efficiency, losses, and performance of induction motors by standard test methods.											Apply	
CO4	Illustrate the working principle, starting methods and the performance of a synchronous motor.											Understand	
CO5	Explicate the construction and starting methods of a single-phase induction motor and special electrical machines.											Understand	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003. 2. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw-Hill Publishing Company Ltd, 2002. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. M.N. Bandyopadhyay, 'Electrical Machines Theory and Practice', PHI Learning PVT LTD., New Delhi, 2009. 2. P.C. Sen, 'Principles of Electric Machines and Power Electronics', Third Edition, Wiley, Third Edition, 2021. 3. J.B. Gupta, 'Electrical Machines - II' S.K. Kataria & Sons, New Delhi, First Edition, 2014. 4. Stephen J. Chapman, 'Electric Machinery Fundamentals', McGraw-Hill Higher Education, Fourth Edition, 2005. 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	1	-	-	2	1	-	2	2	1
CO2	3	3	2	-	1	-	-	2	1	-	2	2	1
CO3	3	3	2	-	1	-	-	2	1	-	2	2	1
CO4	3	2	-	-	-	-	-	2	1	-	2	2	1
CO5	3	2	-	-	-	-	-	2	1	-	2	2	1
1- Low, 2 - Medium, 3 - High													

(Signature)
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24EET42	GENERATION, TRANSMISSION AND DISTRIBUTION	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
<p>PREREQUISITE: Basic knowledge of electrical circuits, electromagnetic theory, and fundamental concepts of electrical machines are needed.</p>							
<p>OBJECTIVE:</p> <ul style="list-style-type: none"> To understand the basic concepts, design, configuration, and performance analysis of electrical power generation, transmission, and distribution systems, including line parameters, interference, underground cables and insulators. 							
UNIT - I	CONVENTIONAL AND NON-CONVENTIONAL SOURCES	(9)					
<p>Conventional Sources: General layout, working of thermal, hydroelectric and nuclear power plants. Non-Conventional Sources: Solar Energy, Wind Energy (HAWT), Geothermal energy (descriptive treatment only).</p>							
UNIT - II	TRANSMISSION LINE PARAMETERS AND TYPES	(9)					
<p>Structure of a power system – Parameters of single and three-phase transmission lines with Single circuits & Double Circuits: Resistance, Inductance and Capacitance of solid, stranded and bundled conductors – Symmetrical and Unsymmetrical spacing and Transposition – Application of Self and Mutual GMD – Skin and Proximity effects.</p>							
UNIT - III	MECHANICAL DESIGN AND INSULATORS	(9)					
<p>Mechanical design of overhead lines – Line Supports – Types of towers – Tension and Sag calculation for different weather conditions – Insulators: Pin type, Suspension type, Polymer disc insulator, voltage distribution in insulator string, improvement of string efficiency.</p>							
UNIT - IV	UNDERGROUND CABLES	(9)					
<p>Underground cables – Classification of cables – Construction of single-core and 3-core belted cables – Insulating Materials for Cables – Laying of underground cables – Insulation Resistance of a single-core cable – Capacitance of single-core cable – Grading of cables: Capacitance Grading, Intersheath grading.</p>							
UNIT - V	DISTRIBUTION SYSTEMS	(9)					
<p>Types of AC and DC distributors: 2-wire and 3-wire, Radial and Ring main distribution: Distributed and Concentrated loads – Substation: Gas Insulated Substations (GIS), Outdoor type, Indoor type – Methods of grounding: Solid, Resistance, Reactance, Peterson coil Grounding.</p>							
<p>LECTURE: 45, TUTORIAL: 0, SELF LEARNING: 45, TOTAL: 90 PERIODS</p>							

J. ... 2/1/26
Chairman (BoS)



COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Discuss the layout and working principles of conventional power plants and the non-conventional energy sources.	Understand
CO2	Determine resistance, inductance and capacitance of Single and Double circuits.	Apply
CO3	Apply design principles to calculate sag and tension of overhead lines under different weather conditions.	Apply
CO4	Elucidate the classification, construction, laying of underground cables and the grading methods of cables.	Understand
CO5	Enlighten the operation of AC and DC distribution systems, types of distributors, load arrangement and grounding.	Understand

TEXT BOOKS:

1. C.L. Wadhwa, 'Electrical Power Systems', New Age International Ltd, Seventh Edition, 2022.
2. S.N. Singh, 'Electric Power Generation', Transmission and Distribution', Prentice Hall of India Pvt. Ltd, Delhi, Sixth Edition, 2022.

REFERENCES:

1. R.K. Rajput, 'Power System Engineering', Laxmi Publisher, New Delhi, Third Edition, 2016.
2. V.K. Mehta, Rohit Mehta, 'Principles of power system', S. Chand & Company Ltd, New Delhi, 2013.
3. W.D.Stevenson Jr., 'Elements of Power System Analysis', Fourth Edition, McGraw-Hill International Book Company, July 2017.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	3	1
CO2	3	3	2	-	-	-	-	-	1	-	2	3	1
CO3	3	3	2	-	-	-	-	-	1	-	2	3	1
CO4	3	2	-	-	-	-	-	-	1	-	2	3	1
CO5	3	2	-	-	-	-	-	-	1	-	2	3	1

1- Low, 2 – Medium, 3 – High

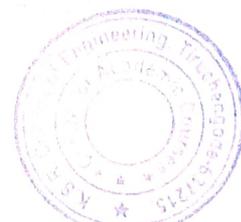
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2/1/26
Chairman (BoS)



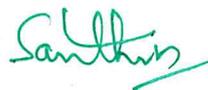
24EET43	MEASUREMENTS AND INSTRUMENTATION	Category	L	T	P	SL	C
		PCC	45	0	0	45	3
PREREQUISITE: Knowledge of Ohm's law, Kirchhoff's laws, and simple circuit analysis. Basic concepts of measurement units, standards, accuracy, precision, and physical quantities.							
OBJECTIVE: <ul style="list-style-type: none"> To provide fundamental knowledge of measurement systems, electrical and non-electrical parameter measurement techniques, and AC/DC bridge methods with instrumentation amplifiers. 							
UNIT - I	CONCEPTS OF MEASUREMENTS						(9)
Elements of a generalized measurement system – Static and dynamic characteristics – Measurement errors – Statistical evaluation of measurement data: Average, Arithmetic Mean, Standard Deviation, Variance – Calibration and standards.							
UNIT - II	MEASUREMENT OF PARAMETERS IN ELECTRICAL SYSTEMS						(9)
Classification of instruments – moving coil and moving iron meters – Induction type, dynamometer type watt meters – Energy meter – Megger – Instrument Transformers (CT & PT).							
UNIT - III	AC AND DC BRIDGES						(9)
DC Bridges: Wheatstone bridge, Kelvin double bridge – AC Bridges: Maxwell, Wien and Schering bridges – Errors and compensation in A.C. bridges – Instrumentation Amplifiers.							
UNIT - IV	TRANSDUCERS FOR MEASUREMENT OF NON-ELECTRICAL PARAMETERS						(9)
Measurement of Pressure: Strain Gauge – Measurement of Temperature: RTD, Thermocouple – Measurement of Displacement: LVDT – Measurement of Flow: Hot wire Anemometer – Measurement of Angular velocity: DC Tachogenerator, AC Tachogenerator – Smart Sensors.							
UNIT - V	DIGITAL INSTRUMENTATION						(9)
A/D converters: Types and characteristics, Successive Approximation, Flash ADC – D/A converters: Types and characteristics, R2R, Weighted Resistor – Digital Voltmeter – Digital Multimeters – Digital Energy meter – DSO – Data Loggers – SCADA.							
LECTURE: 45, TUTORIAL: 0, SELF LEARNING: 45, TOTAL: 90 PERIODS							
 Chairman (BoS) 							

COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Describe the functional blocks, static and dynamic characteristics of a generalized measurement system.											Understand	
CO2	Describe the working and applications of electrical measuring instruments and instrument transformers.											Understand	
CO3	Enlighten the operation of DC and AC bridges, error compensation, and instrumentation amplifiers.											Understand	
CO4	Discuss the working and applications of transducers used for measuring non-electrical parameters.											Understand	
CO5	Explicate the operation of digital instruments, data acquisition systems, and SCADA.											Understand	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. A.K. Sawhney, Puneet Sawhney, 'A Course in Electrical & Electronic Measurements and Instrumentation', Dhanpat Rai and Co, New Delhi, Nineteenth Edition, 2023. 2. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2019. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. M.M.S. Anand, 'Electronics Instruments and Instrumentation Technology', Prentice Hall India, New Delhi, 2009. 2. J.J. Carr, 'Elements of Electronic Instrumentation and Measurement', Pearson Education India, New Delhi, 2013. 3. R.K. Rajput, 'Electrical and Electronics Measurements and Instrumentation', Chand Publication, 2016. 													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	1	2
CO2	3	2	-	-	-	-	-	-	1	-	2	1	2
CO3	3	2	-	-	-	-	-	-	1	-	2	1	2
CO4	3	2	-	-	-	-	-	-	1	-	2	1	2
CO5	3	2	-	-	-	-	-	-	1	-	2	1	2
1- Low, 2 - Medium, 3 - High													

(Signature)
Chairman (BoS)



24GET09	UNIVERSAL HUMAN VALUES AND ETHICS	Category	L	T	P	SL	C	
		HSMC	45	0	0	45	3	
(Common to All Branches)								
OBJECTIVES: To understand the concept of Universal Human Values and discuss theoretical and practical implications of UHV. To relate the use of harmony in the family and society and classify the harmony in the nature methods. To construct effective human values in personal and professional in life.								
UNIT - I	INTRODUCTION TO VALUE EDUCATION							(09)
Right Understanding, Relationship and Physical Facility, Holistic Development and the Role of Education - Understanding Value Education - Sharing about Oneself - Self-exploration as the Process for Value Education- Continuous Happiness and Prosperity – the Basic Human Aspirations - Exploring Human Consciousness - Happiness and Prosperity – Current Scenario - Method to Fulfil the Basic Human Aspirations - Exploring Natural Acceptance.								
UNIT - II	HARMONY IN THE HUMAN BEING							(09)
Understanding Human being as the Co-existence of the Self and the Body - Distinguishing between the Needs of the Self and the Body - Exploring the difference of Needs of Self and Body – The Body as an Instrument of the Self - Understanding Harmony in the Self - Exploring Sources of Imagination in the Self - Harmony of the Self with the Body - Programme to ensure self- regulation and Health - Exploring Harmony of Self with the Body.								
UNIT - III	HARMONY IN THE FAMILY AND SOCIETY							(09)
Harmony in the Family – the Basic Unit of Human Interaction - 'Trust' – the Foundational Value in Relationship-Exploring the Feeling of Trust - 'Respect' – as the Right Evaluation -Exploring the Feeling of Respect - Other Feelings, Justice in Human-to-Human Relationship- Understanding Harmony in the Society - Vision for the Universal Human Order – Exploring Systems to fulfil Human Goal.								
UNIT - IV	HARMONY IN THE NATURE/EXISTENCE							(09)
Understanding Harmony in the Nature – Interconnectedness, self-regulation and Mutual Fulfilment among the Four Orders of Nature - Exploring the Four Orders of Nature – Realizing Existence as Co-existence at All Levels - The Holistic Perception of Harmony in Existence -Exploring Co-existence in Existence.								
UNIT - V	IMPLICATIONS OF THE HOLISTIC UNDERSTANDING- A LOOK AT PROFESSIONAL ETHICS							(09)
Natural Acceptance of Human Values - Definitiveness of (Ethical) Human Conduct – Exploring Ethical Human Conduct - A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order- Competence in Professional Ethics - Exploring Humanistic Models in Education- Holistic Technologies, Production Systems and Management Models -Typical Case Studies- Strategies for Transition towards Value-based Life and Profession - Exploring Steps of Transition towards Universal Human Order.								
TOTAL (L:45, SL:45): 90PERIODS								


 Chairman (BoS)



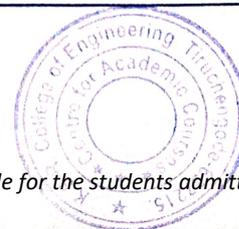
COURSE OUTCOMES:													
At the end of the course, the learners will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Interpret the concepts of Universal Human Values.											Understand	
CO2	Summarize both theoretical and practical implications of Universal Human Values.											Understand	
CO3	Understand how the feeling of trust develops through honesty, care, and consistent behavior.											Understand	
CO4	Explains how viewing existence as a whole helps us understand harmony among humans, nature, and systems.											Understand	
CO5	Relate human values in both personal and professional life.											Understand	
TEXT BOOKS:													
1. R R Gaur, R Asthana, G P Bagaria, A Foundation Course in Human Values and Professional Ethics, 2 nd Revised Edition, Excel Books, New Delhi, 2019. 2. A.N. Tripathi, Human Values, New Age Intl. Publishers, New Delhi, 2004.													
REFERENCES:													
1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics – Teachers Manual, Excel books, New Delhi, 2010. 2. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, Reprinted 2008. 3. Frankl, Viktor E. Yes to Life In spite of Everything, Penguin Random House, London, 2019. 4. Van Zomeren, M., & Dovidio, J. F. The Oxford Handbook of the Human Essence (Eds.), New York Oxford University Press, 2018. 5. https://fdp-si.aicte-india.org/UHVII.php 6. https://nptel.ac.in/courses/109104068													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PSO1	PSO2
CO1	-	-	-	-	-	2	-	-	-	-	2	-	-
CO2	-	-	-	-	-	-	2	-	-	-	-	-	-
CO3	-	-	-	-	-	3	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	3	-	-	-	2	-	-
CO5	-	-	-	-	-	3	-	2	-	-	-	-	-

Santh
V. SANTH
 Chairman (BoS)



24EEP41	ELECTRICAL MACHINES - II LABORATORY	Category	L	T	P	SL	C
		PCC	0	0	45	0	1.5
PREREQUISITE:							
<p>Students should have a basic understanding of AC rotating machines, including alternators, induction motors, and synchronous motors. They must also be familiar with electrical measurements, three-phase circuits, and safe laboratory practices for conducting machine tests.</p>							
OBJECTIVE:							
<ul style="list-style-type: none"> To provide hands-on experience in testing, analyzing, and evaluating the performance characteristics of AC machines, including alternators, induction motors, and synchronous motors. 							
LIST OF EXPERIMENTS:							
<ol style="list-style-type: none"> Load test on three phase alternators. Predetermine the regulation of three phase alternator by EMF, MMF method. Predetermine the regulation of three phase alternator by ZPF Method. Load test on three phase squirrel cage induction motor. No Load and Blocked Rotor test on a three-phase squirrel-cage induction motor. Separation of No-load losses of a three-phase induction motor. Load test on three phase slipring induction motor. V and Inverted V curves of a three-phase synchronous motor. Load test on a single-phase capacitor-start induction motor. No Load and Blocked Rotor test on a single-phase induction motor. 							
PRACTICAL: 45, TOTAL: 45 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level	Exp.				
CO1	Perform load test, EMF, MMF, and ZPF methods to find the voltage regulation of a three-phase alternator.	Apply	1, 2, 3				
CO2	Analyze the performance characteristics of squirrel-cage and slip-ring induction motors by conducting appropriate laboratory tests.	Analyze	4, 7, 9				
CO3	Apply no-load and blocked-rotor test techniques to determine the equivalent circuit parameters of single-phase and three-phase induction motors.	Apply	5, 10				
CO4	Apply experimental methods to obtain V and inverted V-curves of a three-phase synchronous motor under various load conditions.	Apply	8				
CO5	Apply suitable experimental procedures to separate and evaluate the no-load losses of AC induction machines.	Apply	6				

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Chairman (BOB)



Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	1	2	2	-	2	2	1
CO2	3	3	3	2	-	-	1	2	2	-	2	2	1
CO3	3	3	2	-	-	-	1	2	2	-	2	2	1
CO4	3	3	2	-	-	-	1	2	2	-	2	2	1
CO5	3	3	2	-	-	-	1	2	2	-	2	2	1
1 - Low, 2 – Medium, 3 – High													

List of Equipment (For a Batch of 30 Students)

S. No.	Description of Equipment	Qty.
1.	DC shunt motor coupled with three phase alternators.	2
2.	Three phase squirrel cage induction motor with loading arrangement.	2
3.	Three-phase slip-ring induction motor with loading arrangement.	1
4.	Single phase induction motor with a loading arrangement.	2
5.	Three phase synchronous motor with a loading arrangement.	1
6.	Three phase auto transformers.	2
7.	Single phase auto transformer.	1
8.	Three phase resistive load	1
9.	Three phase inductive load	1
10.	Rheostats	As required

d - [Signature]
26/1/24
Chairman (BoS)



24ECP46	DESIGN STUDIO II	Category	L	T	P	SL	C
		ESC	0	0	30	0	1

PREREQUISITE: NIL

OBJECTIVES:
To equip students with Design Thinking competencies for addressing real-world challenges aligned with Smart India Hackathon (SIH) themes by fostering empathy, creativity, innovation, and multidisciplinary teamwork, while enabling effective project execution, documentation, and presentation through experiential learning and faculty mentorship.

GENERAL GUIDELINES

- Students will form teams of 3 members.
- Each team must select a problem statement from Smart India Hackathon or institute-approved innovation challenges.
- A faculty mentor will guide each team throughout the semester.
- Teams must maintain a Design Studio Logbook recording research, ideas, design iterations, feedback and reflections.
- Projects must follow the Design Thinking Framework: Empathize → Define → Ideate → Prototype → Implement → Communicate.
- Each phase will include review checkpoints to ensure progress.
- Final deliverables include Design Process Portfolio, Functional Prototype or Software Demonstration, SIH Submission Document and Reflection Report.

MODULE STRUCTURE

Module 1 – Empathize (Weeks 1-2)

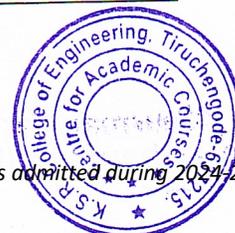
- Understanding SIH domains and societal challenge areas
- Identifying user needs, stakeholders and contexts
- Conducting field studies, surveys and interviews
- Developing empathy maps, personas and user journey maps

Module 2 – Define (Weeks 3-4)

- Synthesizing findings from user research
- Identifying core pain points and opportunity areas
- Framing clear, actionable problem statements
- Establishing project goals, boundaries and success metrics

Module 3 – Ideate (Weeks 5-6)

- Generating diverse ideas through brainstorming and design heuristics
- Sketching and conceptual visualization
- Evaluating ideas based on feasibility, desirability and viability
- Selecting optimal solution paths through mentor feedback and peer review



- Module 4 - Prototype (Weeks 7-8)**
- Creating low and medium-fidelity prototypes (hardware, software, hybrid)
 - Implementing iterative design improvements
 - Conducting usability testing with target users
 - Refining prototypes based on functional and experiential feedback
- Module 5 - Implement (Weeks 9)**
- Developing functional or deployable prototypes
 - Integrating technical components (IoT, AI, software modules, sensors, etc.)
 - Performing real-time validation, data collection and testing
 - Ensuring robustness, scalability and sustainability
- Module 6 - Communicate (Week 10)**
- Preparing final presentations, poster displays and demo videos
 - Showcasing design process and prototype outcomes
 - Crafting compelling stories and narratives for SIH jury and stakeholders
 - Reflecting on design journey, team collaboration and ethical learnings

TOTAL (P - 30) : 30 PERIODS

COURSE OUTCOMES:

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

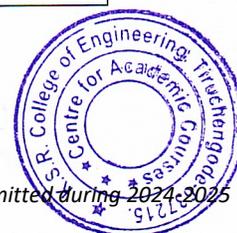
COs	Course Outcome	Cognitive Level
CO1	Empathize with users and identify critical pain points through research, observation and engagement.	Analyze
CO2	Define precise and actionable problem statements based on design insights and contextual understanding.	Analyze
CO3	Generate creative ideas, evaluate them systematically and conceptualize innovative solutions.	Create
CO4	Build, test and refine prototypes using iterative design and implementation practices.	Apply
CO5	Communicate design solutions effectively through storytelling, visual presentation and demonstrations.	Apply

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	-	3	3	3	-	3	3	3	3	3	3	3	3
CO2	-	3	3	3	-	3	3	3	-	3	3	3	3
CO3	3	3	3	3	3	3	3	3	3	3	3	3	3
CO4	3	3	3	3	3	3	3	3	-	3	3	3	3
CO5	2	3	3	3	3	3	3	3	3	3	3	3	3
Avg.	1.6	3	3	3	1.8	3	3	3	1.8	3	3	3	3

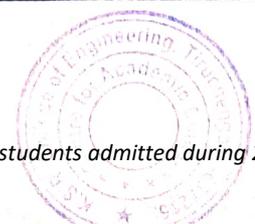
1-low, 2-medium, 3-high

C. Reddy
Chairman (BoS)



24EEP42	SEMINAR PRESENTATION						Category	L	T	P	SL	C	
							EEC	0	0	30	0	1	
OBJECTIVE: To explore the fundamental principles of verbal and non-verbal communication, and to develop active and empathetic listening, speaking, and writing skills, while exposing students to emerging technologies, research, products, algorithms, and services.													
GUIDELINES: <ul style="list-style-type: none"> Each student shall select a seminar topic in the area of engineering/technology, preferably based on recent technological trends and developments beyond the prescribed syllabus. Each student shall prepare and deliver a seminar presentation using appropriate audio-visual aids for a duration of 10 minutes. Seminar presentations shall be conducted for two periods per week. Each student shall present a minimum of two seminars during the semester. Each seminar presentation carries 50 marks. The total marks allotted for the seminar component are 100 and the evaluation shall be carried out internally. 													
TOTAL: 30 PERIODS													
COURSE OUTCOMES: At the end of the course, the learners will be able to:													
COs	Course Outcome										Cognitive Level		
CO1	Explain a selected contemporary topic in the relevant engineering field based on a systematic literature survey.										Understand		
CO2	Summarize and organize technical information from credible sources for seminar preparation.										Understand		
CO3	Apply appropriate presentation tools and visual aids to prepare seminar materials.										Apply		
CO4	Demonstrate effective oral communication skills while presenting technical content.										Apply		
CO5	Apply subject knowledge to respond to questions during seminar discussions.										Apply		
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	2	-	-
CO2	3	3	-	-	-	-	-	-	1	-	2	-	-
CO3	-	-	-	-	3	-	-	-	2	-	2	-	-
CO4	-	-	-	-	-	-	-	-	3	-	2	-	-
CO5	3	3	-	-	-	-	-	-	3	-	2	-	-
1 - Low, 2 – Medium, 3 – High													

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Chairman (PoS)

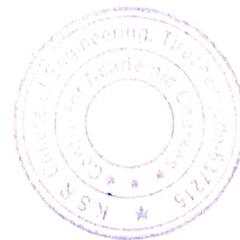


Assessment Weightage

Presentation Skills	Technical Knowledge	Viva Voce	Total
30	20	10	50

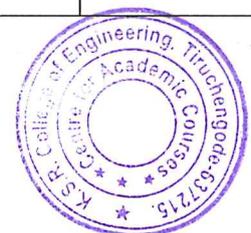
Maximum Marks - 50				
S. No	Assessment	Excellent (90-100%)	Good (75-89%)	Average (50-74%)
1.	Presentation Skills (20)	Delivers with open and closure remarks with appropriate body language and direct eye contact	Delivers with open and closure remarks with appropriate body language and consistent eye contact	Delivers with open and closure remarks with poor body language and consistent eye contact
		Complete the presentation and well-presented within specified time	Completed the Presentation and well-presented beyond the time limit	Completed the Presentation and well presented with in minimum span of time
2.	Technical Knowledge (20)	Demonstrated and answered all questions with detailed elaboration	Demonstrated and answered majority of questions with detailed elaboration	Demonstrated and answered most of questions with detailed elaboration
3.	Viva-Voce (10)	Responded to all the queries with valid explanations	Responded to majority of the queries with valid explanations	Responded to few queries with valid explanations

J - [Signature] 21/1/26
Chairman (BoS)



24SDP49	SOFT SKILLS DEVELOPMENT – IV	Category	L	T	P	SL	C
		EEC	0	0	30	0	1
(Common to All Branches)							
OBJECTIVES:							
To the concept of aptitude and make them aware of its growing importance in academics, competitive exams, and professional life. In addition, it seeks to build a strong foundation in English grammar to improve language and communication skills.							
UNIT - I	TIME AND WORK						(6)
Relationship Between Time and Work – Efficiency Calculation – Wages – Alternate Days – Pipes and Cisterns – Chain Rule.							
UNIT - II	PERMUTATION COMBINATION AND PROBABILITY						(6)
Permutation Based on Words and Numbers – Combination Based on Committee, Balls and Cards – Probability Based on Persons, Balls, Cards, Dice and Coins.							
UNIT - III	SIMPLE INTEREST AND COMPOUND INTEREST						(6)
Introduction to Principal, Interest and Time – Simple Interest Calculation – Compound Interest: Compounded Annually, Half-yearly and quarterly.							
UNIT - IV	LOGICAL REASONING						(6)
Syllogism – Clocks – Calendar.							
UNIT - V	VERBAL ABILITY						(6)
Tenses – Articles – Subject Verb Agreement – Error Spotting – Essay Writing.							
TOTAL: 30 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome					Cognitive Level	
CO1	Apply time and work concepts to solve problems on efficiency, wages, alternate days and pipes & cisterns, and chain rule.					Apply	
CO2	Develop problem solving on permutations, combinations, and probability involving words, objects, and standard.					Understand	
CO3	Apply concepts of principal, rate, and time to calculate simple and compound interest under various compounding periods.					Apply	
CO4	Demonstrate logical reasoning to solve problems related to syllogisms, clocks, and calendars effectively.					Understand	
CO5	Demonstrate grammatical accuracy and coherence in writing by applying rules of tenses, articles, subject-verb agreement.					Understand	

Arumugam
Chairman (BoS)



TEXT BOOKS:

1. R S Aggarwal, "Quantitative Aptitude for Competitive Examinations".
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations".
3. Nishit K. Sinha, "Logical Reasoning and Data Interpretation for CAT".
4. R.S. Agarwal, "A Modern Approach to Verbal & Non-Verbal Reasoning".
5. Wren & Martin, "High School English Grammar & Composition".

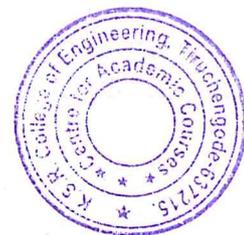
REFERENCES:

1. Arun Sharma, Quantitative Aptitude for CAT, 11e, 2025.
2. Arun Sharma, Logical Reasoning for CAT, 7e, 2025.
3. English for Competitive Examinations – by Edgar Thorpe & Showick Thorpe.
4. <https://prepinsta.com/>.
5. <https://www.geeksforgeeks.org/quantitative-aptitude/?ref=shm>.
6. <https://www.youtube.com/@FeelFreetoLearn/playlists>.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	2	-	-	2	-	-	3	-	-
CO2	3	2	-	-	2	-	-	2	-	-	3	-	-
CO3	3	3	2	-	2	-	-	2	-	-	3	-	-
CO4	3	2	-	-	2	-	-	2	-	-	3	-	-
CO5	3	2	-	-	2	-	-	3	3	-	3	-	-
Avg.	3	2	2	-	2	-	-	2	3	-	3	-	-

Prin. Prasad
Chairman (BoS)



24AU001	BASICS OF AUTOMOBILE ENGINEERING	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: -							
OBJECTIVE: To provide students with a fundamental understanding of automobile engineering, including the construction, working principles, and functions of major automotive systems. The course aims to familiarize learners with different types of vehicles, engines, transmission systems, steering, braking systems and automotive electrical components.							
UNIT - I	INTRODUCTION	(9)					
Automobile - Components of an automobile - Classification of automobiles - Layout of chassis - Types of drives front wheel - rear wheel - four wheel.							
UNIT - II	IC ENGINES	(9)					
Classification - ignition system - firing order - Otto/ Diesel cycles - Two stroke and four stroke engines – scavenging - Cooling and Lubrication systems - Fuel Supply system – air fuel ratio - Carburettor – types.							
UNIT - III	TRANSMISSION SYSTEM	(9)					
Clutch - Function - single plate - multi plate - friction clutches - Centrifugal and semi centrifugal clutch - Gear Box –slide mesh - constant mesh and synchromesh gear box - Torque convertor – overdrive - Propeller shaft and rear axle- Universal joint – Differential - Rear axle drives - Wheels and Tyres.							
UNIT - IV	STEERING AND BRAKE	(9)					
Steering system - function and principle - Ackerman and Davis steering principles - wheel alignment –steering gear boxes. Brakes - Mechanical - hydraulic and vacuum brake - master cylinder - wheel cylinder -Bleeding of brakes.							
UNIT - V	ELECTRICAL SYSTEMS	(9)					
Battery – types - Dynamo and Alternator – Cut-out relay - Diagram of Wiring system - Lighting System and Accessories - Headlight - switches - Windscreen Wipers – Horn – Speedometer – Heater and Air conditioning.							
L = 45, SL = 45, TOTAL = 90 PERIODS							

R. [Signature]
Chairman (BoS)



COURSE OUTCOMES:		
Upon completion of the course, the students will be able to:		
COs	Course Outcome	Cognitive Level
CO1	Provide basic platform knowledge of automobile engineering	Understand
CO2	Explain the working principal of petrol and diesel engines	Understand
CO3	Interpret the method of power transmission unit	Understand
CO4	Built knowledge of steering and brake	Understand
CO5	Illustrate the knowledge of automotive electrical systems and functioning	Understand

TEXT BOOKS:

- 1 Kirpal Singh, Automobile Engineering, Vol. I & II, Standard Publishers, New Delhi, Fourteenth Edition, 2018.
- 2 Gupta, S. K., A Textbook of Automobile Engineering, S. Chand Publishing, New Delhi, Second Edition, 2020.

REFERENCES:

- 1 Rajput, R K, A Textbook of Automobile Engineering, Laxmi Publications (P) Ltd, New Delhi, Second Edition, 2017.
- 2 Ganesan. V, Internal Combustion Engines, Tata McGraw-Hill Publishing Co., New Delhi, Fourth Edition, 2012.
- 3 Mathur M.L. and Sharma R.P, A Course in Internal Combustion Engines, Dhanpat Rai and sons, New Delhi, Second Edition, 2016.
- 4 Ramalingam K.K, Automobile Engineering, Scitech Publications (India) Pvt. Ltd, Chennai, Second Edition, 2011.

Mapping of COs with POs and PSOs

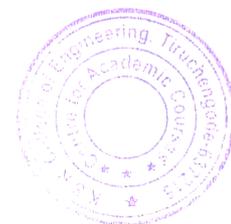
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	1	-	-
CO2	2	2	-	-	-	-	-	1	-	-	1	-	-
CO3	3	2	-	-	-	-	-	1	-	-	1	-	-
CO4	3	2	-	-	-	-	-	1	-	-	1	-	-
CO5	2	2	-	-	-	-	-	1	-	-	1	-	-

R. White
 Chairman (BOS)



24AU002	HYBRID VEHICLES	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: -							
OBJECTIVE: To provide students with a comprehensive understanding of hybrid vehicle technology and its role in sustainable transportation. The course aims to explain the principles of hybridization, energy sources, powertrain configurations, and energy management strategies used in hybrid vehicles.							
UNIT - I	NEED FOR ALTERNATIVE SYSTEM	(9)					
Need for hybrid and electric vehicles – main components and working principles of a hybrid and electric vehicles, Different configurations of hybrid and electric vehicles. Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles.							
UNIT - II	SUBSYSTEMS OF HYBRID AND ELECTRIC VEHICLES	(9)					
Basics – Types, Parameters – Capacity, Discharge rate, State of charge, state of Discharge, Depth of Discharge, Technical characteristics, Battery pack Design, Properties of Batteries.							
UNIT - III	ENERGY SOURCES	(9)					
Battery Parameters- - Different types of batteries – Lead Acid- Nickel Metal Hydride – Lithium ion- Sodium based- Metal Air. Battery Modeling- Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types-Half reactions of fuel cell. Ultra capacitors. Battery Management System.							
UNIT - IV	MOTORS AND CONTROLLERS	(9)					
Types of Motors, Characteristic of DC motors, AC single phase and 3-phase motor, PM motors, Switched reluctance motors, Motor Drives and speed controllers, Torque Vectoring, Regenerative Braking. Rectifiers, Inverters, DC/DC converters.							
UNIT - V	DESIGN CONSIDERATIONS FOR ELECTRIC VEHICLES	(9)					
Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of the vehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refueling Systems, performance of electrical vehicles.							
L = 45, SL = 45, TOTAL = 90 PERIODS							

R. [Signature]
Chairman (BoS)



COURSE OUTCOMES:		
Upon completion of the course, the students will be able to:		
COs	Course Outcome	Cognitive Level
CO1	Summarize the electric and hybrid vehicle operation and architectures.	Understand
CO2	Explain the different subsystems of hybrid and electric vehicle	Understand
CO3	Demonstrate the energy requirement for vehicles	Understand
CO4	Model and simulate the vehicle characteristics, operating modes, and performance parameters of the vehicle	Understand
CO5	Design and develop the systems of hybrid and electric vehicles	Understand

TEXT BOOKS:

- 1 Iqbal Husain, Electric and Hybrid Vehicles-Design Fundamentals, CRC Press, New York, Second Edition, 2010.
- 2 Mehrdad Ehsani, Modern Electric, Hybrid Electric and Fuel Cell Vehicles, CRC Press, New York, Second Edition, 2009.

REFERENCES:

- 1 James Larminie and John Lowry, Electric Vehicle Technology Explained, John Wiley & Sons, New York, Second Edition, 2012.
- 2 Lino Guzzella, Vehicle Propulsion Systems, Springer-Verlag Berlin, Heidelberg, Third Edition, 2013.
- 3 Ron HodKinson, Light Weight Electric / Hybrid Vehicle Design, Butterworth Heinemann Publication, London, 2001.
- 4 Ronald K Jurgen, Electric and Hybrid – Electric Vehicles, SAE International, New York, First Edition, 2011.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	1	-	-
CO2	2	2	-	-	-	-	-	1	-	-	1	-	-
CO3	3	2	-	-	-	-	-	1	-	-	1	-	-
CO4	3	2	-	-	-	-	-	1	-	-	1	-	-
CO5	2	2	-	-	-	-	-	1	-	-	1	-	-

R. [Signature]
Chairman (BoS)



24BMO01	BASICS OF BIOMEDICAL INSTRUMENTATION	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
<p>PREREQUISITE: A basic understanding of physics, human physiology, and electronic circuits is essential to comprehend biosignal generation, sensor operation, and biomedical measurement principles.</p>							
<p>OBJECTIVES: To introduce the fundamentals of biomedical instrumentation by explaining biosignal generation, electrodes, amplifiers, and physiological and biochemical measurement techniques used in healthcare applications.</p>							
UNIT - I	BIO POTENTIAL GENERATION AND ELECTRODES TYPES	9					
Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes							
UNIT - II	BIO SIGNAL CHARACTERISTICS AND ELECTRODE CONFIGURATIONS	9					
Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode							
UNIT - III	SIGNAL CONDITIONING CIRCUITS	9					
Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering							
UNIT - IV	MEASUREMENT OF NON-ELECTRICAL PARAMETERS	9					
Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, direct methods: electronic manometer, Systolic, diastolic pressure, Blood flow and cardiac output measurement: Indicator dilution, and dye dilution method, ultrasound blood flow measurement							
UNIT - V	BIO-CHEMICAL MEASUREMENT	9					
Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).							
L= 45, SL = 45, TOTAL: 90 PERIODS							


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COURSE OUTCOMES:

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

Course Outcome	Description	Bloom's Taxonomy Level
CO1	Describe the origin, propagation, and characteristics of bio-potentials in physiological systems.	Understand
CO2	Explain the types of biomedical electrodes and their placement for ECG, EEG, and EMG recordings.	Understand
CO3	Interpret the functioning of bio-amplifiers and signal conditioning circuits used in physiological measurements.	Understand
CO4	Summarize the techniques used for measuring non-electrical physiological parameters such as temperature, blood pressure, and blood flow.	Understand
CO5	Identify the principles and applications of biochemical measurement instruments used in clinical diagnostics.	Understand

TEXT BOOKS:

1	Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2	John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. (Units I, II & V)

REFERENCES:

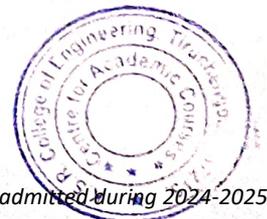
1	Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill Publisher, 2003.
2	Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003.(Units II & IV)
3	Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	-	-
CO2	3	2	-	-	-	-	-	1	1	-	1	-	-
CO3	3	2	-	-	-	-	-	1	1	-	1	-	-
CO4	3	2	-	-	-	-	-	1	1	-	1	-	-
CO5	3	2	-	-	-	-	-	1	1	-	1	-	-

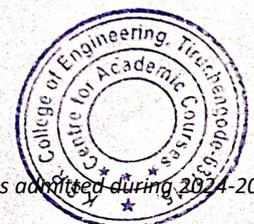
1-Low, 2-Medium, 3-High


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24BMO02	BIOMETRIC SYSTEMS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of signals and systems, probability concepts, and digital image processing is required to understand biometric data acquisition, feature extraction, and performance evaluation of biometric systems.							
OBJECTIVES: To provide learners with a fundamental understanding of biometric system principles, technologies, and evaluation methods, enabling them to analyze fingerprint, face, iris, voice, and multimodal biometric systems with awareness of accuracy and privacy issues.							
UNIT - I	INTRODUCTION TO BIOMETRICS	9					
Introduction – biometric technologies – passive biometrics – active biometrics – Biometric characteristics, Biometric applications – Biometric Authentication systems.							
UNIT - II	FINGERPRINT TECHNOLOGY	9					
General description of fingerprints - fingerprint sensors, fingerprint enhancement, Feature Extraction, fingerprint matching techniques – fingerprint classification, Applications of fingerprints.							
UNIT - III	FACE RECOGNITION AND HAND GEOMETRY	9					
Introduction to face recognition, face recognition using PCA, LDA, shape and texture, face detection in color images, 3D model based face recognition in video images, Neural networks for face recognition, Hand geometry – scanning – Feature Extraction – classification.							
UNIT - IV	IRIS RECOGNITION	9					
Introduction, Anatomical and Physiological underpinnings, Iris sensor, Iris representation and localization- Daugman and Wilde’s approach, Iris matching, Iris scan strengths and Weaknesses, System performance, future directions.							
UNIT - V	VOICE SCAN AND MULTIMODAL BIOMETRICS	9					
Voice scan, speaker features, short term spectral feature extraction, Mel frequency cepstral coefficients, speaker matching, Gaussian mixture model, NIST speaker Recognition Evaluation Program, Introduction to multimodal biometric system – Integration strategies – Architecture – level of fusion – combination strategy, examples of multimodal biometric systems.							
L = 45, SL = 45, TOTAL: 90 PERIODS							


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COURSE OUTCOMES:

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

Course Outcome	Description	Bloom's Taxonomy Level
CO1	Explain the fundamental concepts, characteristics, applications, and privacy concerns of biometric authentication systems.	Understand
CO2	Describe the working principles, feature extraction methods, and matching techniques used in fingerprint recognition systems.	Understand
CO3	Interpret the methodologies involved in face recognition and hand geometry systems using statistical and neural approaches.	Understand
CO4	Summarize the anatomical basis, sensing mechanisms, representation, and matching strategies of iris recognition systems.	Understand
CO5	Illustrate the concepts of voice-based biometrics and multimodal biometric systems, including fusion levels and security architectures.	Understand

TEXT BOOKS:

1	James Wayman & Anil Jain, "Biometric Systems- Technology Design and Performance Evaluation", SPRINGER (SIE), 1st Edition, 2011
2	Paul Reid, "Biometrics for Network Security", Pearson Education, 2004
3	S.Y. Kung, S.H. Lin, M.W., "Biometric Authentication: A Machine Learning Approach", Prentice Hall, 2004

REFERENCES:

1	Nalini K Ratha, Ruud Bolle, "Automatic fingerprint recognition system", Springer, 2003.
2	L C Jain, I Hayashi, S B Lee, U Halici, "Intelligent Biometric Techniques in Fingerprint and Face Recognition", CRC Press, 1st Edition, 1999.
3	John Chirillo, Scott Blaul, "Implementing Biometric Security", John Wiley & Sons, 2003

Mapping of COs with POs and PSOs

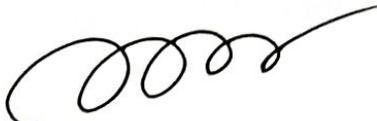
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	1	-	1	2	-
CO2	3	3	2	-	-	-	-	1	1	-	1	2	-
CO3	3	3	2	-	-	-	-	1	1	-	1	2	-
CO4	3	3	2	-	-	-	-	1	1	-	1	2	-
CO5	3	3	2	-	-	-	-	1	1	-	1	2	-

1-Low, 2-Medium, 3-High


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24CEO01	SMART BUILDINGS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of building construction, services, and fundamentals of electrical & mechanical systems.							
OBJECTIVES: The course covers smart building fundamentals, IoT and automation, sustainable design, safety and resilience systems, and the use of digital tools and data analytics for future-ready buildings.							
UNIT – I	INTRODUCTION TO SMART BUILDINGS	(9)					
Definition, evolution, and characteristics of smart buildings - Conventional vs. smart buildings - Role of ICT, IoT, Artificial Intelligence, and digital technologies - Building performance indicators: user comfort, efficiency, safety, sustainability- Global trends, case studies of smart buildings							
UNIT – II	BUILDING AUTOMATION AND CONTROL SYSTEMS	(9)					
Sensors and actuators: types, working principles, applications - HVAC automation, lighting control, occupancy sensing - Building Management System (BMS) and Building Automation System (BAS) - Communication protocols: BACnet, KNX, Modbus, Zigbee - Integration of mechanical, electrical, and plumbing systems							
UNIT – III	SMART MATERIALS AND ENERGY-EFFICIENT SYSTEMS	(9)					
Smart construction materials: self-healing concrete, phase-change materials, photochromic glass - Energy-efficient building envelopes - Smart HVAC systems and heat recovery- Renewable energy integration: solar PV, solar thermal, microgrids - Net-zero and low-carbon building concepts							
UNIT – IV	SAFETY, SECURITY & INTELLIGENT INFRASTRUCTURE	(9)					
Smart fire detection & suppression systems - Disaster-resilient and hazard-aware building technologies - Smart surveillance systems: CCTV, access control, biometrics - Indoor environmental quality monitoring - Emergency response systems and predictive maintenance							
UNIT – V	DIGITAL TOOLS, DATA ANALYTICS & FUTURE TRENDS	(9)					
Building Information Modelling (BIM) for smart buildings - Digital twins: concept, applications, advantages - Role of big data & analytics in building operation - Smart city integration and interoperability - Future innovations: robotics, 3D printing, AI-driven building controls							
L=45,SL= 45,Total = 90 PERIODS							


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

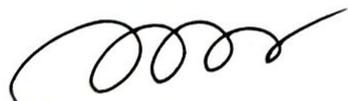
COs	Course Outcome	Cognitive Level
CO1	Illustrate the principles and technologies behind smart buildings.	Understand
CO2	Interpret the principles and functions of sensors, automation, and building control systems.	Understand
CO3	Classify energy-efficient and sustainable smart building components.	Understand
CO4	Explain building safety, security, and environmental monitoring systems.	Understand
CO5	Summarize the use of digital tools such as BIM and digital twins for smart infrastructure solutions.	Understand

- TEXT BOOKS:**
1. V. K. Jain, Automation Systems in Smart and Green Buildings, Khanna Publishers, First Edition, 2009.
 2. James M. Sinopoli, Smart Buildings Systems for Architects, Owners and Builders, Butterworth-Heinemann, First Edition, 2009.
1. O. V. Gnana Swathika, K. Karthikeyan, Sanjeevikumar Padmanaban , Smart Buildings Digitalization: IoT and Energy Efficient Smart Buildings — Architecture and Applications, CRC Press, First Edition, 2022.
 2. Nilesh Y. Jadhav., Green and Smart Buildings: Advanced Technology Options, Springer Singapore, 1st Edition, 2016.
 3. Moncef Krarti, Energy-Efficient Electrical Systems for Buildings, CRC Press / Taylor & Francis, First Edition, 2017.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	2	1	-	2	-	-
CO2	3	2	-	-	-	-	-	2	1	-	2	-	-
CO3	3	2	-	-	-	-	-	2	1	-	2	-	-
CO4	3	2	-	-	-	-	-	2	1	-	2	-	-
CO5	3	2	-	-	-	-	-	2	1	-	2	-	-

1-low, 2-medium, 3-high


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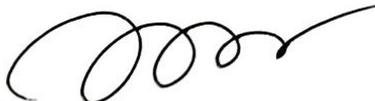


24CE002	CLIMATE CHANGE	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: A basic knowledge of Chemistry, Hydrology and Environmental Engineering.							
OBJECTIVES: The course focuses on understanding climate change causes, global and regional impacts, and mitigation measures to manage sustainability challenges.							
UNIT – I	EARTH’S CLIMATE SYSTEM	(9)					
Introduction-Climate in the spotlight-The Earth’s Climate Machine – Climate Classification – Climatic parameters-Data type-Global wind systems – Trade Wind Systems – Trade Winds and the Hadley Cell – The Westerlies – Cloud formation and Monsoon Rains – Storms and Hurricanes – The Hydrological Cycle – Global Ocean Circulation – El Nino and its Effect – Solar Radiation – The Earth’s Natural Green House Effect – Green House Gases and Global Warming – Carbon Cycle.							
UNIT – II	OBSERVED CHANGES AND ITS CAUSES	(9)					
Observation of Climate Change – Changes in pattern of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of Climate Change – Climate Sensitivity and Feedbacks— Climate Change modeling.							
UNIT – III	IMPACTS OF CLIMATE CHANGE	(9)					
Impacts of Climate Change on various sectors – Agriculture, Forestry and Ecosystem – Water resources – Human Health – Industry, Settlement and Society – Methods and Scenarios – Projected Impacts for different regions							
UNIT – IV	CLIMATE CHANGE ADAPTATION AND MITIGATION MEASURES	(9)					
Adaptation and mitigation Strategy/options in various sectors – Water – Agriculture –Infrastructure and Settlement including coastal zones. Human Health – Tourism – Transport – Energy – Key Mitigation Technologies and practices Carbon sequestration – Carbon Capture and Storage (CCS)							
UNIT – V	TECHNOLOGY AND ENERGY	(9)					
Clean Development Mechanism – Carbon Trading – Examples of future Clean Technology – Biodiesel – Natural Compost – Eco-friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power – Mitigation Efforts in India and Adaptation funding.							
L=45,SL= 45,Total = 90 PERIODS							


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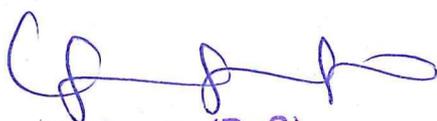


COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Explain the earth’s climate change and its system classification											Understand	
CO2	Illustrate the observed changes in the climate and concept of modeling and Institutional arrangements existing for monitoring this phenomenon											Understand	
CO3	Interpret the impacts of climate change on various sectors and the concept of irreversibility.											Understand	
CO4	Describe climate change adaptation and mitigation measures across different sectors.											Understand	
CO5	Illustrate clean and eco-friendly technologies for fuel and energy applications.											Understand	
TEXT BOOKS:													
1. Dash Sushil Kumar, —Climate Change – An Indian Perspective , Cambridge University Press India Pvt. Ltd, 2007 2. Jan C. van Dam, Impacts of —Climate Change and Climate Variability on Hydrological Regimes, Cambridge University Press, 2003													
1. Chaitanya B. Pande, Kanak N. Moharir, Abdelazim Negm Climate Change Impacts in India , Springer ,2023. 2. Tim Flannery, The Weather Makers: The History and Future Impact of Climate Change, Text Publishing Company,2009 UNFCCC (2006). UNFCCC Handbook.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	2	-	2	1	-	2	-	-
CO2	3	2	-	-	-	2	-	2	1	-	2	-	-
CO3	3	2	-	-	-	2	-	2	1	-	2	-	-
CO4	3	2	-	-	-	2	-	2	1	-	2	-	-
CO5	3	2	-	-	-	2	-	2	1	-	2	-	-
1-low, 2-medium, 3-high													


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24CS001	DATA STRUCTURES AND ALGORITHMS USING C	Category	L	T	P,	SL	C
		OEC	45	0	30	45	4
PREREQUISITE: Basic knowledge of programming concepts such as variables, data types, loops, conditionals and functions, along with logical thinking and problem-solving skills.							
OBJECTIVES: To provide knowledge of basic data structures and algorithms and their use in searching, sorting, and efficient problem-solving techniques.							
UNIT – I	BASICS OF DATA STRUCTURES						(9)
Abstract Data Types (ADTs) – List ADT – Array-based implementation – Singly linked lists – Doubly linked lists – Circularly linked lists – Applications of lists – Polynomial ADT.							
UNIT – II	STACKS AND QUEUES						(9)
Stack ADT – Implementation of Stack using Linked List – Applications of Stack: Evaluating arithmetic expressions – Conversion of Infix to postfix and prefix expression. Queue ADT – Implementation of Queue using Linked List – Circular Queue – Applications of Queues.							
UNIT – III	TREES AND GRAPHS						(9)
Tree ADT – Binary Tree ADT – Binary Tree Traversal – Binary Search Tree – AVL Trees – Graphs and Types – Prim’s Algorithm – Kruskal’s Algorithm – Dijkstra’s Algorithm – Breadth First Traversal – Depth First Traversal.							
UNIT – IV	SEARCHING, HASHING AND SORTING						(9)
Searching: Linear and Binary Search – Hashing: Hash function – Separate Chaining – Open Addressing: Linear Probing, Quadratic Probing and Double Hashing. Sorting: Merge sort – Quick sort – Insertion Sort – Heap Sort.							
UNIT – V	ALGORITHM DESIGN AND ANALYSIS						(9)
Notion of algorithm – Fundamentals of algorithmic problem solving – Analysis framework – Asymptotic Notations: Big O Notation, Omega Ω Notation and Theta Θ Notation – Mathematical analysis for Recursive and Non-recursive algorithms.							
List of Exercise/Experiments							
<ol style="list-style-type: none"> 1. Apply singly linked list operations for dynamic data insertion and deletion. 2. Develop a program to perform insertion and deletion operations using a doubly linked list. 3. Demonstrate stack functionality using a linked list data structure. 4. Construct a queue using linked list-based enqueue and dequeue operations. 5. Implement binary tree traversal algorithms for node processing. 6. Perform Linear Search to retrieve a specified element from an array. 7. Execute Binary Search on a sorted array and measure its efficiency. 8. Design the Merge Sort algorithm for efficient array sorting. 9. Derive the Minimum Spanning Tree of a graph using Prim’s Algorithm and compute its total minimum cost. 							


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10. Implement Dijkstra’s Algorithm to determine the shortest path from a given source vertex to all other vertices in a weighted graph.

L=45,T=0,P=30, SL=45 TOTAL: 120 PERIODS

COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Infer the concepts of abstract data types and list structures for singly, doubly and circular linked lists.	Understand
CO2	Apply stack and queue operations implemented with linked lists to solve expression evaluation and data-handling problems.	Apply
CO3	Implement tree and graph structures with traversal techniques for hierarchical and network-based data processing.	Apply
CO4	Design solutions using searching, sorting, and hashing methods for fast and organized data access.	Apply
CO5	Demonstrate algorithm design principles and asymptotic analysis to solve computational problems with classical algorithms.	Apply

TEXT BOOKS:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, Pearson Education, 2nd Edition, 2018.
2. Anany Levitin, Introduction to the Design and Analysis of Algorithms, 3rd Edition, Pearson Education, 2017.

REFERENCES:

1. Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, Pearson Education, 2nd Edition, 2015.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, Introduction to Algorithms, Mcgraw Hill, 4th Edition, 2022.
3. Alfred V. Aho, Jeffrey D. Ullman John E. Hopcroft, Data Structures and Algorithms, 1st Edition, Pearson, 2002.
4. Kruse, Data Structures and Program Design in C, Pearson Education, 2nd Edition, 2006.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	2	-	-
CO2	3	3	2	-	-	-	-	1	-	-	2	-	-
CO3	3	3	2	-	-	-	-	1	-	-	2	-	-
CO4	3	3	2	-	-	-	-	1	-	-	2	-	-
CO5	3	3	2	-	-	-	-	1	-	-	2	-	-

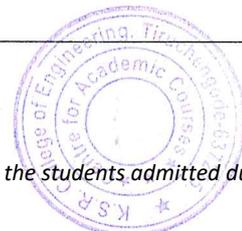
1-low, 2-medium, 3-high


Chairman (BoS)



24CS002	FUNDAMENTALS OF JAVA PROGRAMMING	Category	L	T	P	SL	C
		OEC	15	0	90	15	4
PREREQUISITE: Basic knowledge of programming concepts such as variables, data types, loops and conditional statements.							
OBJECTIVES: To introduce Object-Oriented Programming concepts using Java and develop skills in inheritance, interfaces, exception handling, file handling, multithreading and collections for building reliable applications.							
UNIT – I	JAVA LANGUAGE BASICS	(3+18)					
Classes in Java – Constructors and Methods – Representing Real-World Entities Using Classes – Access Specifiers – Static Members – Comments – Data Types – Variables – Operators – Control Flow – Arrays – Packages – Java API Documentation – Javadoc Comments.							
List of Experiments:							
<ol style="list-style-type: none"> 1. Apply object-oriented principles by writing a Java program that defines a simple class representing a real-world entity, uses both default and parameterized constructors to initialize objects, and illustrates the use of public, private, and protected access specifiers. 2. Implement a Java program that demonstrates the use of static data members and static methods to show shared values across objects and includes appropriate single-line, multi-line, and documentation comments. 3. Analyze a Java program that uses different data types and variables to perform simple calculations and evaluates expressions using arithmetic, relational, and logical operators. 4. Develop a Java program that demonstrates control flow statements such as if-else, switch, for loop, while loop, and do-while loop. 5. Write a Java program that performs array operations including creation, traversal, and basic processing, and organizes the program using packages with proper Javadoc comments to generate documentation 							
UNIT – II	BASICS OF OBJECT ORIENTED PROGRAMMING	(3+18)					
Object-Oriented Programming – Abstraction – Objects and Classes – Encapsulation – Inheritance – Polymorphism – OOP in Java – Characteristics of Java – Java Environment – Java Source File Structure – Compilation – Fundamental Programming Structures in Java.							
List of Experiments:							
<ol style="list-style-type: none"> 1. Construct a Java class representing a real-world entity with attributes and methods, apply encapsulation using private data members with public accessors, and initialize objects using multiple constructors 2. Analyze abstraction in Java by implementing an abstract class with abstract methods and creating appropriate subclasses to perform specific operations. 							


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3. Develop inheritance in Java by designing class hierarchies that demonstrate single inheritance, multilevel inheritance, and hierarchical inheritance with suitable parent and child classes.
4. Implement polymorphism in Java by demonstrating both compile-time polymorphism using method overloading and runtime polymorphism using method overriding with superclass references.
5. Write a small Java application using multiple classes to integrate inheritance, encapsulation, abstraction and polymorphism for managing system entities.

UNIT – III	INHERITANCE AND INTERFACES	(3+18)
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Inheritance – Super classes and Subclasses – Protected Members – Constructors in Subclasses – The Object Class – Abstract Classes and Methods – Final Methods and Classes – Interfaces – Defining and Implementing Interfaces – Differences Between Classes and Interfaces – Extending Interfaces – Polymorphism with Inheritance – Strings.

List of Experiments:

1. Create a Java program to demonstrate inheritance by defining a superclass and one or more subclasses, illustrating the use of protected members and constructor chaining between the superclass and subclasses.
2. Construct a Java program that overrides methods of the Object class and uses abstract classes with abstract methods, where subclasses provide their own implementations.
3. Build a Java program to demonstrate the use of final methods and final classes and show how they restrict inheritance and method overriding.
4. Create Java programs using interfaces to enforce behavior through interface contracts, demonstrate multiple inheritance using interfaces, and show interface extension.
5. Write a Java program to demonstrate runtime polymorphism using inheritance, where a superclass reference invokes overridden subclass methods, including suitable operations using Java Strings.

UNIT– IV	EXCEPTION HANDLING AND I/O	(3+18)
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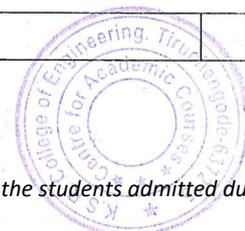
Exceptions – Exception Hierarchy – Throwing and Catching Exceptions – Built-in Exceptions – Creating User-Defined Exceptions – Stack Trace Elements – I/O Basics – Streams – Byte Streams and Character Streams – Reading and Writing Console – Reading and Writing Files.

List of Experiments:

1. Implement a Java program to demonstrate basic exception handling using try, catch, and finally blocks, including handling of common built-in runtime exceptions.
2. Develop a Java program to illustrate the exception hierarchy by handling multiple related exceptions and explicitly using the throw and throws keywords.
3. Implement a Java program that defines and applies a user-defined exception and displays stack trace details to show how exceptions propagate through method calls.
4. Develop a Java program demonstrating basic input and output operations using standard input and output streams.
5. Implement a Java program that performs file handling by reading data from a text file and writing data to another file using appropriate byte and character streams.

UNIT – V	MULTITHREADING AND COLLECTIONS	(3+18)
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Multithreading vs. Multitasking – Thread Life Cycle – Creating Threads – Synchronizing Threads – Interthread Communication – Daemon Threads – Inner Classes – ArrayList – Basics of Collections Framework – Generics – Generic Classes – Generic Methods.

List of Experiments:

1. Create a Java program to start multiple threads using the Thread class and Runnable interface, and demonstrate synchronization for shared resource access.
2. Develop a Java program to illustrate the thread life cycle, inter thread communication using wait(), notify() or notifyAll() and the behavior of daemon threads.
3. Build a Java program using inner classes to organize thread-related tasks within an outer class.
4. Write a Java program using the Collections Framework, specifically ArrayList, to store, retrieve, add, remove, and traverse dynamic data entered by the user.
5. Implement a Java program to demonstrate generic programming by designing a generic class and a generic method to perform operations on multiple data types.

L = 15, T = 0, P = 90, SL = 15, TOTAL: 120 PERIODS

COs	Course Outcome	Cognitive Level
CO1	Outline the fundamentals of Java programming including data types, variables, operators, control structures, arrays, classes, constructors, and packages for developing basic programs.	Understand
CO2	Design modular Java programs using object-oriented principles such as abstraction, encapsulation, inheritance and polymorphism.	Apply
CO3	Implement inheritance, interfaces, abstract classes and final methods to develop reusable and extensible Java applications.	Apply
CO4	Develop robust Java programs using exception handling mechanisms and file-based input/output operations.	Apply
CO5	Apply multithreading concepts, collections framework and generics to build efficient and scalable Java applications.	Apply

TEXT BOOKS:

1. Herbert Schildt, Dr.Danny Coward, Java - The Complete Reference, McGraw-Hill Education, Thirteenth Edition, 2023.
2. Cay S. Horstmann, Core Java Volume I & II, Prentice Hall, Thirteenth Edition, 2024.

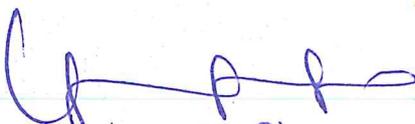
REFERENCES:

1. Herbert Schildt, Java - A Beginner Guide, Oracle Press, McGraw-Hill Education, Tenth Edition, 2024.
2. Joshua Bloch, Effective Java: A Programming Language Guide, Addison-Wesley Professional, Fourth Edition, 2023.
3. Allen B. Downey and Chris Mayfield, Think Java: How to Think Like a Computer Scientist, O'Reilly, Second Edition, 2019.
4. https://onlinecourses.nptel.ac.in/noc22_cs47/preview.
5. To practice: www.codingbat.com and [www. Geeks for geeks. Com](http://www.GeeksforGeeks.com).


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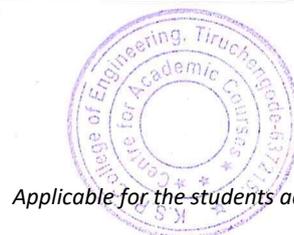
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO 1	PSO 2
CO1	3	2	-	-	2	-	-	1	-	-	3	-	-
CO2	3	3	2	-	2	-	-	1	-	-	3	-	-
CO3	3	3	2	-	2	-	-	1	-	-	3	-	-
CO4	3	3	2	-	2	-	-	1	-	-	3	-	-
CO5	3	3	2	-	2	-	-	1	-	-	3	-	-
1-low, 2-medium, 3-high													


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24CSO03	FULL STACK FRAMEWORK	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
PREREQUISITE: Basic knowledge of HTML, CSS, JavaScript, and understanding of how web applications work.								
OBJECTIVES: To learn front-end and back-end development, work with databases and build simple full-stack web applications.								
UNIT – I	JAVA SCRIPT							(9)
Syntax and Execution: Variables – Operators – Conditions – Loops – Functions – JavaScript Objects – DOM – JavaScript Events – Forms.								
UNIT – II	NODE JS							(9)
Basics of Node JS – Installation – Working with Node packages – Using Node package manager – Creating a simple Node.js application – Using Events – Listeners – Timers – Callbacks – Handling Data I/O – Implementing HTTP services in Node.js								
UNIT – III	MONGO DB							(9)
Understanding NoSQL and MongoDB – Building MongoDB Environment – User accounts – Access control – Administering databases – Managing collections – Connecting to MongoDB from Node.js – simple applications.								
UNIT – IV	EXPRESS AND ANGULAR							
Implementing Express in Node.js – Configuring routes – Using Request and Response objects – Angular – Typescript – Angular Components – Expressions – Data binding – Built-in directives								
UNIT – V	REACT							(9)
MERN Stack – Basic React applications – React Components – React State – Express REST APIs – Modularization and Webpack.								
L=45, T=0, P=0, SL=45, TOTAL: 90 PERIODS								
COURSE OUTCOMES: At the end of the course, the students will be able to:								
COs	Course Outcome							Cognitive Level
CO1	Comprehend the components and functionalities of popular web technology stacks and how they support end-to-end application development.							Understand
CO2	Develop basic server-side applications using Node.js, including package management, asynchronous operations, data I/O, and HTTP services.							Apply
CO3	Design and manage MongoDB databases and implement simple applications by integrating Node.js with NoSQL data operations.							Apply


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CO4	Build full-stack web applications using Express for routing and Angular with TypeScript for component-based front-end development.	Apply
CO5	Develop MERN stack applications using React components, state management, routing, REST APIs, and modern build tools	Apply

TEXT BOOKS:

1. Randy Connolly and Ricardo Hoar, Fundamentals of Web Development, Pearson Education, New Delhi, Third Edition, 2022.
2. Brad Dayley, Brendan Dayley, Caleb Dayley, Node.js, MongoDB and Angular Web Development, Addison-Wesley, Second Edition, 2018
3. Vasan Subramanian, Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node, Second Edition, Apress, 2019.

REFERENCES:

1. Langsam, Augenstein and Tanenbaum, Data Structures Using C and C++, Pearson Education, Second Edition, 2015.
2. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress, First edition, 2018.
3. https://www.tutorialspoint.com/the_full_stack_web_development/index.asp
4. <https://www.udemy.com/course/the-full-stack-web-development/>

Mapping of COs with POs and PSOs

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	1	-	-	2	-	-
CO2	3	3	2	-	-	-	-	1	-	-	2	-	-
CO3	3	3	2	-	-	-	-	1	-	-	2	-	-
CO4	3	3	2	-	-	-	-	1	-	-	2	-	-
CO5	3	3	2	-	-	-	-	1	-	-	2	-	-

1-low, 2-medium, 3-high


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24CSO04	DIGITAL MARKETING	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITES: Students should have basic knowledge of computers, internet usage, and familiarity with websites and social media platforms.							
OBJECTIVES: To introduce students to the fundamentals of digital marketing and equip them with knowledge of key tools, channels and strategies used in online marketing. The course aims to develop practical skills for planning, executing, and evaluating digital marketing campaigns in a business environment.							
UNIT - I	BASICS OF DIGITAL MARKETING	(9)					
Evolution of Digital Marketing – Introduction to Digital Marketing – How Website works – Website ingredients – Digital Marketing vs Traditional Marketing – The role of digital marketing in business – Digital Marketing channels – Customer journey (stages of Digital Marketing) – Digital Marketing Metrics – Tools used in Digital Marketing (Free as well as third party tools) – Demand generation – Demand fulfilment, Digital Marketing trends.							
UNIT - II	SEARCH ENGINE OPTIMIZATION (SEO)	(9)					
How Search Engine works – SERP layout – Role of search algorithms – Ranking Factors – SEO Components (Technical SEO – On page SEO - Off-page SEO) Keyword Research – On-Page SEO Techniques -Off-Page SEO Techniques – Technical SEO (Introduction to technical SEO, website indexing, crawl ability, XML sitemaps, robots.txt, broken links, redirect issues and other technical issues) – Local SEO (Google My Business, How Local SEO works).							
UNIT - III	SEARCH ENGINE MARKETING (SEM) AND SOCIAL MEDIA MARKETING (SMM)	(9)					
Introduction to Search Engine Marketing (SEM) – PPC model – Key SEM platforms (Google Ads, Microsoft Advertising, etc.) – SEM Campaign Creation and Management – Bidding formula – Native advertising. Introduction to Social Media Marketing (SMM) – Major social media platforms and their marketing potential (Facebook, Instagram, Twitter, LinkedIn, etc.) – Organic vs. paid social media marketing – SMM Campaign Creation and Management – Social media marketing strategy – Integrating SEM and SMM in Digital Marketing Strategy.							
UNIT - IV	CONTENT MARKETING AND EMAIL MARKETING	(9)					
Introduction to Content Marketing and its importance – Content marketing funnel –Types of content – Content Creation and Optimization – Content Distribution and Promotion – Measuring content marketing performance. Introduction to Email Marketing – Types of email marketing – Benefits of email marketing – Email marketing regulations and best practices – Email Campaign Creation and Management – Email marketing metrics – Email marketing technical setup.							
UNIT - V	DIGITAL BUSINESS PRESENT AND FUTURE	(9)					
Digital Marketing – Landscape and Emerging Areas: Digital Marketing – Global Landscape – Digital Marketing – The Indian View – Digital Marketing – Emerging Trends and Concepts. A Career in Digital Marketing: Emerging Opportunities for Digital Marketing Professionals – Building a Career in Digital Marketing– Top Digital Marketing Areas as Career Tracks – Approaching a Career in Digital Marketing.							


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L:45, T:0, P:0, SL:45, TOTAL: 90 PERIODS													
COURSE OUTCOMES:													
At the end of the course, the learners will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Apply the concept of digital marketing landscape and its importance in modern business.											Apply	
CO2	Implement SEO methods to enhance website efficiency and improve organic search visibility.											Apply	
CO3	Differentiate SEM and SMM campaign strategies to build an effective, unified digital marketing approach.											Understand	
CO4	Examine content marketing and email marketing concepts and utilize them in digital marketing activities.											Apply	
CO5	Identify emerging domains of digital marketing and select appropriate strategies for real-world applications.											Understand	
TEXT BOOKS:													
1. Puneet Bhatia, Fundamentals of Digital Marketing, First Edition, Pearson Education, 2019.													
2. Vandana Ahuja, Digital Marketing, First Edition, Oxford University Press, India, 2015													
REFERENCES:													
1. Philip Kotler, Marketing 4.0: Moving from Traditional to Digital, First Edition, Wiley Publication, 2017.													
2. Damian Ryan, Calvin Jones, Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, First Edition, Kogan Page,													
3. Seema Gupta, Digital Marketing, McGraw Hill Education (I) Pvt. Ltd., 2022.													
4. Chinmay Nitin Kamat, Nitin C.Kamal, Digital Marketing, Himalaya Publishing House, Second Edition, 2025													
5. digitalgarage/course/digital-marketing.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	-	-	-	1	-	1	-	1	-	-
CO2	3	3	2	-	-	-	1	-	1	-	1	-	-
CO3	3	2	-	-	-	-	1	-	1	-	1	-	-
CO4	3	3	2	-	-	-	1	-	1	-	1	-	-
CO5	3	2	-	-	-	-	1	-	1	-	1	-	-
1-low, 2-medium, 3-high													


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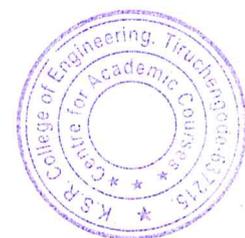
24CBO01	ETHICAL HACKING	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
PREREQUISITE: Basic knowledge of computer networks, operating systems, and fundamental cybersecurity concepts.								
OBJECTIVES: To understand and analyze ethical hacking techniques, penetration testing methodologies, and cybersecurity threats in computer networks and systems.								
UNIT - I	INTRODUCTION							(9)
Ethical Hacking Overview - Role of Security and Penetration Testers. - Penetration-Testing Methodologies- Laws and Regulations in Cybersecurity - Overview of TCP/IP and Network Layers- IP Addressing and Network Attacks- Malware and Intruder Attacks. - Physical Security Threats.								
UNIT - II	FOOT PRINTING AND SCANNING							(9)
Footprinting Concepts and Techniques- Footprinting via Search Engines, Web Services, and Social Media- Competitive Intelligence & Social Engineering Techniques- Footprinting Tools and Methods- Network Scanning Concepts- Port Scanning Techniques and Tools- Scanning Beyond IDS and Firewalls.								
UNIT - III	SYSTEM HACKING AND EXPLOITATION							(9)
Gaining Access to Systems- Privilege Escalation- Password Cracking Techniques- Hacking Web Servers and Web Applications- Web Vulnerabilities (SQL Injection, XSS, CSRF)- Wireless Hacking and Network Intrusions- Reverse Engineering and Code Injection.								
UNIT - IV	MALWARE THREATS AND SESSION HIJACKING							(9)
Viruses and Worms- Trojans - Covert Communication - Keystroke Logging and Spyware – Malware Counter Measures- Sniffers - Session Hijacking - Denial of Service - Distributed Denial of Service.								
UNIT - V	WEB SERVER HACKING AND ATTACKS							(9)
Web Server Hacking - Web Application Hacking - Database Hacking - Wireless Technologies – Mobile Security and Attacks: Wireless Technologies - Mobile Device Operation and Security – Wireless LANs.								
L=45, SL=45, TOTAL= 90 PERIODS								

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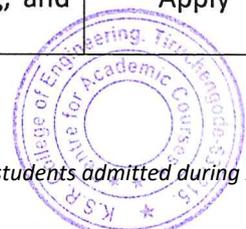
COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Explain basic ethical hacking concepts, cybersecurity laws, TCP/IP networking, and common security threats.											Understand	
CO2	Apply foot printing, reconnaissance, and scanning techniques to identify system and network vulnerabilities.											Apply	
CO3	Analyze system and network weaknesses using exploitation techniques and web and wireless attacks.											Analyze	
CO4	Apply malware, hijacking, sniffing, and denial-of-service attack analysis techniques to assess system security.											Apply	
CO5	Utilize security countermeasures to safeguard servers, databases, wireless networks, and mobile devices.											Apply	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. Michael T. Simpson, Kent Backman, and James E. Corley, "Hands-On Ethical Hacking and Network Defense," Course Technology, Delmar Cengage Learning, 2010. 2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing" - SYNGRESS, Elsevier, 2013. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. Justin Seitz "Black Hat Python: Python Programming for Hackers and Pentesters", 2014. 2. Dafydd Stuttard and Marcus Pinto "The Web Application Hacker's Handbook: Finding and Exploiting 3. Michael Gregg, "Certified Ethical Hacker", Version 10, Third Edition, Pearson IT Certification, 2019. 4. Roger Grimes, "Hacking the Hacker", 1st Edition, Wiley, 2017. 5. Ankit Fadia, "The Unofficial Guide to Ethical Hacking", Laxmi Publications, 2ns Edition, 2006. 													
NPTEL LINKS:													
<ol style="list-style-type: none"> 1. https://archive.nptel.ac.in/courses/106/105/106105214/ 													
Mapping of COs with POs and PSOs													
COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	1	1	1	-	1	2	3
CO2	3	3	2	-	-	-	1	1	1	-	1	3	3
CO3	3	3	3	2	-	-	1	1	1	-	1	3	3
CO4	3	3	2	-	-	-	1	1	1	-	1	3	3
CO5	3	3	2	-	-	-	1	1	1	-	1	3	2
1 - Low, 2 - Medium, 3 – High													


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24CB002	DIGITAL AND MOBILE FORENSICS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic understanding of computer systems and cybersecurity concepts. Logical reasoning and familiarity with legal aspects of digital investigations are recommended							
OBJECTIVES: The course helps the students to understand the fundamental knowledge of digital forensic processes, investigation techniques, legal frameworks, iOS and Android forensic analysis using modern tools and methodologies							
UNIT-I	INTRODUCTION TO DIGITAL FORENSICS						9
Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase							
UNIT-II	DIGITAL CRIME AND INVESTIGATION						9
Digital Crime – Substantive Criminal Law – General Conditions – Offenses – Investigation Methods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence							
UNIT-III	DIGITAL FORENSIC READINESS						9
Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics							
UNIT-IV	IOS FORENSICS						9
Mobile Hardware and Operating Systems - iOS Fundamentals – Jail breaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud							
UNIT-V	ANDROID FORENSICS						9
Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android Only Tools – Dual Use Tools–Oxygen Forensics – MobilEdit – Android App Decompiling							
L=45, SL=45, TOTAL=90 PERIODS							
COURSE OUTCOMES: Upon completion of the course, the students will be able to:							
Course Outcome	Description	Bloom's Taxonomy					
CO1	Understand the principles and phases of digital forensics, forensic science, and digital evidence handling	Understand					
CO2	Analyze digital crimes, legal frameworks, and methods for collecting digital evidence in compliance with legal standards	Analyze					
CO3	Apply digital forensic readiness frameworks in organizational contexts and address key forensic challenges	Apply					
CO4	Perform forensic investigations on iOS devices using appropriate tools, techniques, and security bypass procedures	Apply					
CO5	Conduct forensic analysis on Android devices using ADB, rooting, and app decompiling methods.	Apply					

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TEXT BOOKS:

1. Andre Arnes, "Digital Forensics", Wiley, 2018.
2. Chuck Easttom, "An In-depth Guide to Mobile Device Forensics", First Edition, CRC Press, 2022.

REFERENCES:

1. Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.
2. Lee Reiber, "Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation" by Second Edition, 2019.
3. Andrew Hogg "Android Forensics: Investigation, Analysis, and Mobile Security for Google Android" Packet Publishing Ltd, 2016.
4. Chuck Easttom "Advanced Smartphone Forensics: An Up-to-Date Guide to Forensic Investigation and Evidence Collection", 2021.
5. Sean Morrissey, "iOS Forensic Analysis for iPhone, iPad, and iPod Touch", 2014.

Mapping of COs with POs and PSOs

COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	1	-	1	-	-	3	2
CO2	3	3	2	2	-	-	1	-	1	-	-	3	2
CO3	3	3	2	-	-	-	1	-	1	-	-	3	2
CO4	3	3	3	-	-	-	1	-	1	-	-	3	3
CO5	3	3	3	-	-	-	1	-	1	-	-	3	3

1-low, 2-medium, 3-high, '-' - no correlation

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24CBO03	APPLIED JAVA PROGRAMMING	Category	L	T	P	SL	C	
		OEC	15	0	90	15	4	
PREREQUISITE: Basic knowledge of Java programming concepts such as classes, objects, inheritance, and exception handling are required.								
OBJECTIVES: This course provides knowledge of Java Collections, server-side programming, modern Java features, and design patterns. It helps students develop efficient and maintainable Java applications.								
UNIT – I	COLLECTIONS FRAMEWORK- I							(21)
Java Arrays– Collections Overview – Collections Framework – Collection Interface – Collections and Generic, List, Cursors, Iterators, Vector (Theory-3)								
List of Exercise: <ol style="list-style-type: none"> Analyze the use of one-dimensional and multi-dimensional arrays by writing a Java program to store, access, and manipulate data elements. Develop a Java program using ArrayList to perform insertion, deletion, and searching operations. Apply the Iterator and ListIterator interfaces in a Java program to traverse and modify elements of a List. Implement a Java program using Vector and show thread-safe operations. Write a Java program to demonstrate Enumeration cursor on a Vector. (Laboratory-18) 								
UNIT – II	COLLECTIONS FRAMEWORK- II							21
Set - Basic Set and Extended Set. Comparable and Comparator - Sorting objects, Queue, Map, Concurrent Collections, Streams (Theory-3)								
List of Exercise: <ol style="list-style-type: none"> Apply HashSet, LinkedHashSet, and TreeSet collections in a Java program to store a set of elements and demonstrate their behavior with respect to insertion order, sorting, and uniqueness. Develop a Java program to sort objects using Comparable and Comparator interfaces. Analyze the behavior of a PriorityQueue by writing a Java program to perform queue operations such as insertion, deletion, and traversal, and observe the element ordering. Implement a Java program using HashMap and TreeMap. Write a Java program to demonstrate Java Streams for filtering and mapping collections. (Laboratory-18) 								
UNIT – III	SERVER-SIDE PROGRAMMING							21
Java Regex API - Matcher class - Pattern class - PatternSyntaxException – POSIX Standards JDBC - JDBC Drivers – JDBC Components – DriverManager, Driver, Connection, Statement, ResultSet, Handling SQL Exception - Prepared Statement – Callable Statement – Scrollable ResultSet (Theory-3)								
List of Exercise: <ol style="list-style-type: none"> Write a Java program using Pattern and Matcher classes to validate email IDs. Construct a Java program that demonstrates the occurrence and handling of PatternSyntaxException in regular expressions. Apply JDBC concepts by writing a Java program to establish connectivity between a Java application and a database. Implement CRUD operations on a database using PreparedStatement. Develop a Java program using Scrollable ResultSet. (Laboratory-18) 								
UNIT – IV	LAMBDA AND ANNOTATIONS							21
Wrapper Classes – Autoboxing- Unboxing –Lambda Expressions – Method References – functional Interfaces Javadocs, Annotations – Assertions (Theory-3)								
List of Exercise: <ol style="list-style-type: none"> Write a Java program to demonstrate wrapper classes with autoboxing and unboxing. Implement lambda expressions for arithmetic operations. Apply method references in a Java program to implement functional interfaces and simplify lambda expressions. 								

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4. Develop a Java program using functional interfaces.
5. Apply custom annotations and assertions in a Java program to define metadata and validate program conditions during execution. **(Laboratory-18)**

UNIT – V	DESIGN PATTERNS	21
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Design Patterns - Creational – Structural and Behavioural Design Patterns - Singleton – Factory Method Pattern - Adapter Pattern – Proxy - Iterator, MVC. **(Theory-3)**

- List of Exercise:**
1. Implement the Singleton Design Pattern in Java.
 2. Write a Java program using Factory Method Pattern.
 3. Build a Java application that demonstrates the use of the Adapter Design Pattern to enable compatibility between incompatible interfaces.
 4. Construct a Java application implementing the Proxy Design Pattern using a real-world example to control access to an object.
 5. Develop a Java application using the MVC architectural pattern. **(Laboratory-18)**

COURSE OUTCOMES:
Upon completion of the course, the students will be able to:

Course Outcome	Description	Bloom's Taxonomy
CO1	Interpret Java Arrays and the Collections Framework, including Generics, Lists, Vectors, and basic traversal methods such as iterators.	Understand
CO2	Use Set, Queue, and Map interfaces with Comparable, Comparator, and streams to solve data processing problems.	Apply
CO3	Construct server-side Java applications that perform database interaction using JDBC and regular expressions.	Apply
CO4	Examine Java features such as lambda expressions, functional interfaces, and annotations to identify their roles and interactions in program design.	Analyze
CO5	Analyze suitable design patterns to achieve reusability, scalability, and maintainability in Java applications.	Analyze

- TEXT BOOKS:**
- 1 Herbert Schildt, "Java – The Complete Reference", McGraw-Hill Education, 13th Edition, 2023
 - 2 Modern Java in Action by Raoul-Gabriel Urma, Mario Fusco & Alan Mycroft, Manning Publications, 2nd Edition, 2023

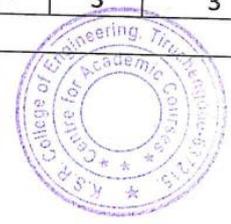
- REFERENCES:**
- 1 Scott Oaks, High-Performance Java: Strategies and Best Practices for Developing High Performance Java Applications, Publisher: Packt Publishing, 1st Edition, 2025
 - 2 Y. Daniel Liang, Introduction to Java Programming and Data Structures, Comprehensive Version, Pearson, 12th Edition, 2024
 - 3 Cay S. Horstmann, Core Java Volume I – Fundamentals, Pearson, 12th Edition, 2024
 - 4 Joshua Bloch, Effective Java, Addison-Wesley, 4th Edition, 2023
 - 5 Paul Deitel & Harvey Deitel, Java: How to Program, Pearson, 12th Edition, 2022

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	–	–	3	–	–	1	1	–	–	3	–
CO2	3	3	2	–	3	–	–	1	1	–	–	3	–
CO3	3	3	2	–	3	–	–	1	1	–	–	3	2
CO4	3	3	3	2	3	–	–	1	1	–	–	3	3
CO5	3	3	3	2	3	–	–	1	1	–	–	3	3

1 - low, 2 - medium, 3 - high, '-' - no correlation

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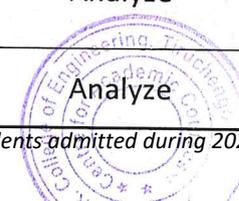


24CSO06	DATA SCIENCE FUNDAMENTALS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Students should have basic knowledge of mathematics (algebra and introductory probability) and statistics. They are also expected to have familiarity with programming fundamentals and data handling concepts to understand data analysis methods.							
OBJECTIVES: The course aims to introduce the fundamental concepts, methods, and applications of Data Science, including data collection, analysis, probability, and statistical inference. It prepares the students to develop the ability to evaluate data-driven models, apply statistical reasoning, and make informed decisions using real-world data.							
UNIT – I	INTRODUCTION						9
Introduction – Data Science – Data Science Relates to Other Fields - The Relationship between Data Science and Information Science – Computational Thinking – Issues of Ethics, Bias, and Privacy in Data Science – Data Types – Data Collections – Data Pre-processing and its Techniques.							
UNIT – II	APPLICATIONS, EVALUATIONS, AND METHODS						9
Solving Data Problems: Collecting and Analyzing Social Media Data. Data Collection Methods – Picking Data Collection and Analysis Method: Quantitative Methods – Qualitative Methods – Evaluation: Comparing Models – Cross-Validation.							
UNIT – III	PROBABILITY						9
Probability Concepts – Axioms of Probability – Conditional Probability and Independence – Bayes Theorem – Random Variables – Mean and Variance of a Discrete and Continuous Random Variable							
UNIT – IV	STATISTICS						9
Role to Statistics - Estimation of Parameter and Sampling Distribution: Point Estimation – Sampling Distributions and the Central Limit Theorem. Statistical Intervals for a Single Sample: Confidence Interval on Mean – variance and Standard Deviation.							
UNIT – V	EVALUATION						9
Hypothesis Testing – Tests on the Mean, Variance and Standard – Tests on a Population Proportion – Summary – Testing for Goodness of Fit – Contingency Table Tests – Nonparametric Procedures – Equivalence Testing – Combining P -Values. A/B testing concepts – T-test and p-value – Measuring t-statistics and p-values.							
L=45, T=0, P=0, SL=45, TOTAL = 45 PERIODS							

Course Outcomes:

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

COs	Course Outcome	Cognitive Level
CO1	Describe the fundamentals of Data Science, its relationship with other disciplines, data collection, and preprocessing techniques.	Understand
CO2	Apply appropriate data collection and analysis methods to solve real-world data problems.	Apply
CO3	Apply probability concepts, random variables, and common probability distributions to model and analyze uncertainty in data.	Apply
CO4	Analyze data using statistical estimation, sampling distributions, confidence intervals, and resampling techniques for informed inference.	Analyze
CO5	Analyze the data-driven decisions and model performance by testing the methods.	Analyze



TEXT BOOKS:

- 1.Chirag Shah, "A Hands-On Introduction to Data Science", 1st Edition, Kindle Edition, 2020, for Units I & II.
2. Douglas C. Montgomery, George C. Ranger, Applied Statistics and Probability for Engineers, Sixth Edition, Wiley, 2013. for Units I, III, IV, V.

REFERENCES:

- 1.Joel Grus, "Data Science from the Scratch", NA Edition, O'Reilly, NA, 2015.
- 2.Frank Kane, "Hands-On Data Science and Python Machine Learning", First edition, Packt Publication, 2017.

Mapping of COs with POs and PSOs													
COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	2	0	1	1	1	0	2	2	2
CO2	3	3	2	1	2	0	1	1	1	0	2	2	2
CO3	3	3	2	1	2	0	1	1	1	0	2	2	2
CO4	3	3	3	2	2	0	1	1	1	0	2	2	2
CO5	3	3	3	2	2	0	1	1	1	0	2	2	2
1 – Low, 2 – Medium, 3 - High													

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24CSO07	ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE:							
Students should have basic knowledge of programming, data structures, and algorithms. They are also expected to be familiar with probability, statistics, linear algebra, and calculus will help them understand machine learning and AI models.							
OBJECTIVES:							
The course aims to provide a comprehensive understanding of Artificial Intelligence concepts, problem-solving techniques, probabilistic reasoning, and learning models. It prepares the students to design, analyze, and apply AI and ML algorithms to real-world problems.							
UNIT – I	PROBLEM SOLVING						9
Introduction to AI – AI Applications – Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP).							
UNIT – II	PROBABILISTIC REASONING						9
Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.							
UNIT – III	SUPERVISED LEARNING						9
Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model – Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests.							
UNIT – IV	ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING						9
Combining multiple learners: Model combination schemes, Voting, Ensemble Learning – bagging, boosting, stacking, Unsupervised learning: K-means, Instance-Based Learning: KNN, Gaussian mixture models and Expectation maximization.							
UNIT – V	NEURAL NETWORKS						9
Perceptron – Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation.							
L=45, T=0, P=0, SL=45, TOTAL = 45 PERIODS							

Course Outcomes:

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

COs	Course Outcome	Cognitive Level
CO1	Apply basic AI problem-solving techniques such as search, heuristics, and constraint satisfaction.	Apply
CO2	Understand uncertainty handling using probability, Bayesian inference, and Bayesian networks.	Understand
CO3	Apply supervised machine learning algorithms for regression and classification tasks.	Apply
CO4	Apply ensemble and unsupervised learning methods to improve model accuracy and identify patterns in data.	Apply
CO5	Understand and implement neural network models and training techniques for deep learning applications.	Understand



TEXT BOOKS:

1. Stuart Russell and Peter Norvig, "Artificial Intelligence – A Modern Approach", Fourth Edition, Pearson Education, 2021.
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.

REFERENCES:

1. Dan W. Patterson, "Introduction to Artificial Intelligence and Expert Systems", Pearson Education, 2007.
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008.

Mapping of COs with POs and PSOs													
COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	2	1	2	0	1	1	1	0	2	2	2
CO2	3	2	1	1	2	0	1	1	1	0	2	2	2
CO3	3	3	2	1	2	0	1	1	1	0	2	2	2
CO4	3	3	2	1	2	0	1	1	1	0	2	2	2
CO5	3	2	1	1	2	0	1	1	1	0	2	2	2

1 – Low, 2 – Medium, 3 - High

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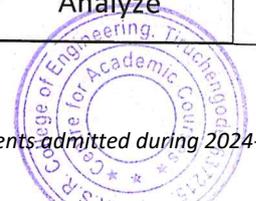
24CSO08	DATA EXPLORATION AND VISUALIZATION	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE:							
Students should have basic knowledge of statistics and data handling concepts. They are also expected to be familiar with Python programming and basic plotting concepts.							
OBJECTIVES:							
The course aims to introduce Exploratory Data Analysis techniques for understanding, cleaning, and transforming data. It prepares the students to develop skills in data visualization and statistical analysis for extracting meaningful insights.							
UNIT – I	EXPLORATORY DATA ANALYSIS						9
EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA – Visual Aids for EDA – Data transformation techniques – merging database, reshaping and pivoting, Transformation techniques – Grouping Datasets – data aggregation – Pivot tables and cross-tabulations.							
UNIT – II	VISUALIZING USING MATPLOTLIB						9
Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three-dimensional plotting – Geographic Data with Basemap – Visualization with Seaborn.							
UNIT – III	UNIVARIATE ANALYSIS						9
Introduction to Single Variable: Distributions and Variables – Numerical Summaries of Level and Spread – Scaling and Standardizing – Inequality – Smoothing Time Series.							
UNIT – IV	BIVARIATE ANALYSIS						9
Relationships between Two Variables – Percentage Tables – Analyzing Contingency Tables Handling Several Batches – Scatterplots and Resistant Lines – Transformations.							
UNIT – V	MULTIVARIATE AND TIME SERIES ANALYSIS						9
Introducing a Third Variable – Causal Explanations – Three-Variable Contingency Tables and Beyond – Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.							
L=45, T=0, P=0, SL=45, TOTAL = 45 PERIODS							

Course Outcomes:

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

COs	Course Outcome	Cognitive Level
CO1	Understand the purpose of EDA and apply data transformation, grouping, and aggregation techniques to explore datasets.	Understand
CO2	Create effective data visualizations using Matplotlib and Seaborn for clear data interpretation.	Create
CO3	Analyze single-variable data using summary statistics, scaling methods, and smoothing techniques.	Analyze
CO4	Describe the relationships between two variables using tables, plots, and data transformations.	Understand
CO5	Analyze multi-variable and time-based data using visualization, grouping, and resampling methods to identify trends and patterns.	Analyze

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TEXT BOOKS:

- 1.Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python", Packt Publishing, 2020. (Unit 1).
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2).
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for Social Scientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5).

REFERENCES:

- 1.Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
- 2.Claus O. Wilke, "Fundamentals of Data Visualization", O'Reilly publications, 2019.
- 3.Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC Press, 2015.

Mapping of COs with POs and PSOs													
COs / POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	1	1	2	0	1	1	1	0	2	2	2
CO2	3	3	3	2	2	0	1	1	1	0	2	2	2
CO3	3	3	3	2	2	0	1	1	1	0	2	2	2
CO4	3	2	1	1	2	0	1	1	1	0	2	2	2
CO5	3	3	3	2	2	0	1	1	1	0	2	2	2

1 – Low, 2 – Medium, 3 - High

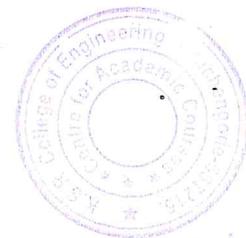
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2410001	INDUSTRIAL INTERNET OF THINGS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Nil							
OBJECTIVE :							
<ul style="list-style-type: none"> • Introduce how IIoT has become a game changer in the new economy where customers are looking for integrated value • Bring the IIoT perspective in thinking and building solutions • Introduce the tools and techniques that enable IIoT solutions and Security 							
Unit - I	INTRODUCTION						[9]
Introduction to IOT, What is IIOT? IOT vs. IIOT History of IIOT, fundamental terms in IIOT, Components of IIOT – Architectures of IIOT, Challenges & Benefits in implementing IIOT-Enablers of IIOT: sensitivity and connectivity, security threats and challenges.							
Unit – II	SENSOR AND ACTUATORS						[9]
Introduction to sensors, Roles of sensors in IIOT, Characteristics of Sensors, types of sensors-thermal sensors, Mechanical sensors, Chemical sensors, Electrical Sensors, Optical Sensors, Acoustic sensors, Actuators.							
Unit – III	BUSINESS MODEL AND LEAN PRODUCTION SYSTEMS						[9]
Business Models-Business opportunities and categorization in IIOT-IIIRA frameworks- Product lifecycle management streams in the lean production system - Necessity of lean production system -Implementation of lean manufacturing system.							
Unit – IV	KEY TECHNOLOGIES AND IIOT ANALYTICS						[9]
Requirements of Cybersecurity-Augmented Reality-Virtual Reality-Big Data Advanced Analytics-Industrial Sensing-Industrial internet systems-Cloud computing-Fog computing, Introduction to IoT analytics.							
Unit - V	APPLICATION DOMAIN IN IIOT						[9]
Health care, Inventory Management, Quality Control, Plant Safety and Security, Oil, Chemical, and Pharmaceutical industries, applications of UAVs in industries, Case study on the Manufacturing industry, Mining Industry, and Automotive Industry.							
L=45, SL= 45, Total : 90 Periods							

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COURSE OUTCOMES:		Cognitive Level
At the end of the course, the student will be able to		
CO1:	Describe the architectures and security issues in IIOT.	understand
CO2:	Interpret the various sensors and Actuators and their applications.	understand
CO3:	Examine the business model and lean production systems.	Analyze
CO4:	Illustrate augmented reality, virtual reality.	understand
CO5:	Analyze real-life applications using off-the-shelf hardware and software	Analyze

TEXT BOOKS:

1. Sudip Misra, Chandana Roy, and AnandarupMukherjee, "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press, edition 2020
2. R. Anandan, Suseendran Gopalakrishnan, Souvik Pal and Noor Zaman, "The Industrial Internet of Things (IIoT), Intelligent Analytics for Predictive Maintenance" Wiley publications
3. Alasdair Gilchrist, Industrial 4.0, the industrial internet of things, Apress

REFERENCES:

1. Hakima Chaouchi, "The Internet of Things Connecting Objects to the Web" ISBN : 978-1-84821-140-7, Willy Publications
2. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2 nd Edition, Willy Publications
3. Internet of Things-From Research and Innovation to Market Deployment; By Ovidiu & Peter; River Publishers Series
4. <https://freevideolectures.com/course/4231/nptel-introduction-industry-industrial-internet-things>.

NPTEL LINKS:

1. <https://nptel.ac.in/courses/106/105/106105195/>

Mapping of Cos with Pos and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1:	3	1	2	2		2					1	1	1
CO2:	3	1	2	2		2					1	3	2
CO3:	3	1	3	2		2					2	3	2
CO4:	3	1	3	2		2					2	3	2
CO5:	3	1	3	2		2					2	3	2

1 – Low, 2- Medium, 3- High


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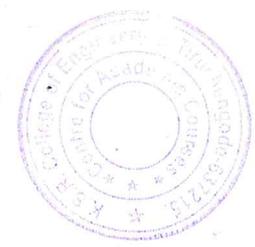
2410002	INTRODUCTION TO SENSORS AND IoT	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Nil							
OBJECTIVES:							
<ul style="list-style-type: none"> Introduce evolution of sensors and IoT. Discuss on IoT hardware , communication Technologies and its applications 							
Unit - I	SENSORS AND MEASUREMENT SYSTEMS	[9]					
Classification of sensors – Basic terminology: accuracy, precision, sensitivity, resolution, linearity, hysteresis and repeatability – Static and dynamic characteristics of sensors – Actuators and types – Measurement system overview – Signal conditioning basics – Sensor selection criteria.							
Unit – II	SENSORS FOR IOT APPLICATIONS	[9]					
Temperature and humidity sensors – Light and sound sensors – Motion and proximity sensors: PIR sensor, ultrasonic sensor, IR proximity sensor – MEMS-based sensors: accelerometer and gyroscope – Soil moisture and water level sensors –RFID tags and readers.							
Unit – III	INTRODUCTION TO INTERNET OF THINGS (IOT)	[9]					
Evolution of IoT – Characteristics – IoT architecture (three-layer and five-layer models) – Components of IoT ecosystem– Role of embedded systems in IoT – Overview of IoT applications: smart home, smart city- Industrial IoT.							
Unit – IV	IOT HARDWARE AND COMMUNICATION TECHNOLOGIES	[9]					
IoT hardware platforms : Arduino , ESP32, Raspberry Pi – Communication interfaces: UART, I2C, SPI – Wireless technologies: Wi-Fi, Bluetooth, ZigBee, LoRa – Internet communication protocols: HTTP, MQTT, CoAP.							
Unit - V	IOT CLOUD AND APPLICATIONS	[9]					
Cloud computing concepts for IoT – IoT cloud platforms – Data flow from sensor to cloud – Introduction to edge computing – Security issues in IoT - Future trends in sensors and IoT.							
Case studies: Smart agriculture, Smart energy monitoring, Smart healthcare, Smart transportation.							
L=45, SL= 45, Total : 90 Periods							


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COURSE OUTCOMES:												Cognitive Level	
At the end of the course, the student will be able to													
CO1:	Explain the fundamentals of sensors, transducers, and measurement systems											Understand	
CO2:	Describe different sensors used in IoT applications											Understand	
CO3:	Outline the architecture, components, and applications of IoT											Understand	
CO4:	Identify IoT hardware platforms, communication interfaces, and protocols											Understand	
CO5:	Discuss IoT cloud concepts, security issues, and real-world applications											Apply	
TEXT BOOKS:													
<ol style="list-style-type: none"> 1. Arshdeep Bahga, Vijay Madiseti, Internet of Things – A Hands-On Approach, Universities Press, Second Edition, 2015. 2. Jacob Fraden, Handbook of Modern Sensors, Springer, Fifth Edition, 2016. 													
REFERENCES:													
<ol style="list-style-type: none"> 1. D. Patranabis, Sensors and Transducers, PHI Learning, Second Edition, 2014. 2. O S. Salivahanan, Sensors and Transducers, McGraw Hill Education, Second Edition, 2010. 3. Adrian McEwen, Hakim Cassimally, Designing the Internet of Things, Wiley, First Edition, 2013. 													
NPTEL LINKS:													
<ol style="list-style-type: none"> 1. https://nptel.ac.in/courses/106105166 													
Mapping of Cos with Pos and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1:	3	2	-	-	1	-	-	-	-	-	-	-	-
CO2:	3	2	-	-	1	-	-	-	-	-	-	-	-
CO3:	3	2	-	-	1	-	-	-	-	-	-	-	-
CO4:	3	2	1	-	2	-	-	-	-	-	-	-	-
CO5:	3	2	1	-	2	1	-	-	-	-	1	-	-
1 – Low, 2- Medium, 3- High													

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24ECO01	DRONE TECHNOLOGY	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
OBJECTIVES:								
To provide fundamental knowledge of drone concepts, including design, fabrication, programming, and flight operations. It also familiarizes learners with various drone applications while emphasizing safety guidelines and best practices for safe flying.								
UNIT - I	INTRODUCTION TO DRONE TECHNOLOGY						(9)	
Drone Concept-Vocabulary Terminology-History of drone-Types of current generation of drones based on their method of propulsion-Drone technology impact on the businesses-Drone business through entrepreneurship-Opportunities/applications for entrepreneurship and Employability								
UNIT - II	DRONE DESIGN, FABRICATION AND PROGRAMMING						(9)	
Classifications of the UAV -Overview of the main drone parts- Technical characteristics of the parts - Function of the component parts -Assembling a drone- The energy sources- Level of autonomy- Drones configurations -The methods of programming drone- Download program - Install program on computer- Running Programs- Multi rotor stabilization- Flight modes -Wi-Fi connection.								
UNIT - III	DRONE FLYING AND OPERATION						(9)	
Concept of operation for drone -Flight modes- Operate a small drone in a controlled environment- Drone controls Flight operations -management tool -Sensors-Onboard storage capacity -Removable storage devices- Linked mobile devices and applications.								
UNIT - IV	DRONE COMMERCIAL APPLICATIONS						(9)	
Choosing a drone based on the application -Drones in the insurance sector- Drones in delivering mail, parcels and other cargo- Drones in agriculture- Drones in inspection of transmission lines and power distribution -Drones in filming and panoramic picturing								
UNIT - V	FUTURE DRONES AND SAFETY						(9)	
The safety risks- Guidelines to fly safely -Specific aviation regulation and standardization- Drone license- Miniaturization of drones- Increasing autonomy of drones -The use of drones in swarms								
Total(L: 45 ,SL:45) : 90 Periods								
COURSE OUTCOMES:								
At the end of the course, the learners will be able to:								
COs	Course Outcome	Cognitive Level						
CO1	To Know about a various type of Drone technology, drone fabrication and programming	Remember						
CO2	To Execute the suitable operating procedures for functioning a Drone	Apply						
CO3	To Select appropriate sensors and actuators for Drones	Analyze						
CO4	To Develop Drone mechanism for specific applications	Create						
CO5	To Create the programs for various Drones	Create						
TEXT BOOKS:								



1.	Daniel Tal and John Altschuld, "Drone Technology in Architecture, Engineering and Construction: A Strategic Guide to Unmanned Aerial Vehicle Operation and Implementation", 2021 John Wiley & Sons, Inc.
2.	Terry Kilby and Belinda Kilby, "Make: Getting Started with Drones ", Maker Media, Inc,
REFERENCES:	
1.	John Baichtal, "Building Your Own Drones: A Beginners' Guide to Drones, UAVs, and ROVs", Que Publishing, 2016
2.	Zavrsnik, "Drones and Unmanned Aerial Systems: Legal and Social Implications for Security and Surveillance", Springer, 2018.

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	3	3	3	-	-	-	-	-	3	3	3
CO2	3	3	3	3	3	-	-	-	-	-	3	3	3
CO3	3	3	3	3	3	-	-	-	-	-	3	3	3
CO4	3	3	3	3	3	-	-	-	-	-	3	3	3
CO5	3	3	3	3	3	-	-	-	-	-	3	3	3
Avg.	3	3	3	3	3	-	-	-	-	-	3	3	3
1-Low, 2-Medium, 3-High													


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24ECO02	WEARABLE DEVICES	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
OBJECTIVES:							
To study the fundamentals of wearable systems, sensors, and smart textiles, including their structure, working principles, and fabrication techniques and to provide learners with the applications of wearable systems in medical diagnostics, patient monitoring, gait analysis, neural recording, and sports medicine.							
UNIT - I	INTRODUCTION TO WEARABLE SYSTEMS AND SENSORS	(9)					
Wearable Systems- Introduction, Need for Wearable Systems, Drawbacks of Conventional Systems for Wearable Monitoring, Applications of Wearable Systems, Types of Wearable Systems, Components of wearable Systems. Sensors for wearable systems-Inertia movement sensors, Respiration activity sensor, Inductive plethysmography, Impedance plethysmography, pneumography, Wearable ground reaction force sensor.							
UNIT - II	SIGNAL PROCESSING AND ENERGY HARVESTING FOR WEARABLE DEVICES	(9)					
Wearability issues -physical shape and placement of sensor, Technical challenges - sensor design, signal acquisition, sampling frequency for reduced energy consumption, Rejection of irrelevant information. Power Requirements- Solar cell, Vibration based, Thermal based, Human body as a heat source for power generation, Hybrid thermoelectric photovoltaic energy harvests, Thermopiles.							
UNIT - III	WIRELESS HEALTH SYSTEMS	(9)					
Need for wireless monitoring, Definition of Body area network, BAN and Healthcare, Technical Challenges- System security and reliability, BAN Architecture - Introduction, Wireless communication Techniques.							
UNIT - IV	SMART TEXTILE	(9)					
Introduction to smart textile- Passive smart textile, active smart textile. Fabrication Techniques- Conductive Fibres, Treated Conductive Fibres, Conductive Fabrics, Conductive Inks. Case study- smart fabric for monitoring biological parameters - ECG, respiration.							
UNIT - V	APPLICATIONS OF WEARABLE SYSTEMS	(9)					
Medical Diagnostics, Medical Monitoring-Patients with chronic disease, Hospital patients, Elderly patients, neural recording, Gait analysis, Sports Medicine.							
Total(L: 45 ,SL:45) : 90 Periods							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	To understand the fundamentals, need, types, components, and working principles of wearable systems.	Understand					
CO2	To interpret wearability issues, signal processing challenges, and power requirements, including energy harvesting techniques.	Understand					
CO3	To apply the principles of wireless monitoring and Body Area	Apply					

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	Networks to design basic healthcare monitoring systems for patients.	
CO4	To develop the concepts of passive and active smart textiles to select appropriate materials for wearable sensing applications.	Apply
CO5	To organize wearable sensing techniques for neural recording, gait analysis, and sports medicine to assess human health and performance.	Apply

TEXT BOOKS:

1. Annalisa Bonfiglio and Danilo De Rossi, "Wearable Monitoring Systems", Springer, Boston, 2011
2. Zhang and Yuan-Ting, "Wearable Medical Sensors and Systems", Springer, Boston, 2013.

REFERENCES:

1. Edward Sazonov and Micheal R Neuman, "Wearable Sensors: Fundamentals, Implementation and Applications", Elsevier, New York, 2014.
2. Sandeep K.S., Gupta, Tridib Mukherjee and Krishna Kumar Venkatasubramanian, "Body Area Networks Safety, Security, and Sustainability", Cambridge University Press, New York, 2013.
3. Guang-Zhong Yang, "Body Sensor Networks", Springer, Boston, 2006.
4. Mehmet R. Yuce and Jamil Y.Khan, "Wireless Body Area Networks Technology, Implementation Applications", Pan Stanford Publishing Pvt.Ltd, Singapore, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	1	2	-	-	1	-	-	-	-	2	2
CO2	3	2	1	1	2	-	-	1	-	-	-	-	2	2
CO3	3	2	1	1	2	-	-	1	-	-	-	-	2	2
CO4	3	2	1	1	2	-	-	1	-	-	-	-	2	2
CO5	3	2	1	1	2	-	-	1	-	-	-	-	2	2
Avg.	3	2	1	1	2	-	-	1	-	-	-	-	2	2

1-low, 2-medium, 3-high

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24ECO03	5G /6G COMMUNICATION	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
OBJECTIVES: To understand the evolution of wireless communication systems, including 5G and emerging 6G technologies. It covers 5G architecture, dynamic spectrum sharing, millimeter-wave communication, and the fundamental components of 6G, along with an evaluation of security features in next-generation networks.								
UNIT - I	EVOLUTION OF WIRELESS NETWORKS							(9)
Evolution of mobile networks: 1G to 6G - evolution of radio access networks - Evolving LTE to 5G Capability - 5G NR and 5G Core Network (5GCN) - 5G Standardization - 5G Architecture - Spectrum for 5G - 5G Deployment - Options, Challenges and Applications.								
UNIT - II	NETWORK ARCHITECTURE AND THE PROCESSES							(9)
5G core network architecture - 5G new radio and cloud technologies - Radio Access Technologies (RATs) - EPC for 5G - network slicing - multi access edge computing (MEC) visualization of 5G Components - end-to-end system architecture - service continuity - 5G protocols: 5G NAS, NGAP, GTP-U, IPSec and GRE.								
UNIT - III	DYNAMIC SPECTRUM MANAGEMENT AND MM-WAVES							(9)
Mobility management - Command and control - spectrum sharing and spectrum trading - millimeter waves - Small cell deployment - densification - OFDM variants, waveform design - Beam forming & massive MIMO - Carrier aggregation & Dynamic Spectrum Sharing (DSS)								
UNIT - IV	6G WIRELESS NETWORKS							(9)
6G Vision and Key Technologies - Need for 6G - 5G versus 6G - 6G Network Architecture - AI and Machine Learning (AI/ML) Integration for 6G - Digital twins for networks - THz communication fundamentals - Channel modeling & transceiver architectures - Visible Light Communication (VLC) & LiFi								
UNIT - V	SECURITY & PRIVACY IN 5G/6G							(9)
Security features in 5G networks - network domain security - user domain security - flow based QoS Framework - mitigating the threats in 5G - Threats in virtualized and cloud-native networks - Post-quantum cryptography - Blockchain in 6G - Security for IoT & massive machine networks								
Total(L: 45 ,SL:45) : 90 Periods								
COURSE OUTCOMES: At the end of the course, the students will be able to								
COs	Course Outcome	Cognitive Level						
CO1	Explain the evolution of wireless networks	Understand						
CO2	Describe the concepts of 5G networks architecture	Understand						
CO3	Realize the dynamic spectrum and mm waves with 5G networks	Apply						
CO4	Implement the concept of 6G wireless networks in Communication	Apply						
CO5	Examine the security aspects in 5G and 6G networks	Analyze						
TEXT BOOKS:								



1. Erik Dahlman, Stefan Parkvall, Johan Skold "5G NR: The Next Generation Wireless Access Technology", 2018.
2. Saad Z. Asif "5G Mobile Communications Concepts and Technologies", CRC Press - Taylor and Francis Group, 2018.

- REFERENCES:**
1. Benny Bing, "5G and 6G Technologies and Applications: An Introduction to the New Wireless Frontiers".
 2. Saro Velrajan, "An Introduction to 5G Wireless Networks: Technology, Concepts and Use-cases, Thomson Learning, Ninth Edition Reprint, 2020.
 3. Syed Farrukh Hassan, Alexander Orel, Kashif Islam, "A Network Architect's Guide to 5G, Pearson 1st Edition, 2023.
 4. https://onlinecourses.nptel.ac.in/noc25_ee88

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO2
CO1	3	1	3	3	3	2	-	-	-	-	1	1	1
CO2	3	2	3	3	3	3	-	-	-	-	1	2	2
CO3	3	3	3	3	3	3	-	-	-	-	1	2	2
CO4	3	3	3	3	3	3	-	-	-	-	1	2	2
CO5	3	3	3	3	3	3	1	-	-	-	1	2	2
Avg.	3	3	3	3	3	3	1	-	-	-	1	2	2

1-low, 2-medium, 3-high

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24ECO04	EMBEDDED IoT	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
OBJECTIVES:							
To provide students with a strong understanding of embedded system design methodologies, ARM processor architecture, and real-time processing concepts. It also introduces the architecture and design flow of IoT, enabling learners to design and implement IoT-based applications effectively.							
UNIT - I	INTRODUCTION TO EMBEDDED SYSTEM DESIGN	(9)					
Complex systems and microprocessors- Embedded system design process -Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis - Specifications-System analysis and architecture design - Quality Assurance techniques -Designing with computing platforms - consumer electronics architecture -platform-level performance analysis.							
UNIT - II	ARM PROCESSOR & EMBEDDED PROGRAMMING	(9)					
ARM Architecture Versions - ARM Architecture - Instruction Set - Stacks and Subroutines - Features of the LPC 214X Family - UART - Block Diagram of ARM9 and ARM Cortex M3 MCU. Models for programs - Assembly, Linking and Loading - Compilation Techniques - Program Level Performance Analysis.							
UNIT - III	PROCESSES AND OPERATING SYSTEMS	(9)					
Structure of a real - time system - Task Assignment and Scheduling - Multiple Tasks and Multiple Processes - Multirate Systems - Pre emptive real - time Operating systems - Priority based scheduling - Interprocess Communication Mechanisms - Distributed Embedded Systems - MPSoCs and Shared Memory Multiprocessors - Design Example - Audio Player, Engine Control Unit and Video Accelerator.							
UNIT - IV	IOT ARCHITECTURE AND PROTOCOLS	(9)					
Internet - of - Things - Physical Design, Logical Design - IoT Enabling Technologies - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF - YANG - IoT Platform Design - Methodology - IoT Reference Model - Domain Model - Communication Model - IoT Reference Architecture - IoT Protocols - MQTT, XMPP, Modbus, CANBUS and BACNet.							
UNIT - V	IOT SYSTEM DESIGN	(9)					
Basic building blocks of an IoT device - Raspberry Pi - Board - Linux on Raspberry Pi - Interfaces- Programming with Python - Case Studies: Home Automation, Smart Cities, Environment and Agriculture.							
Total(L: 45 ,SL:45) : 90 Periods							
COURSE OUTCOMES:							
At the end of the course, the learners will be able to:							
COs	Course Outcome	Cognitive Level					
CO1	Explain embedded system design methodologies and their role in developing microprocessor-based systems.	Understand					
CO2	Apply embedded programming techniques to write and test code for ARM-based systems.	Apply					
CO3	Describe RTOS concepts including task scheduling and communication in real-time systems.	Understand					
CO4	List IoT architectures and describe the function of common IoT protocols such as MQTT and Modbus.	Remember					
CO5	Implement simple IoT applications using Raspberry Pi, Python, and sensors for basic automation tasks.	Apply					

TEXT BOOKS:													
1.	Marilyn Wolf, Computers as Components – Principles of Embedded Computing System Design, Third Edition, Morgan Kaufmann, 2012.(Unit – I,II,III)												
2.	Arshdeep Bahga, Vijay Madiseti, Internet – of- Things – A Hands on Approach, Universities Press, 2015.(Unit – IV,V)												
REFERENCES:													
1	Mayur Ramgir, Internet – of – Things, Architecture, Implementation and Security, First Edition, Pearson Education, 2020.												
2	Lyla B.Das, Embedded Systems: An Integrated Approach, Pearson Education 2013.												
3	Jane.W.S .Liu, Real – Time Systems, Pearson Education, 2003.												
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO 11	PSO1	PSO2
CO1	3	3	3	2	2	-	-	-	-	-	1	1	2
CO2	3	3	3	2	2	-	-	-	-	-	1	1	3
CO3	3	3	2	2	2	-	-	-	-	-	1	1	2
CO4	3	3	2	2	2	-	-	-	-	-	1	1	3
CO5	3	3	3	3	3	-	-	-	-	-	1	1	3
Avg.	3	3	3	2	2	-	-	-	-	-	1	1	2
1-low, 2-medium, 3-high													

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24ITO01	INTRODUCTION TO MOBILE APPLICATION DEVELOPMENT	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
Open Elective							
PREREQUISITE:							
Basic programming knowledge in C, C++, or Java and understanding of computer fundamentals. Familiarity with object-oriented concepts and problem-solving skills.							
OBJECTIVES:							
The course aims to provide basic knowledge of mobile computing and mobile platforms, introduce Android fundamentals, develop simple user interfaces, implement basic data storage and networking concepts, and enable students to test and deploy mobile applications.							
UNIT - I	BASICS OF MOBILE APPLICATION DEVELOPMENT						(9)
Fundamentals of mobile computing – Types of mobile applications – Mobile devices – Mobile operating systems – Introduction to Android – Mobile application structure – Development tools – Steps in mobile app development – Uses of mobile applications.							
UNIT - II	ANDROID FUNDAMENTALS						(9)
Fundamentals of Android - Features of Android – Android versions overview – Basic Android system structure – Introduction to Android Studio – Android project files and folders – Activities and screens – Intents for navigation – Running apps on emulator.							
UNIT - III	USER INTERFACE DESIGN						(9)
User interface basics – Android layouts – Views and widgets – Buttons and text fields – Image and list views – Event handling – Menus and dialogs – Toast messages – Simple UI design guidelines.							
UNIT - IV	DATA STORAGE AND NETWORKING						(9)
Need for data storage – Shared preferences – File storage – Introduction to SQLite – Simple database operations – Networking basics – Internet permissions – JSON data handling – Basic online data access.							
UNIT - V	APPLICATION TESTING AND DEPLOYMENT						(9)
Application permissions – Basic application security – Notifications in Android – Using device features – Testing mobile applications – Finding and fixing errors (debugging) – Generating APK files – Installing applications on mobile devices – Introduction to Google Play Store.							
L= 45, SL= 45, TOTAL = 90 PERIODS							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome						Cognitive Level
CO1	Explain the fundamentals of mobile computing, types of mobile applications, mobile platforms, and development tools						Understand
CO2	Identify the Android software stack and its system components. and also describe the Android application framework.						Understand
CO3	Understand the principles of user interface design in mobile application development to create simple, usable, and user-friendly mobile applications.						Understand
CO4	Describe the concepts of data storage and networking in mobile applications for storing, retrieving, and exchanging data efficiently and securely						Understand

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CO5	Apply testing and deployment techniques in mobile applications to identify defects, ensure functionality, and successfully release applications to target platforms.											Apply	
TEXT BOOKS:													
1	Wei-Meng Lee, "Beginning Android Application Development", Wiley, 1st Edition, 2011.												
2	Bill Phillips & Chris Stewart, "Android Programming: The Big Nerd Ranch Guide", Addison Wesley, 5th Edition, 2022.												
REFERENCES:													
1	Dawn Griffiths & David Griffiths, "Head First Android Development: A Learner's Guide to Building Android Apps with Kotlin", O'Reilly Media, 3rd Edition, 2021.												
2	John Horton, "Android Programming for Beginners", Packt Publishing, 3rd Edition, 2021.												
3	Ian F. Darwin, "Android Cookbook: Problems and Solutions for Android Developers", O'Reilly Media, 2nd edition, 2017.												
4	Erik Hellman, "Android Programming", Wiley, 1st Edition, 2014.												
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-
1- Low, 2 - Medium, 3 - High													

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24ITO02	FUNDAMENTALS OF BIG DATA ANALYTICS	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
Open Elective							
PREREQUISITE: Basic knowledge of programming concepts and database fundamentals. Familiarity with statistics and computer systems is recommended.							
OBJECTIVES: The course aims to introduce students to the fundamentals of big data, its characteristics, processing frameworks, and analytical techniques, enabling them to understand big data ecosystems and apply basic tools for data storage, processing, and analysis.							
UNIT – I	INTRODUCTION TO BIG DATA						(9)
Introduction to Big Data – Evolution of data and data growth – Characteristics of Big Data (5Vs)– Types of data – Big Data vs Traditional Data – Sources of Big Data – Challenges in Big Data – Applications of Big Data – Big Data Analytics overview.							
UNIT – II	BIG DATA ARCHITECTURE AND ECOSYSTEM						(9)
Big Data architecture overview – Distributed computing concepts – Hadoop ecosystem overview – Hadoop Distributed File System (HDFS) – Map Reduce programming model – YARN architecture – Data ingestion tools – Data storage tools – Big Data workflow.							
UNIT – III	BIG DATA PROCESSING FRAMEWORKS						(9)
Batch processing concepts – Real-time data processing – Apache Hadoop framework – Apache Spark architecture – Spark RDDs and Data Frames – Introduction to Hive – Pig – HBase – Comparison of processing frameworks.							
UNIT – IV	BIG DATA ANALYTICS TECHNIQUES						(9)
Introduction to data analytics – Descriptive analytics – Diagnostic analytics – Predictive analytics – Prescriptive analytics – Basic statistical analysis – Data visualization concepts – Introduction to machine learning – Use cases of analytics.							
UNIT – V	APPLICATIONS AND TOOLS OF BIG DATA						(9)
Big Data in business analytics– Healthcare – Social media– IoT – Finance – Security and privacy – Ethical issues in Big Data – Emerging trends in Big Data – Case studies.							
L= 45, SL= 45, TOTAL = 90 PERIODS							
COURSE OUTCOMES: At the end of the course, the students will be able to:							
COs	Course Outcome						Cognitive Level
CO1	Understand the fundamental concepts, characteristics, and importance of Big Data and its role in modern data driven applications and decision making.						Understand
CO2	Explain the architecture and ecosystem of Big Data, including the key components, tools, and technologies used for large-scale data storage and processing.						Understand
CO3	Describe Big Data processing frameworks and their role in efficient large scale data processing and analysis.						Understand

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CO4	Understand Big Data analytics techniques used to extract meaningful insights and patterns from large and complex datasets	Understand
CO5	Apply Big Data applications and tools to process, analyze, and solve real-world problems using large and diverse datasets.	Apply

TEXT BOOKS:

- 1 Seema Acharya & Subhashini Chellappan, “Big Data and Analytics Wiley India”, 2nd Edition, 2019.
- 2 Tom White, “Hadoop: The Definitive Guide”, O’Reilly Media, 4th Edition, 2015.

REFERENCES:

- 1 Viktor Mayer Schönberger & Kenneth Cukier, “Big Data: A Revolution That Will Transform How We Live, Work, and Think”, Houghton Mifflin Harcourt, 1st edition Reprint, 2025.
- 2 Anand Rajaraman & Jeffrey Ullman, “Mining of Massive Datasets”, Cambridge University Press, 3 rd edition, 2020.
- 3 Arshdeep Bahga & Vijay Madisetti, “Big Data Science & Analytics”, VPT, 2016.
- 4 Eric Sammer, “Hadoop Operations”, O’Reilly Media, 2012.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2		-	-	-	-	-	-	-	-	-	-
CO2	3	2		-	-	-	-	-	-	-	-	-	-
CO3	2	2		-	-	-	-	-	-	-	-	-	-
CO4	3	2		-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-

1 – Low, 2 – Medium, 3 – High

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24ITO03	AUGMENTED REALITY / VIRTUAL REALITY (AR/VR)	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
Open Elective								
PREREQUISITE: Basic programming knowledge (C, C++, or Java), understanding of computer fundamentals, and familiarity with object-oriented programming and basic graphics concepts.								
OBJECTIVES: The course aims to provide students with a fundamental understanding of AR and VR concepts, devices, and software tools, and to enable them to design basic immersive applications while exploring practical AR/VR solutions in various fields.								
UNIT – I	BASICS OF AR AND VR							(9)
Introduction to Augmented Reality – Virtual Reality – Differences between AR, VR, and Mixed Reality – History and evolution of AR and VR – Components of AR/VR systems – Types of AR/VR applications – Key concepts: Immersion and Presence – Advantages and limitations of AR/VR – Future trends and emerging technologies.								
UNIT – II	AR / VR DEVICES							(9)
Overview of AR and VR devices – VR headsets – AR glasses – Mobile devices for AR – Sensors and tracking systems – Input devices – Haptic devices and feedback systems – Display technologies – Limitations and challenges of AR/VR devices.								
UNIT – III	AR / VR SOFTWARE TOOLS							(9)
Introduction to AR/VR development software – Unity 3D for AR/VR development – Unreal Engine for immersive applications – AR SDKs: AR Core and AR Kit – SDK for AR applications – 3D modelling basics and software – Scene creation and asset integration – Testing and simulation tools – Deployment of AR/VR applications.								
UNIT – IV	DESIGNING AR/VR EXPERIENCES							(9)
Principles of immersive design – User interaction and interface design – Storyboarding and scenario creation – Audio and visual effects in AR/VR – 3D environment layout and scene composition – Motion and navigation in virtual environments – Usability and user comfort considerations – Safety guidelines for VR experiences – Best practices for effective AR/VR design.								
UNIT – V	APPLICATIONS OF AR/VR							(9)
AR/VR in gaming and entertainment – Education and training – Healthcare and medicine – Industry and manufacturing – Architecture and construction – Marketing and retail – Tourism and travel – Military and defines – Emerging trends and future applications.								
L= 45, SL= 45, TOTAL = 90 PERIODS								

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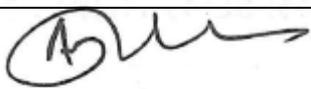


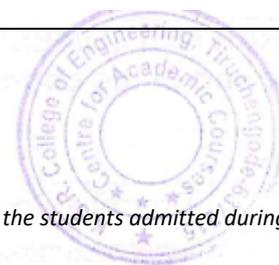
COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Describe the fundamental concepts, components, and functioning of Augmented Reality (AR) and Virtual Reality (VR) technologies.											Understand	
CO2	Illustrate the different AR and VR devices, their functionalities, and how they support immersive interactions.											Understand	
CO3	Explain the AR and VR software tools, their features, and how they are used to develop immersive applications.											Understand	
CO4	Describe the principles and methods for creating AR / VR experiences that deliver interactive and immersive user engagement.											Understand	
CO5	Apply AR / VR technologies to develop practical applications in areas like gaming, education, healthcare, and industry for interactive user experiences.											Apply	
TEXT BOOKS:													
1 Tony Thomas, Ravi Prakash, "Augmented and Virtual Reality: Theory and Practice", Wiley, India, 1 st edition, 2025. 2 Tony Parisi, "Learning Virtual Reality: Developing Immersive Experiences and Applications for Desktop, Web, and Mobile", O'Reilly Media, 1st Edition, 2015.													
REFERENCES:													
1 Alan B. Craig, "Understanding Augmented Reality: Concepts and Applications", Morgan Kaufmann, 1st edition, 2013. 2 Paul Mealy, "Virtual & Augmented Reality", Wiley pUBLICATION, India, 2018. 3 Jesse Glover & Jonathan Linowes, "Complete Virtual Reality and Augmented Reality Development with Unity", Packt Publishing, 1st edition, 2019. 4 Jonathan Linowes & Krystian Babilinsk, "Augmented Reality for Developers", Packt Publishing, 1st Edition, 2017.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	3	2	-	-	-	-	-	-	-	-	-	-
1 – Low, 2 –Medium, 3 – High													

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24ME001	3D PRINTING	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
Open Elective								
OBJECTIVES: Understand 3D design considerations, materials for printing, post-processing methods, and industrial applications of additive manufacturing.								
UNIT - I	INTRODUCTION TO ADDITIVE MANUFACTURING						9	
Introduction to 3D printing – History and evolution – Comparison with conventional manufacturing – Additive manufacturing process chain – Classification of additive manufacturing processes – Applications – Advantages and limitations.								
UNIT - II	3D PRINTING PROCESSES						9	
Material extrusion (FDM/FFF) – Vat photo polymerization (SLA, DLP) – Powder bed fusion (SLS, SLM, EBM) – Material jetting – Binder jetting – Sheet lamination – Directed energy deposition – Process selection criteria.								
UNIT - III	MATERIALS FOR 3D PRINTING						9	
Polymers for additive manufacturing – Metals and alloys – Ceramics – Composites – Material properties and selection – Feedstock forms – Material qualification and standards.								
UNIT - IV	DESIGN FOR ADDITIVE MANUFACTURING						9	
CAD modeling for 3D printing – File formats (STL, AMF, 3MF) – Part orientation and support structures – Design guidelines – Topology optimization – Lattice structures – Reverse engineering.								
UNIT - V	POST-PROCESSING, QUALITY AND APPLICATIONS						9	
Post-processing techniques – Heat treatment – Surface finishing – Dimensional accuracy and tolerances – Testing and inspection – Defects in additive manufacturing – Industrial applications – Rapid prototyping, tooling, medical and aerospace applications – Future trends in additive manufacturing.								
L: 45: SL:45 TOTAL: 90								
COURSE OUTCOMES: At the end of the course, the students will be able to:								
COs	Course Outcome						Cognitive Level	
CO1	Interpret the evolution, principles, advantages, and limitations of additive manufacturing technologies.						Understand	
CO2	Explain various additive manufacturing processes and their appropriate applications.						Understand	
CO3	Describe the properties and selection criteria of materials used in 3D printing.						Understand	
CO4	Illustrate design considerations and digital tools employed in additive manufacturing.						Understand	
CO5	Summarize post-processing methods, quality aspects, and industrial applications of 3D printing.						Understand	


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TEXT BOOKS:

1. Dr. Kothari, Additive Manufacturing and 3D Printing Technology, CRC Pr I Llc; 1st edition (11 February 2021).
2. Gibson, I., Rosen, D.W., and Stucker, B., *Additive Manufacturing Technologies*, 3rd Edition, Springer, 2021.

REFERENCES:

1. Chua, C.K. and Leong, K.F., *3D Printing and Additive Manufacturing*, 5th Edition, World Scientific Publishing, 2023
2. Ngo, T.D., Kashani, A., Imbalzano, G., Nguyen, K.T.Q., and Hui, D., *Additive Manufacturing: Materials, Methods and Applications*, 1st Edition, Elsevier, 2024.

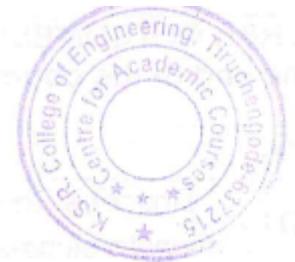
Mapping of COs with POs and PSOs

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-

1-low, 2-medium, 3-high

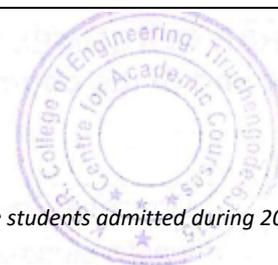


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24ME002	ROBOTICS AND AUTOMATION	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
Open Elective								
OBJECTIVES: Provide fundamental knowledge of robotics and automation system in robot structure, motion, sensing, control principles, and automation applications.								
UNIT - I	INTRODUCTION TO ROBOTICS						9	
Definition and classification of robots – History and evolution of robotics – Robot anatomy – Robot configurations (Cartesian, Cylindrical, Spherical, SCARA, Articulated) – Degrees of freedom – Coordinate systems – Work envelope – Robot specifications and selection – Applications of industrial robots.								
UNIT - II	ROBOT KINEMATICS						9	
Forward and inverse kinematics – Homogeneous transformation matrices – Denavit–Hartenberg (D–H) parameters – Position and orientation representation – Velocity kinematics – Jacobian matrix – Singularities – Workspace analysis.								
UNIT - III	ROBOT DYNAMICS AND CONTROL						9	
Robot dynamics – Lagrange and Newton–Euler formulations – Forces and torques in robot joints – Trajectory planning – Joint space and Cartesian space control – Open loop and closed loop control – Servo control systems – Robot motion control strategies.								
UNIT - IV	SENSORS AND END EFFECTORS						9	
Robot sensors – Classification of sensors – Position, velocity and force sensors – Proximity and vision sensors – Machine vision system – Image processing basics – End effectors – Grippers (mechanical, pneumatic, hydraulic, magnetic, vacuum) – Tooling and applications.								
UNIT - V	AUTOMATION AND ROBOT APPLICATIONS						9	
Automation concepts – Fixed, programmable and flexible automation – CNC and robotic automation – Automated material handling systems – PLC basics and role in automation – Robot programming methods – Safety considerations in robotics – Industrial applications of robots in manufacturing, assembly, welding, painting, and inspection.								
L: 45: SL:45 TOTAL: 90								
COURSE OUTCOMES: At the end of the course, the students will be able to:								
COs	Course Outcome	Cognitive Level						
CO1	Describe the basic concepts, classification, structure, and industrial significance of robotic systems.	Understand						
CO2	Illustrate the principles used to determine position, orientation, and motion of mechanical manipulators.	Understand						
CO3	Explain the concepts governing forces, torques, trajectories, and control strategies used in motion control.	Understand						
CO4	Explain the role of sensing elements and end devices in achieving accurate manipulation and interaction.	Understand						
CO5	Describe the integration of automated systems in manufacturing environments and their impact on productivity and safety.	Understand						

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REFERENCES:

1. Kumar, K. and Babu, B.S., Industrial Automation and Robotics: Techniques and Applications, 1st Edition, CRC Press (Taylor & Francis Group), 2024.
2. Fu, K.S., Gonzalez, R.C., and Lee, C.S.G., Robotics: Control, Sensing, Vision and Intelligence, 2nd Edition, McGraw Hill Education, 2023
3. Mittal, R.K. and Nagrath, I.J., Robotics and Control, 3rd Edition, Tata McGraw Hill, 2022.

Mapping of COs with POs and PSOs

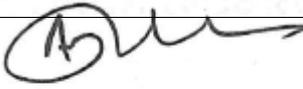
CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-

1-low, 2-medium, 3-high

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24MEO03	LEAN MANUFACTURING	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
Open Elective							
OBJECTIVES:							
Implement lean manufacturing concepts in the factories and Understand the distinction between mass and lean production to assess the difference in a manufacturing environment.							
UNIT - I	INTRODUCTION TO LEAN MANUFACTURING					9	
The mass production system – Origin of lean production system – Necessity – Lean revolution in Toyota – Systems and systems thinking – Basic image of lean production – Customer focus – Muda (waste).							
UNIT - II	STABILITY OF LEAN SYSTEM:					9	
Standards in the lean system – 5S system – Total Productive Maintenance – standardized work – Elements of standardized work – Charts to define standardized work – Man power reduction – Overall efficiency - standardized work and Kaizen – Common layouts.							
UNIT - III	JUST IN TIME					9	
Principles of JIT – JIT system – Kanban – Kanban rules – Expanded role of conveyance – Production levelling – Pull systems – Value stream mapping.							
UNIT - IV	JIDOKA (AUTOMATION WITH A HUMAN TOUCH					9	
Jidoka concept – Poka-Yoke (mistake proofing) systems – Inspection systems and zone control – Types and use of Poka-Yoke systems – Implementation of Jidoka.							
UNIT - V	WORKER INVOLVEMENT AND SYSTEMATIC PLANNING METHODOLOGY					9	
Involvement – Activities to support involvement – Quality circle activity – Kaizen training - Suggestion Programmes – Hoshin Planning System (systematic planning methodology) – Phases of Hoshin Planning – Lean culture.							
L: 45: SL:45 TOTAL: 90							
COURSE OUTCOMES:							
At the end of the course, the students will be able to:							
COs	Course Outcome					Cognitive Level	
CO1	Describe the evolution, necessity, customer orientation, and waste elimination philosophy of modern manufacturing systems.					Understand	
CO2	Explain the role of standardization, workplace organization, maintenance practices, and efficiency improvement in achieving					Understand	
CO3	Illustrate flow-based production principles and material control methods used to minimize inventory and lead time.					Understand	
CO4	Explain defect prevention, inspection approaches, and human-centered automation techniques for quality assurance					Understand	
CO5	Describe employee participation methods and structured planning approaches used to sustain continuous improvement					Understand	


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TEXT BOOKS:

1. Dennis P.,” Lean Production Simplified: A Plain-Language Guide to the World's Most Powerful Production System”, (Second edition), Productivity Press, New York,2007.
2. Liker, J., “The Toyota Way: Fourteen Management Principles from the World’s Greatest Manufacturer”, McGraw Hill, 2004.

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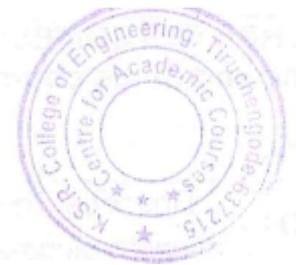
1. Michael, L.G., “Lean Six SIGMA: Combining Six SIGMA Quality with Lean Production Speed”, McGraw Hill, 2002.
2. Ohno, T.,” Toyota Production System: Beyond Large-Scale Production”, Taylor & Francis, Inc., 1988.
3. Rother, M., and Shook, J.,’ Learning to See: Value Stream Mapping to Add Value and Eliminate MUDA”, Lean Enterprise Institute, 1999.

Mapping of COs with POs and PSOs

CO/ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PS01	PS02
CO1	3	2	-	-	-	-	-	-	-	-	-	-	-
CO2	3	2	-	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-	-

1-low, 2-medium, 3-high


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24SFO01	OCCUPATIONAL HEALTH AND SAFETY	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Fundamental understanding of industrial processes, machines, and workplace environments.							
OBJECTIVES: Introduce the fundamental concepts of Occupational Health and Safety (OHS) and its importance in industrial environments.							
UNIT – I	INTRODUCTION TO OCCUPATIONAL HEALTH & SAFETY	(9)					
Definition, scope, and importance of OHS-Types of workplace hazards: Physical, Chemical, Biological, Ergonomic, Psychosocial-Accident causation models: Domino Theory, Human Factors Theory, Energy Release Theory-Occupational diseases: Pneumoconiosis, Silicosis, Asbestosis, Dermatitis, Hearing loss-Industrial hygiene and exposure limits (TLV, PEL)-Personal Protective Equipment (PPE): Types and selection criteria.							
UNIT – II	HAZARD IDENTIFICATION & RISK ASSESSMENT (HIRA)	(9)					
Hazard identification techniques: Checklists, HAZOP, What-if analysis, FMEA-Risk assessment tools: Risk matrix, fault tree analysis, event tree analysis-Chemical hazard classification (GHS)-Fire & explosion hazards, flammability limits-Toxicology basics: Routes of entry, dose-response-Control of hazards: Engineering, administrative, PPE.							
UNIT – III	OCCUPATIONAL SAFETY PRACTICES AND CONTROLS	(9)					
Machine safety: Guards, interlocks, Two Hand Operation, Light curtain sensors, emergency stops-Electrical safety: Shock, arc flash, grounding, LOTO-Safety in welding, cutting, material handling-Noise and vibration control, thermal stress, heat exposure-Ventilation, lighting, housekeeping standards-Confined space safety and permit-to-work system-Safety signs, color codes, alarms.							
UNIT – IV	SAFETY MANAGEMENT SYSTEMS & LEGISLATION	(9)					
Safety Management System (SMS) components-Safety policy, objectives, safety committees-National legislation: Factories Act 1948 (safety, health, welfare provisions):Workmen’s Compensation Act, Environmental Protection Act, International standards: OSHAS 18001 / ISO 45001-ILO conventions-Safety audits and inspections-Documentation and recordkeeping.							
UNIT – V	ACCIDENT INVESTIGATION, EMERGENCY & DISASTER MANAGEMENT	(9)					
Accident investigation steps, data collection, root cause analysis-Accident reporting, cost of accidents, safety performance indicators-Emergency preparedness: Fire safety, evacuation plans-Disaster management: On-site and Off-site emergency plans-First aid and CPR basics-Human factors and ergonomics in accident prevention-Case studies of industrial accidents (Bhopal, Chernobyl, Fukushima).							
L=45, SL=45, TOTAL = 90 PERIODS							

COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Illustrate the fundamentals, scope, and importance of Occupational Health & Safety (OHS) and classify different types of workplace hazards and occupational diseases.	Understand
CO2	Interpret chemical, fire, and explosion risks using industrial hygiene principles and toxicology basics.	Understand
CO3	Implement appropriate safety practices and engineering controls for machines, electrical systems, welding, material handling, noise control, ventilation, confined spaces, and workplace environmental conditions.	Understand
CO4	Describe and interpret Safety Management System (SMS) components, national safety legislation (Factories Act, EPA, Workmen's Compensation), and international standards (ISO 45001, OSHAS 18001), including safety audit and documentation practices.	Understand
CO5	Outline industrial accidents using systematic methods, perform root cause analysis, evaluate cost of accidents and safety performance indicators, and disaster management strategies effectively.	Understand

TEXT BOOKS:

1. R.K. Jain and Sunil S. Rao, Industrial Safety, Health and Environment Management Systems, Khanna Publishers, 2nd Edition, 2012.
2. Frank E. McElroy, Occupational Health and Safety Management, CRC Press, 1st Edition, 1996.

REFERENCES:

1. Hughes & Ferrett, Introduction to Health and Safety at Work, Elsevier, 7th Edition, 2011.
2. ILO Encyclopaedia of Occupational Health and Safety, 4th Edition, 1998.
3. D.L. Goetsch, Occupational Safety and Health for Technologists, Engineers, and Managers, Pearson, 8th Edition, 2019.
4. Willie Hammer, Occupational Safety Management and Engineering, PHI, 6th Edition, 1978.

Mapping of COs with POs and PSOs

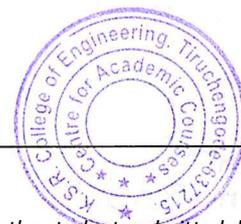
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	-	2	-	-
CO4	3	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	-	-	-	-	-	-	1	-	2	-	-

1-low, 2-medium, 3-high


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24SFO02	ELECTRICAL SAFETY	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Awareness of common industrial safety practices and basic hazard control principles.							
OBJECTIVES: To Provide foundational understanding of electrical hazards including electrocution, arc flash, energy leakage, insulation failure, and electrical causes of fire and explosion.							
UNIT – I	ELECTRICAL HAZARDS	(9)					
Review of Electrical Concept - Electrostatic - Electromagnetism - Electrical Hazards - Energy Leakage - Clearance and Insulation- Current Surges – Electrical Causes of Fire and Explosion – Human interface with electricity – Human resistance to electricity.							
UNIT – II	STANDARDS AND REQUIREMENTS	(9)					
National Electrical Safety Code – Standards and Statutory Requirement’s – Indian Electricity Act and Rules – Statutory requirements from electrical inspectorate – Hazardous Area and Classification of Electrical Equipment’s for Hazardous Area (IS, NFPA, API and OSHA Standards) – Intrinsically safe and explosion proof electrical equipment’s.							
UNIT – III	ELECTRICAL PROTECTION AND MAINTENANCE	(9)					
Selection of Environment, Protection and Interlock – Discharge rods and earthing device -Safety in the use of portable tools -Safety devices- RCCB, ELCB, Preventive maintenance – First Aid – Cardio Pulmonary Resuscitation – Electrical Shocks and their prevention.							
UNIT – IV	ELECTRICAL GROUNDING, EARTHING AND INSULATION	(9)					
Fuses - types - selection - Advantages and disadvantages. Grounding - Neutral Grounding - Solid Grounding - resistance Grounding - Arc Suppression Coil Grounding. Equipment grounding for Safety.- Grounding substation - Grounding of Line Structure. Earthing and bonding effect of electric and magnetic fields - Human safety aspects - effect of current and voltage on human beings - Insulation - Classes of Insulation - FRLS Insulation - Continuity test, Radiography test.							
UNIT – V	ELECTRICITY AND FIRE SAFETY	(9)					
Total quality control and Management, Importance of high load factor – Power factor improvement - equipment’s – Importance of P.F. Improvement. Personal Protective equipment’s used in safe usage of electricity like Hand Gloves, Rubber Shoes, Waist belt, earthing rod goggles etc. Static Electricity – Lightning Protection – Electrical Safety Audit, CO2 fire suppression system.							
L=45, SL=45, TOTAL = 90 PERIODS							



COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Illuminate fundamental electrical concepts, electrical hazards, insulation, current surges, and human interaction with electricity for identifying potential risks in electrical systems.	Understand
CO2	Interpret relevant electrical safety standards, statutory requirements, and classification of hazardous areas to ensure compliance in industrial and commercial installations.	Understand
CO3	Identify electrical protection systems, preventive maintenance practices, first aid measures, CPR procedures, and shock prevention techniques to enhance workplace electrical safety.	Understand
CO4	Inspect grounding, earthing, insulation types, and fuse characteristics to determine safe operational conditions and evaluate risks associated with electrical faults.	Understand
CO5	Outline safety procedures related to electricity and fire hazards, power factor improvement, PPE usage, static electricity, lightning protection, and electrical safety audits.	Understand

TEXT BOOKS:

1. Ray A. Jones & Jane G. Jones – Electrical Safety Handbook, McGraw-Hill, 6th Edition, 2021.
2. Hugh Hoagland, Michael F. M. Leach – Arc Flash Hazard Analysis and Electrical Safety, CRC Press, 3rd Edition, 2020.

REFERENCES:

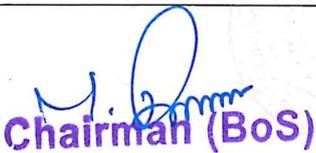
1. NFPA 70E – Standard for Electrical Safety in the Workplace, National Fire Protection Association, 2024 .
2. Electrical Safety Manual – Institute of Electrical and Electronics Engineers (IEEE), 2022.
3. John Cadick, Mary Capelli-Schellpfeffer, Dennis K. Neitzel – Electrical Safety: Safety Management and Practices, IEEE Press, 2nd Edition, 2018.
4. BIS Standards (IS 3043, IS 5216, IS 732) – Code of Practice for Earthing and Electrical Installations, 2019.

Mapping of COs with POs and PSOs

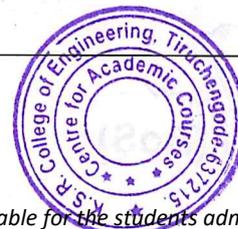
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	-	2	-	-
CO4	3	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	-	-	-	-	-	-	1	-	2	-	-

1-low, 2-medium, 3-high

24SFO03	BUILDING FIRE SAFETY	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of building construction, fire science fundamentals, heat transfer, electrical systems, and safety engineering principles. Familiarity with building drawings and national fire safety codes is desirable.							
OBJECTIVES: To provide fundamental knowledge on fire hazards in buildings, fire prevention measures, firefighting systems, and safe evacuation planning to ensure life and property protection.							
UNIT – I	BASIC BUILDING PLANNING AND DESIGN	(9)					
Process of emergency evacuation - special features of personnel movement. Parameter characteristics of the movement of people; Stages of evacuation; Planning and design of evacuation routes and exits; planning of seating arrangements in large assembly buildings.							
UNIT – II	NBC CODES FOR BUILDINGS	(9)					
Classification of buildings based on occupancy and type of construction according to fire resistance as per NBC; Fire zone; General fire safety requirements applicable to all individual occupancies. General exit requirements as per NBC; Internal staircases; horizontal exits; fire tower; ramps; fire lifts; external fire escape ladders; Planning of location and calculation of capacity, number and width of exit as per NBC for different occupancy classification.							
UNIT – III	FIRE PREVENTION AND BIS STANDARD	(9)					
Fire and life safety requirements in different groups of buildings-Hotel, Schools & Colleges, Hospitals, Theatres, shopping malls, etc., Fire protection and prevention in high rise buildings - Fire protection in underground structures and in buildings under construction. Sitting of detectors as per relevant Indian standard specifications; Selection and planning of alarm system as per relevant standards (BIS).							
UNIT – IV	FIRE PREVENTION AND BIS STANDARD	(9)					
Selection and distribution of portable extinguishers (for class A and B fires) and other fire protection equipment and systems for different occupancy classification as per NBC; Planning of fixed firefighting installation for different occupancy classification-sprinkler system; total flooding system; CO2 system; foam system; Fire Investigation; Detection of arson; Fire training and education - fire drill, fire order; Fire safety audits; Fire risk assessment.							
UNIT – V	FIRE SAFETY AND CODES	(9)					
Causes of fire in buildings. Stages of fire and how it spreads. Fire drill. Heat / fire / smoke detection. Alarm and extinguisher systems. Fire safety standards. General guidelines for egress design for multi-storey buildings. Understanding all the above through product literature/ field visits. Exercise on design of fire safety systems for different building types through choice, calculations, layout and drawings.							
L=45, SL=45, TOTAL = 90 PERIODS							


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COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Explain emergency evacuation processes, human movement characteristics, evacuation stages, and planning of evacuation routes, exits, and seating in assembly buildings.	Understand
CO2	Outline NBC provisions on building occupancy classification, fire resistance construction, fire zones, and exit systems including staircases, ramps, lifts, fire towers, and exit capacity calculations.	Understand
CO3	Illustrate fire and life safety requirements for various occupancies and BIS standards for detector placement and alarm system planning.	Understand
CO4	Describe the selection and application of portable extinguishers, fixed firefighting systems, fire investigation, arson detection, drills, audits, and risk assessment.	Understand
CO5	Interpret causes and stages of fire, fire spread, detection and alarm systems, extinguisher systems, and egress design guidelines for multi-storey buildings.	Understand

TEXT BOOKS:

- Butcher, E.G. and Parnell, A.C., Designing of fire safety. John Wiley and Sons Ltd., New York, U.S.A, 1983.
- Roytman, M. Ya., Principles of Fire Safety Standards for Building Construction, Amerind Publishing Co. Pvt. Ltd., New Delhi, 1975.

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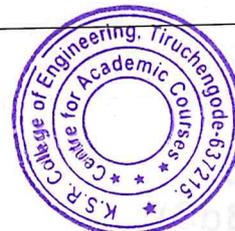
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- Jain, V.K., Fire Safety in Buildings, New Age International (P) Ltd., New Delhi, Second Edition, 2010.
- Huang, Kai, Population and Building Factors That Impact Residential Fire Rates in Large U.S. Cities, Applied Research Project, Texas State University.
- Life Safety Code Handbook, National Fire Protection Association, Lathrop, James K.Ed. NFPA, 1991.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	-	2	-	-
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CO5	3	2	-	-	-	-	-	-	1	-	2	-	-

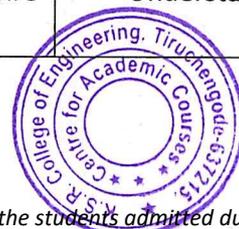
1-low, 2-medium, 3-high

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24SFO04	CONSTRUCTION SAFETY					Category	L	T	P	SL	C
						OEC	45	0	0	45	3
PREREQUISITE: basic knowledge in Building Construction Basics, Construction Equipment's, Environmental Awareness.											
OBJECTIVES: To Provide knowledge on basic safety concepts, accident causation, hazard identification, and risk assessment in construction projects.											
UNIT – I	INTRODUCTION									(9)	
Safety aspects of construction planning- Human factors in construction safety management. Roles of various groups in ensuring safety in construction industry.											
UNIT – II	SAFETY IN VARIOUS CONSTRUCTION OPERATIONS									(9)	
Excavation- underwater works- Ladders & Scaffolds - Tunneling- Blasting- Demolition- Pneumatic caissons- Confined Space-Temporary Structures. Indian Standards on construction safety- National Building Code Provisions on construction safety											
UNIT – III	SAFETY IN MATERIAL HANDLING EQUIPMENTS									(9)	
Storage & stacking of construction materials, Safety in the use of construction equipment's - Vehicles, Cranes, Tower Cranes, Lifting gears, Hoists & Lifts, Wire Ropes, Pulley blocks, Temporary power supply, Mixers, Conveyors, Pneumatic and hydraulic tools in construction.											
UNIT – IV	CONTRACT CONDITIONS ON SAFETY									(9)	
Health, Welfare, Social Security and Insurance. Application of ergonomics for construction safety.											
UNIT – V	CONTRACT LABOUR ACT AND CENTRAL RULES									(9)	
Buildings and other Construction Workers (RE & CS) Act and Central Rules. Provisions regarding Licensing, safety, health, welfare and social security aspects only.											
L=45, SL=45, TOTAL = 90 PERIODS											
COURSE OUTCOMES: At the end of the course, the learners will be able to:											
COs	Course Outcome									Cognitive Level	
CO1	Describe safety aspects in construction planning, human factors in safety management, and roles of stakeholders in construction safety.									Understand	
CO2	Explain safety procedures in excavation, underwater works, scaffolding, tunneling, blasting, demolition, pneumatic caissons, confined spaces, temporary structures, and relevant Indian Standards & NBC provisions.									Understand	
CO3	illustrate safety in storage, stacking, material handling, and operation of construction equipment such as cranes, hoists, lifts, vehicles, wire ropes, mixers, conveyors, and power tools.									Understand	


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CO4	Outline provisions related to health, welfare, social security, insurance, and ergonomics in construction safety.	Understand
CO5	Interpret provisions of Building & Other Construction Workers Act and Central Rules regarding licensing, safety, health, welfare, and social security.	Understand

TEXT BOOKS:

1. National Building Code of India, Bureau of Indian Standards, New Delhi, 2016.
2. Building & Other Construction Workers (RE &CS) Act and Central Rules, 1998.

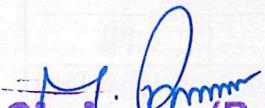
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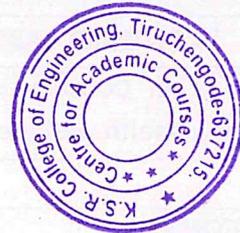
1. V.J. Davies & K. Tomasin, Construction Safety Handbook, Thomas Telford Publishing, London. 1990.
2. K.N. Vaid (Ed.), Construction Safety Management, National Institute of Construction Management and Research, Bombay, 1988.
3. James B. Fullman, Construction Safety, Security & Loss Prevention, John Wiley & Sons. 1984.
4. R.T. Ratay, Handbook of Temporary Structures in Construction, McGraw-Hill, 1984.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	-	2	-	-
CO4	3	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	-	-	-	-	-	-	1	-	2	-	-

1-low, 2-medium, 3-high


Chairman (BoS)



24EE001	SOLAR AND WIND ENERGY SYSTEM	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of physics and electrical engineering fundamentals such as energy concepts, electricity generation principles, and elementary circuit theory.							
OBJECTIVE: <ul style="list-style-type: none"> To provide fundamental knowledge on solar and wind energy systems and enable students to understand their principles, components, technologies, and applications for sustainable power generation. 							
UNIT - I	BASICS OF RENEWABLE, SOLAR AND WIND ENERGY	(9)					
Conventional and non-conventional energy sources – Need for renewable energy – Basics of solar energy – Solar radiation types and simple measurement methods – Basics of wind energy – Origin of wind, simple wind characteristics – Site selection for solar and wind installations.							
UNIT - II	SOLAR THERMAL ENERGY SYSTEMS	(9)					
Solar energy collectors: Flat Plate Collectors, Concentrating collectors – Solar energy storage systems – Solar Pond and applications – Applications of solar energy: Solar water heater principles, solar pumping, solar cooking, solar distillation and solar greenhouse.							
UNIT - III	PHOTOVOLTAIC ENERGY CONVERSION SYSTEM	(9)					
Basic photo voltaic system for power generation – Advantages and disadvantages of photo voltaic solar energy conversion – Application of solar photo voltaic system – Components of PV systems – Design of PV systems – Power conditioning and storage arrangement – Maximum Power Point Tracking (MPPT) – Introduction to string inverters.							
UNIT - IV	WIND ENERGY CONVERSION	(9)					
Wind resources – Nature and occurrence of wind – Power in the wind – Wind characteristics – Principles of wind energy conversions – Components of wind energy conversion system (WECS) – Classification of WECS – Wind energy collectors – Advantages and disadvantages of WECS.							
UNIT - V	WIND TURBINE TECHNOLOGIES	(9)					
Review of modern wind turbine technologies – Fixed and Variable speed wind turbine – Generators and their characteristics: Squirrel-cage Induction generator, Wound rotor motor induction generators, Doubly Fed Induction Generator, Synchronous Generators, Permanent Magnet Synchronous Generators.							
LECTURE: 45, SELF-LEARNING: 45, TOTAL: 90 PERIODS							
 Chairman (BoS) 							

COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Elucidate the concepts, characteristics, and site considerations of conventional and renewable energy sources, including solar and wind energy.											Understand	
CO2	Describe the working, types, and applications of solar energy collectors, storage systems, and solar energy utilization devices.											Understand	
CO3	Enlighten the components, operation, design, and applications of photovoltaic (PV) systems.											Understand	
CO4	Explain the principles, components, classification, and operation of wind energy conversion systems (WECS) and the characteristics of wind resources.											Understand	
CO5	Discuss the modern wind turbine technologies, fixed and variable speed turbines and the characteristics of various generators.											Understand	
TEXT BOOKS:													
1. B.H. Khan, 'Non-Conventional Energy Resources', Mc. Graw Hill Education Ltd, Third Edition, 2017.													
2. Mukund R. Patel, Omid Beik, 'Wind and Solar Power Systems', CRC Press, Third Edition, 2021.													
REFERENCES:													
1. G.D. Rai, 'Non-Conventional Energy Sources', Khanna Publishers, Sixth Edition, 2017.													
2. G.N. Tiwari, G.N., 'Solar Energy: Fundamentals, Design, Modeling and Applications', Narosa Publishing House, Revised Edition, 2013.													
3. D.P. Kothari, K.C. Singal, and Rakesh Ranjan, 'Renewable Energy Sources and Emerging Technologies', PHI Learning, Third Edition, 2021.													
4. Chetan Singh Solanki, 'Solar Photovoltaics: Fundamentals, Technologies and Applications', PHI Learning, Third Edition, 2019.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	1	-	-	1	-	2	-	-
CO2	3	2	-	-	-	1	-	-	1	-	2	-	-
CO3	3	2	-	-	-	1	-	-	1	-	2	-	-
CO4	3	2	-	-	-	1	-	-	1	-	2	-	-
CO5	3	2	-	-	-	1	-	-	1	-	2	-	-
1- Low, 2 - Medium, 3 - High													

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21/1/26
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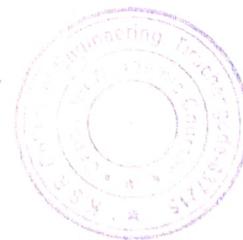


24EE002	HYDROGEN AND HYBRID ENERGY STORAGE SYSTEMS		Category	L	T	P	SL	C
			OEC	45	0	0	45	3
PREREQUISITE: A basic understanding of power systems and renewable energy fundamentals is essential. Prior exposure to power electronics and grid analysis will be beneficial.								
OBJECTIVE: <ul style="list-style-type: none"> To equip students with a comprehensive understanding of renewable energy systems, hydrogen production, storage technologies, and hybrid energy integration. 								
UNIT - I	INTRODUCTION TO RENEWABLE SOURCES AND HYDROGEN PRODUCTION						(9)	
Overview of renewable energy sources – Solar, wind, biomass, hydro, geothermal, ocean – Need for green hydrogen in the energy transition – Hydrogen as an energy vector – Hydrogen production methods: Steam methane reforming, biomass gasification, electrolysis (alkaline, PEM, SOE), and biological methods – Efficiency and cost comparison of production routes.								
UNIT - II	HYDROGEN TECHNOLOGY AND STORAGE SYSTEMS						(9)	
Hydrogen storage techniques – Compressed gas, liquid hydrogen, and metal hydrides – Basics of storage vessel design – Introduction to hydrogen safety standards – Simple case study examples of hydrogen storage in mobility.								
UNIT - III	GRID INTEGRATION OF HYBRID ENERGY STORAGE SYSTEMS						(9)	
Basic architecture of hybrid systems (e.g., PV-wind-fuel cell combinations) – Introduction to grid-connected vs. islanded systems – Simple load balancing and power flow concepts – Basics of using software tools for hybrid system analysis and design.								
UNIT - IV	ENERGY STORAGE TECHNIQUES: BATTERIES AND CONVERTERS						(9)	
Overview of key battery technologies and selection criteria – Introduction to UPS systems in renewable energy setups – Emphasis on essential power converters (basic DC-DC converters like buck and boost, and simple inverters) – Practical applications of batteries and converters in hybrid systems.								
UNIT - V	CONFIGURATIONS AND APPLICATIONS OF HYBRID SYSTEMS						(9)	
Basic types of hybrid configurations – Key applications like rural electrification and EV charging – A couple of brief case studies – Simplified techno-economic concepts (LCOE, ROI) – Short overview of global trends and national initiatives.								
LECTURE: 45, SELF-LEARNING: 45, TOTAL: 90 PERIODS								
								

COURSE OUTCOMES:		
At the end of the course, the students will be able to:		
Course Outcome	Description	Bloom's Taxonomy Level
CO1	Describe various renewable energy sources and different hydrogen production methods, along with their efficiency and cost aspects.	Understand
CO2	Enlighten hydrogen storage techniques, associated materials, and applicable safety standards used in modern energy systems.	Understand
CO3	Interpret the architecture and operating principles of hybrid energy systems, including grid-connected and islanded modes.	Understand
CO4	Discuss on the role of power converters in integrating renewable, battery, and hydrogen-based systems and their control requirements.	Understand
CO5	Elucidate different hybrid system configurations, their applications, and techno-economic indicators such as LCOE and carbon reduction metrics.	Understand
TEXT BOOKS:		
1 N. Hatzigiorgiou, 'Microgrids: Architectures and Control', Wiley-IEEE Press, First Edition, 2014.		
2 J.N. Twidell and A.D. Weir, 'Renewable Energy Sources', University Press, Cambridge, 2001.		
REFERENCES:		
1 B.H. Khan 'Non-conventional Energy sources', Tata McGraw-Hill Publishing Company, New Delhi.		
2 J.F. Manwell, J.G. McGowan, A.L. Rogers, 'Wind Energy Explained', John Wiley & Sons Ltd, 2009.		
3 M.H. Rashid, 'Power Electronics Handbook', Academic Press, Fourth Edition, 2018.		
4 Tomorrow's Energy – Hydrogen Fuel Cells and the Prospects for a Cleaner Planet, Peter Hoffman, MIT.		

Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	-	-	1	-	2	-	-
CO2	3	2	-	-	-	-	-	-	1	-	2	-	-
CO3	3	2	-	-	-	-	-	-	1	-	2	-	-
CO4	3	2	-	-	-	-	-	-	1	-	2	-	-
CO5	3	2	-	-	-	-	-	-	1	-	2	-	-
1- Low, 2 - Medium, 3 - High													

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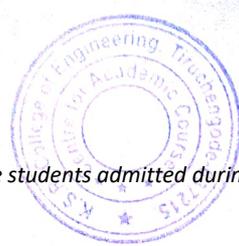
24EE003	ELECTRIC VEHICLE TECHNOLOGY	Category	L	T	P	SL	C	
		OEC	45	0	0	45	3	
PREREQUISITE: Basic knowledge of electrical machines, circuit fundamentals, and power electronics concepts is required to understand the architecture, drives, energy storage, and converter technologies used in electric vehicles.								
OBJECTIVE: <ul style="list-style-type: none"> To provide students with a comprehensive understanding of electric and hybrid vehicle fundamentals, architectures, energy storage systems, electric drives, and charging technologies, enabling them to analyze modern EV systems and their applications. 								
UNIT - I	BASICS OF ELECTRIC VEHICLES							(9)
History and need for electric and hybrid vehicles – Social and Environmental importance of hybrid and electric vehicles – Impact of modern drive-trains on energy supplies – Comparison of ICE and HEV, limitations, technical challenges – Vehicle power plant and transmission characteristics – Configuration of EVs – Performance of EVs.								
UNIT - II	ELECTRIC VEHICLE ARCHITECTURE							(9)
Electric vehicle types, layout and performance – Tractive effort, Transmission requirements, Energy consumption – Concepts of hybrid electric drive train, architecture of series and parallel hybrid electric drive train, merits and demerits – Mild and Full hybrids, Plug-in hybrid electric vehicles.								
UNIT - III	ENERGY STORAGE SYSTEMS							(9)
Battery basics – Battery parameters – Types: Lead Acid battery, NiMH (Nickel-Metal Hydride), Ni-Zn (Nickel-Zinc), Ni-Cd (Nickel-Cadmium) and Lithium-Ion battery – Battery Management Systems – Ultra-capacitors – Flywheel technology – Hydrogen fuel cell.								
UNIT - IV	ELECTRIC VEHICLE DRIVES AND CONTROL							(9)
Electric Motors Types – Working principle of AC and DC motors, advantages and limitations – DC motor drives and control – Induction motor drives and control – PMSM and brushless DC motor drives and control – Switched Reluctance Motor drives and control.								
UNIT - V	CONVERTERS AND EV CHARGERS							(9)
Functions of DC-DC Converter, DC-AC Converter, AC-DC Converter – Charging methods – Charging System: Wireless, On-board and Off-board charging, V1G (Uni-directional smart charging), V2B/V2H (Vehicle-to-Building/ Vehicle-to-Home), V2X (Vehicle to Everything) and V2G (Vehicle-to-Grid, Bi-directional smart charging).								
LECTURE: 45, SELF LEARNING: 45, TOTAL: 90 PERIODS								

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COURSE OUTCOMES:													
At the end of the course, the students will be able to:													
COs	Course Outcome											Cognitive Level	
CO1	Describe the configurations and performance of electric and hybrid vehicles.											Understand	
CO2	Describe configurations and drive-train architectures of electric and hybrid vehicles.											Understand	
CO3	Enlighten ultra-capacitors, flywheels, and hydrogen fuel cells used for energy storage in electric and hybrid vehicles.											Understand	
CO4	Discuss the working principles, advantages, and control strategies of electric motors and drives used in EVs.											Understand	
CO5	Explain the functions of power electronic converters and EV charging methods and systems.											Understand	
TEXT BOOKS:													
1. Iqbal Husain, 'Electric and Hybrid Vehicles: Design Fundamentals', CRC Press, Third Edition, 2021.													
2. Mehrdad Ehsani, Yimi Gao, Ali Emadi, Modern Electric, 'Hybrid Electric and Fuel Cell Vehicles', CRC Press, Third Edition, 2018.													
REFERENCES:													
1. Lance Noel, Gerardo Zarazua de Rubens, Johannes Kester, Benjamin K. Sovacoo, 'Vehicle-to-Grid: A Sociotechnical Transition Beyond Electric Mobility', Palgrave Macmillan / Springer, First Edition 2019.													
2. C.C Chan, K.T Chau, 'Modern Electric Vehicle Technology', Oxford University Press Inc., New York, Second Edition, 2023.													
3. Amir Khajepour, M. Saber Fallah, Avesta Goodarzi, 'Electric and Hybrid Vehicles Technologies, Modeling and Control - A Mechatronic Approach', Wiley Publication, First Edition 2014.													
4. James Larminie, John Lowry, 'Electric Vehicle Technology Explained', Wiley Publication, India, Second Edition, 2012.													
Mapping of COs with POs and PSOs													
COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	1	-	1	-	3	-	-
CO2	3	2	-	-	-	-	1	-	1	-	3	-	-
CO3	3	2	-	-	-	-	1	-	1	-	3	-	-
CO4	3	2	-	-	-	-	1	-	1	-	3	-	-
CO5	3	2	-	-	-	-	1	-	1	-	3	-	-
1- Low, 2 - Medium, 3 - High													

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Chairman (BoS)



24EE004	ENERGY CONSERVATION AND MANAGEMENT	Category	L	T	P	SL	C
		OEC	45	0	0	45	3
PREREQUISITE: Basic knowledge of physics, thermodynamics, and electrical/mechanical systems, along with fundamental mathematics for calculations. Familiarity with energy systems and environmental concepts is advantageous.							
OBJECTIVE: <ul style="list-style-type: none"> To understand energy systems, improve energy efficiency, and implement effective energy management practices. Additionally, to promote sustainability, reduce costs, and optimize resource utilization. 							
UNIT - I	ENERGY CONSERVATION PRINCIPLES AND PRACTICES	(9)					
Energy scenario – Principles and imperatives of energy conservation – Energy consumption pattern – Resource availability – Need for energy saving – Overview of energy consumption and its effects – Energy Monitoring, targeting and reporting – Role of Bureau of Energy Efficiency – Standards and labeling.							
UNIT - II	ENERGY EFFICIENCY IN BUILDINGS	(9)					
Introduction, definition and concepts – Energy and water as a resource – Electrical energy conservation: Opportunities and techniques for energy conservation in buildings – Green buildings, Intelligent buildings, Rating of buildings, Efficient use of buildings – Solar passive architecture – Eco-housing concepts.							
UNIT - III	ENERGY EFFICIENCY IN INDUSTRIES	(9)					
Potential areas for electrical energy conservation in various industries – Conservation methods – Energy management opportunities in electrical heating, cable selection – Energy efficient motors – Adjustable AC drives – Application and its use – Energy efficiency in lighting.							
UNIT - IV	ENERGY EFFICIENCY IN POWER PLANTS	(9)					
Captive power generation systems – Sequence operation of power plants – Gas Insulated Substation – Bus ducts – Types and working principle – Energy management opportunities in transformer – Power transformer – Types of switchgear (HT and LT switchgear) GCB and generator.							
UNIT - V	ENERGY MANAGEMENT AND AUDIT	(9)					
Energy Management: Definition, Objective, Importance of energy management – Load management: Demand control techniques – Utility monitoring control system. Energy Audit: definition, types of energy audit, methodology, need for energy audit, steps involved in energy auditing.							
LECTURE: 45, SELF LEARNING: 45, TOTAL: 90 PERIODS							

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COURSE OUTCOMES:

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

COs	Course Outcome	Cognitive Level
CO1	Elucidate the principles of energy conservation, energy consumption patterns and the role of the Bureau of Energy Efficiency, standards, and labeling.	Understand
CO2	Describe techniques of electrical energy conservation in buildings, including green and intelligent buildings.	Understand
CO3	Explain the efficient heating, cable selection, energy-efficient motors, adjustable AC drives and efficient lighting systems.	Understand
CO4	Describe the methods for electrical energy conservation in industries, including efficient motors, adjustable AC drives, electrical heating and lighting.	Understand
CO5	Enlighten the principles and techniques of energy management, load management, utility monitoring, and energy auditing.	Understand

TEXT BOOKS:

1. Mehmet Kanoglu and Yunus A. Cengel Dr, 'Energy Efficiency and Management for Engineers', Tata Mcgrow-Hill, New Delhi, First Edition, 2019.
2. Craig B. Smith, 'Energy Management Principles', Pergamon Press, United Kingdom, Second Edition, 2015.

REFERENCES:

1. Wayne C Turner, 'Energy Management Handbook', The Fairmount Press, Newyork, Eighth Edition, 2006.
2. Bureau of Energy Efficiency Study material for Energy Managers and Auditors Examination: Paper I to IV.
3. G.G. Rajan, 'Optimizing Energy Efficiencies in Industry', Tata McGraw Hill, New Delhi, Fourth Edition, 2004.
4. Frank Kreith and Yogi Goswami D, 'Energy Management and Conservation Handbook', Taylor & Francis, New Delhi, Second Edition, 2016.

Mapping of COs with POs and PSOs

COs/ POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	2	-	-	-	-	1	-	1	-	2	-	-
CO2	3	2	-	-	-	-	1	-	1	-	2	-	-
CO3	3	2	-	-	-	-	1	-	1	-	2	-	-
CO4	3	2	-	-	-	-	1	-	1	-	2	-	-
CO5	3	2	-	-	-	-	1	-	1	-	2	-	-

1- Low, 2 - Medium, 3 – High

d. m. 21/1/24
Chairman (BoS)

