K.S. Rangasamy College of Technology

(Autonomous Institution affiliated to Anna University, Chennai)

CURRICULUM AND SYLLABI

FOR

B.E. Mechatronics Engineering

(For the batch admitted in 2022– 2023)

R2022

Accredited by NAAC A++, Approved by AICTE,
Affiliated to Anna University, Chennai.

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

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

VISION

To become a pioneer in producing competent Mechatronics Engineers, researchers and entrepreneurs through quality education

MISSION

- To produce competent and ethically bound Mechatronics professionals by imparting the technical knowledge and skills through quality teaching learning process
- To build an environment that is favourable for employability skills through collaborations with academia and industry
- To groom the students to focus on higher studies, research, entrepreneurship and be committed to the societal welfare and quality of life by creating an effective ecosystem

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Core competencies: Our graduates apply engineering knowledge to solve problems in Mechatronics and relevant fields.

PEO2: Employability: Our graduates demonstrate technical and professional skills to ethically address the industrial and societal needs.

PEO3: Higher Studies, Research and Entrepreneurship: Our graduates pursue higher studies, research and entrepreneurship in diverse fields.

PROGRAM OUTCOMES (POs)

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO3: Design /development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs):

Engineering Graduates will be able to:

PSO1: Specify, design and develop automation systems for the given engineering applications.

PSO2: Design and evaluate mechatronic systems using the state-of-the-art equipment and software tools.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) WITH PROGRAMMEOUTCOMES (POs)

The B.E. Mechatronics Engineering Programme outcomes leading to the achievement of the objectives are summarized in the following Table.

Programme Educational Objectives	Programme Outcomes											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
PEO 1	3	1	3	2	2	1	1	1	2	2	3	1
PEO 2	3	3	3	2	2	1	1	1	2	2	3	1
PEO 3	3	2	3	2	2	1	1	1	3	2	3	1

Contributions: 1- low, 2- medium, 3- high

MAPPING: MECHATRONICS ENGINEEIRNG (UG)

Year	Sem.	Course Name	PO											
			1	2	3	4	5	6	7	8	9	10	11	12
I	I	Professional English-I								2	3	3	2	3
		Matrices and Calculus	3	3	3	2	2							2
		Engineering Physics	3	3	3	3	2	2	3	2	1	1	1	1
		Basic Electrical Electronics Engineering and Measurements	2	3	1	2	-	-	3	2	-	-	2	3
		Engineering Mechanics	3	3	3	3	3	1		1		3	1	1
		Environmental Studies and Climate Change	3	3	3	3	3	3	3	3	3	2	2	3
		Fabrication and Reverse Engineering Laboratory	3	3	3	2	3	3	2	3	3	1	1	3
		Basic Electrical Electronics Engineering and Measurements Laboratory	3	2	1			3	1		3		3	2
	II	Professional English-II	1	2	1	2	1	2	1	2	3	3	2	3
		Integrals and Partial Differential Equations	3	3	2	2	3							2
		Engineering Drawing	3	1	1	1	2				2			2
		C Programming	1	3		2	3			2				2
		Chemistry for Mechanical Sciences												
		Heritage of Tamils							3	3		2		3
		Physics & Chemistry Laboratory	3	2	2	1	3	2	2	3	1	2	2	1
		C Programming Laboratory	1	3		2	3			2				2
		Career Skill Development-I												
II	III	Statistics and Numerical Methods	3	3	3	2.6	2.6	0	0	0	0	0	0	2
		Analog Devices and Digital Circuits	3	1.6	1.6	1.6	1	0	0	0	0.6	1	0.4	2
		Sensors and Instrumentation	3	1.4	2.2	0.8	0.8	0.2	0.2	0.4	0.4	1	1.2	2
		Manufacturing Technology	3	0	0	0	2.2	0	3	0	0	0	2	3
		Mechanics of Solids	3	3	3	1.8	3	2	0	0	0	2	0	2
		Universal Human Values	0	0	0	0	0	2.4	1.8	3	2.8	0.6	0.4	3
		Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	0	0	0	0	0	0	3	3	0	2	0	3
		Analog Devices and Digital Circuits Laboratory	2	2.2	1	0.8	2	0	0	0.8	1.2	1.4	0.8	1
		Manufacturing Technology Laboratory	3	2	2	0	0	0	0	0	2	0	2	2
		Career Skill Development-II	0	0	0	0	0	0	0	2	3	3	2	3
	IV	Industrial Drives and Control	3	2.6	3	2.6	2.8	0	0	1.8	1.2	0.8	0.8	1
		Fluid Mechanics and Thermodynamics	3	3	2	2	0	0	0	0	1	0	0	1
		Metrology and Statistical Quality control	3	3	2	2	0	0	0	0	1	0	0	1
		Hydraulic and Pneumatic control	3	3	0	2	3	2	0	0	0	2	0	0
		Virtual Instrumentation and Applications	3	3	3	2	0	0	0	3	0	0	2	1
		Industrial Drives and Control Laboratory	2	2.2	1	0.8	2	0	0	0.8	1.2	1.4	0.8	1
		Applied Mechanics Laboratory	3	2	0	0	0	2	3	0	2	2	0	2
		Career Skill Development-III	2.6	2.6	2.6	2.8	0	2.4	0	0	0	2	3	3
III	V	Microprocessors and Microcontrollers	3	3	3	2.6	2.6	0	0	0	0	0	0	2
		System Design and Control	3	1.6	1.6	1.6	1	0	0	0	0.6	1	0.4	2
		Kinematics and Dynamics of Machines	3	1.4	2.2	0.8	0.8	0.2	0.2	0.4	0.4	1	1.2	2
		Total Quality Management	3	0	0	0	2.2	0	3	0	0	0	2	3

		Start-ups and Entrepreneurship	2.8	2.6	3	2.4	2.2	1	1	1.4	0.8	0.8	2.2	2.4
		Microprocessors and Microcontrollers Laboratory	2	2.2	1	0.8	2	0	0	0.8	1.2	1.4	0.8	1
		Metrology and Dynamics Laboratory	3	2	2	0	0	0	0	0	2	0	2	2
		Career Skill Development-IV	0	0	0	0	0	0	0	2	3	3	2	3
	VI	Industrial Automation Controllers	3	2.6	3	2.6	2.8	0	0	1.8	1.2	0.8	0.8	1
		Machine Design	3	3	2	2	0	0	0	0	1	0	0	1
		Computer Aided Design and Manufacturing	3	3	2	2	0	0	0	0	1	0	0	1
		Computer Aided Manufacturing Laboratory	3	2	0	0	0	2	3	0	2	2	0	2
		Design Thinking and Industrial Automation Laboratory	2.6	2.6	2.6	2.8	0	2.4	0	0	0	2	3	3

K.S. RANGASAMY COLLEGE OF TECHNOLOGY

Credit Distribution for B.E(MCT)Programme–2022 –2023 Batch

S. No.	**Category**	**Credits Per Semester**								**Total Credits**	**Percentage %**
		I	**II**	**III**	**IV**	**V**	**VI**	**VII**	**VIII**		
1.	HS	2	2	-	-	3	-	-	-	**07**	**4.29**
2.	BS	7	9	4	-	-	-	-	-	**20**	**12.27**
3.	ES	11	9	-	-	-	-	-	-	**20**	**12.27**
4.	PC	-	-	18	21	15	15	13	-	**82**	**50.31**
5.	PE	-	-	-	-	3	6	3	3	**15**	**9.20**
6.	OE	-	-	-	3	3	3	-	-	**09**	**5.52**
7.	CG	-	-	-	-	-	-	2	8	**10**	**6.14**
8.	MY	-	MY I	MY II	-	MY III	-	-	-	**-**	**-**
9.	AC	-	-	-	-	-	-	AC I	AC II	**-**	**-**
10.	GE*	-	1*	1*	-		-	-	-	2*	**-**
Total		**20**	**20**	**22**	**24**	**24**	**24**	**18**	**11**	**163**	**100**

General Elective- Extra credits is offered

HS – HUMANITIES AND SOCIAL SCIENCES
BS – BASIC SCIENCE
ES – ENGINEERING SCIENCES
PC – PROFESSIONAL CORE
PE – PROFESSIONAL ELECTIVES
OE – OPEN ELECTIVES
CG – CAREER GUIDANCE COURSES
MY – MANDATORY COURSES
AC – AUDIT COURSES
GE – GENERAL ELECTIVE

Open Electives are courses offered by different departments that do not have any prerequisites and could be of interest to students of any branch

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HUMANITIES AND SOCIAL SCIENCES (HS)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 EN 001	Professional English - I	HS	2	1	1	0	2	-NIL-
2.	60 EN 002	Professional English - II	HS	2	1	1	0	2	-NIL-
3.	60 HS 003	Total Quality Management	HS	3	3	0	0	3	-NIL-
4.	60 AB 00*	NCC/NSS/NSO/YRC/RRC/Fine Arts*	HS	4	2	0	2	3*	-NIL-

BASIC SCIENCE (BS)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MA 001	Matrices and Calculus	BS	4	3	1	0	4	-NIL-
2.	60 PH 001	Engineering Physics	BS	3	3	0	0	3	-NIL-
3.	60 CH 001	Chemistry for Mechanical Sciences	BS	3	3	0	0	3	-NIL-
4.	60 CP 0P1	Physics and Chemistry Laboratory	BS	4	0	0	4	2	-NIL-
5.	60 MA 003	Integrals, Partial Differential Equations and Laplace Transform	BS	4	3	1	0	4	-NIL-
6.	60 MA 007	Statistics and Numerical Methods	BS	4	3	1	0	4	-NIL-

ENGINEERING SCIENCES (ES)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 ME 001	Engineering Drawing	ES	6	2	0	4	4	-NIL-
2.	60 ME 004	Engineering Mechanics	ES	4	3	1	0	4	-NIL-
3.	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2	-NIL-
4.	60 CS 001	C Programming	ES	3	3	0	0	3	-NIL-
5.	60 EE 003	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3	-NIL-
6.	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2	-NIL-
7.	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	ES	6	2	0	4	4	-NIL-

PROFESSIONAL CORE (PC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC 301	Analog Devices and Digital Circuits	PC	3	3	0	0	3	NIL
2.	60 MC 302	Sensors and Instrumentation	PC	5	3	0	2	4	NIL
3.	60 MC 303	Manufacturing Technology	PC	3	3	0	0	3	Engineering Physics
4.	60 MC 304	Mechanics of Solids	PC	4	3	1	0	4	Applied Mechanics
5.	60 MC 3P1	Analog Devices and Digital Circuits Laboratory	PC	4	0	0	4	2	Analog Devices and Digital Circuits
6.	60 MC 3P2	Manufacturing Technology Laboratory	PC	4	0	0	4	2	Manufacturing Technology
7.	60 MC 401	Industrial Drives and Control	PC	3	3	0	0	3	Basic Electrical and Electronics Engineering
8.	60 MC 402	Fluid Mechanics and Thermodynamics	PC	4	3	1	0	4	Mechanics of Solids
9.	60 MC 403	Metrology and Statistical Quality control	PC	3	3	0	0	3	NIL
10.	60 MC 404	Hydraulic and Pneumatic control	PC	5	3	0	2	4	Fluid Mechanics and Thermodynamics
11.	60 MC 405	Virtual Instrumentation and Applications	PC	4	3	1	0	4	NIL
12.	60 MC 4P1	Industrial Drives and Control Laboratory	PC	4	0	0	4	2	Industrial Drives and Control
13.	60 MC 4P2	Applied Mechanics Laboratory	PC	4	0	0	4	2	Metrology and Statistical Quality Control
14.	60 MC 501	Microprocessors and Microcontrollers	PC	3	3	0	0	3	Analog Devices and Digital Circuits
15.	60 MC 502	System Design and Control	PC	4	3	1	0	4	NIL
16.	60 MC 503	Theory of Machines	PC	4	3	1	0	4	NIL
17.	60 MC 5P1	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2	Microprocessors and Microcontrollers
18.	60 MC 5P2	Metrology and Dynamics Laboratory	PC	4	0	0	4	2	Metrology and Statistical Quality Control
19.	60 MC 601	Industrial Automation Controllers	PC	3	3	0	0	3	System Design and Control
20.	60 MC 602	Machine Design	PC	4	3	1	0	4	Theory of Machines
21.	60 MC 603	Computer Aided Design and Manufacturing	PC	3	3	0	0	3	NIL
22.	60 MC 6P1	Computer Aided Manufacturing Laboratory	PC	4	0	0	4	2	Computer Aided Design and Manufacturing
23.	60 MC 6P2	Design Thinking and Industrial Automation Laboratory	PC	4	0	0	4	2	Industrial Automation Controllers
24.	60 MC 701	Robotics Engineering	PC	3	3	0	0	3	NIL
25.	60 MC 702	Embedded System	PC	3	3	0	0	3	Microprocessors and Microcontrollers
26.	60 MC 703	Automation in Automobiles	PC	3	3	0	0	3	Industrial Automation Controllers
27.	60 MC 7P1	Embedded System Laboratory	PC	4	0	0	4	2	Embedded System
28.	60 MC 7P2	Robotics and Machine Vision Laboratory	PC	4	0	0	4	2	Robotics Engineering

PROFESSIONAL ELECTIVES (PE): Vertical

Elective	(Vertical I) Robotics	(Vertical II) Electric Vehicle	(Vertical III) Drone	(Vertical IV) Manufacturing	(Vertical V) Design and Analysis	(Vertical VI) Logistics and Supply Chain Management
ELECTIVE I	Design of Robot Elements	Mechatronics System	Drone Technology	Design of Manufacturing	Finite Element Analysis	Automation in Process Industries
ELECTIVE II	Mobile Robotics	Electric Vehicle	Aircraft Mechatronics	Applied Materials Technology	Design of Experiments	Supply Chain Management
ELECTIVE III	Robots and Systems in Smart Manufacturing	Automotive Electronics	Design of UAV Systems	Non-conventional Machining Processes	Product Design and Costing	Ware House Management
ELECTIVE IV	Agricultural Robotics and Automation	Design of Transmission Systems	Navigation and Communication Systems	Non Destructive Testing	Optimization Techniques	Process Planning and Cost Estimation
ELECTIVE V	Robotic Welding Technology	Smart Mobility and Intelligent Vehicles	Aerodynamics of Drones	AI/ML for Manufacturing	Rapid Prototyping	Container Logistics

PROFESSIONAL ELECTIVES (PE)

Semester V Elective –I

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC E11	Mobile Robotics	PE	3	3	0	0	3	Robotics Engineering
2.	60 MC E12	Electric Vehicle	PE	3	3	0	0	3	Industrial Drives and Control, Sensors and Instrumentation
3.	60 MC E13	Aircraft Mechatronics	PE	3	3	0	0	3	Applied Mehanics
4.	60 MC E14	Applied Materials Technology	PE	3	3	0	0	3	NIL
5.	60 MC E15	Design of Experiments	PE	3	3	0	0	3	NIL
6.	60 MC E16	Automation in Process Industries	PE	3	3	0	0	3	Industrial Automation Controllers

Semester VI Elective –II

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC E21	Agricultural Robotics and Automation	PE	3	3	0	0	3	Robotics Engineering
2.	60 MC E22	Design of Transmission Systems	PE	3	3	0	0	3	NIL
3.	60 MC E23	Navigation and Communication Systems	PE	3	3	0	0	3	NIL
4.	60 MC E24	Non Destructive Testing	PE	3	3	0	0	3	NIL
5.	60 MC E25	Optimization Techniques	PE	3	3	0	0	3	NIL
6.	60 MC E26	Supply Chain Management	PE	3	3	0	0	3	NIL

Semester VI Elective –III

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC E31	Robots and Systems in Smart Manufacturing	PE	3	3	0	0	3	Robotics Engineering
2.	60 MC E32	Automotive Electronics	PE	3	3	0	0	3	Sensors and Instrumentation
3.	60 MC E33	Design of UAV Systems	PE	3	3	0	0	3	NIL
4.	60 MC E34	Non-conventional Machining Processes	PE	3	3	0	0	3	NIL
5.	60 MC E35	Product Design and Costing	PE	3	3	0	0	3	Manufacturing Technology
6.	60 MC E36	Ware House Management	PE	3	3	0	0	3	NIL

Semester VII Elective –IV

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC E41	Design of Robot Elements	PE	4	2	0	2	3	Robotics Engineering
2.	60 MC E42	Mechatronics System	PE	4	2	0	2	3	Sensors and Instrumentation
3.	60 MC E43	Drone Technology	PE	4	2	0	2	3	NIL
4.	60 MC E44	Design of Manufacturing	PE	4	2	0	2	3	NIL
5.	60 MC E45	Finite Element Analysis	PE	4	2	0	2	3	NIL
6.	60 MC E46	Process Planning and Cost Estimation	PE	4	2	0	2	3	NIL

Semester VIII Elective –V

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC E51	Robotic Welding Technology	PE	3	3	0	0	3	Robotics Engineering
2.	60 MC E52	Smart Mobility and Intelligent Vehicles	PE	3	3	0	0	3	NIL
3.	60 MC E53	Aerodynamics of Drones	PE	3	3	0	0	3	NIL
4.	60 MC E54	AI/ML for Manufacturing	PE	3	3	0	0	3	Manufacturing Technology
5.	60 MC E55	Rapid Prototyping	PE	3	3	0	0	3	NIL
6.	60 MC E56	Container Logistics	PE	3	3	0	0	3	NIL

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

MANDATORY COURSES (MY)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MY 001	Environmental Studies and Climate Change	MY	2	2	0	0	0	Nil
2.	60 MY 002	Universal Human Values	MY	3	3	0	0	3	Nil
3.	60 MY 003	Start-ups and Entrepreneurship	MY	3	3	0	0	3	Nil

SEMESTER VII & SEMESTER VIII, AUDIT COURSES (AC)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 AC 001	Research Methodology - I	AC	1	1	0	0	0	Nil
2.	60 AC 002	Research Methodology - II	AC	1	1	0	0	0	Research Methodology - I

OPEN ELECTIVES I / II / III / IV (OE)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 MC L003	Applied Ergonomics	OE	3	3	0	0	3	Nil
2.	60 MC L004	Automation in Process Industries	OE	3	3	0	0	3	Nil
3.	60 MC L005	Introduction to Occupational Health	OE	3	3	0	0	3	Nil

CAREER GUIDANCE COURSES (CG)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 CG 0P1	Career Skill Development I	CG	2	0	0	2	1*	Basic knowledge of reading and writing in English
2.	60 CG 0P2	Career Skill Development II	CG	2	0	0	2	1*	Basic knowledge of reading and writing in English
3.	60 CG 0P3	Career Skill Development III	CG	2	0	0	2	1*	Career Skill Development – II
4.	60 CG 0P4	Career Skill Development IV	CG	2	0	0	2	1*	Career Skill Development – III
5.	60 CG 0P5	Comprehension Test	CG	2	0	0	2	1*	Career Skill Development I, II, III, IV
6.	60 MC 7P3	Project Work - Phase I	CG	4	0	0	4	2	Nil
7.	60 MC 8P1	Project Work - Phase II	CG	4	0	0	4	8	Nil
8.	60 CG 00*	Internship*	CG	0	0	0	0	3*	Nil

GENERAL ELECTIVE (GE)

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C	Pre-requisite
1.	60 GE 001	Heritage of Tamils / *தமிழர் மரபு* (Common to all Branches)	GE	1	1	0	0	1*	Nil
2.	60 GE 002	Tamils and Technology / *தமிழரும் தொழில்நுட்பமும்* (Common to all Branches)	GE	1	1	0	0	1*	Nil

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COURSES OF STUDY

(For the candidates admitted from 2022-2023 onwards)

SEMESTER I

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
		Induction Programme	**-**	**-**	**-**	**-**	**-**	**0**
THEORY								
1.	60 EN 001	Professional English-I	HS	3	1	0	2	2
2.	60 MA 001	Matrices and Calculus	BS	4	3	1	0	4
3.	60 PH 001	Engineering Physics	BS	3	3	0	0	3
4.	60 EE 001	Basic Electrical and Electronics Engineering	ES	3	3	0	0	3
5.	60 ME 004	Engineering Mechanics	ES	4	3	1	0	4
6.	60 MY 001	Environmental Studies and Climate Change	MY	2	2	0	0	0
PRACTICALS								
7.	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	ES	4	0	0	4	2
8.	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	ES	4	0	0	4	2
			Total	**27**	**15**	**02**	**10**	**20**

I to VII semester

NCC% - Course can be waived with 3 credits in VII semester or offered as extra credits

NSS/NSO/YRC/RRC/Fine Arts% 3 credits is not accounted for CGPA

Career Skill Development (CSD) - additional credit is offered not accounted for CGPA.

I to VIII semester

Internship 3 additional credits not accounted for CGPA is offered based on the Internship duration

SEMESTER II

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 EN 002	Professional English-II	HS	3	1	0	2	2
2.	60 MA 003	Integrals, Partial Differential Equations and Laplace Transform	BS	4	3	1	0	4
3.	60 ME 001	Engineering Drawing	ES	6	2	0	4	4
4.	60 CS 001	C Programming	ES	3	3	0	0	3
5.	60 CH 001	Chemistry for Mechanical Sciences	BS	3	3	0	0	3
6.	60 GE 001	Heritage of Tamils / தமிழர் மரபு	GE	1	1	0	0	1&
PRACTICALS								
7.	60 CP 0P1	Physics & Chemistry Laboratory	BS	4	0	0	4	2
8.	60 CS 0P1	C Programming Laboratory	ES	4	0	0	4	2
9.	60 CG 0P1	Career Skill Development-I	CG	2	0	0	2	1*
			Total	**30**	**13**	**1**	**16**	**20**

Heritage of Tamils& additional 1 credit is offered and not account for CGPA.

SEMESTER III

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MA 007	Statistics and Numerical Methods	BS	4	3	1	0	4
2.	60 MC 301	Analog Devices and Digital Circuits	PC	3	3	0	0	3
3.	60 MC 302	Sensors and Instrumentation	PC	5	3	0	2	4
4.	60 MC 303	Manufacturing Technology	PC	3	3	0	0	3
5.	60 MC 304	Mechanics of Solids	PC	4	3	1	0	4
6.	60 MY 002	Universal Human Values	MY	3	3	0	0	3[#]
7.	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	GE	1	1	0	0	1[&]
PRACTICALS								
8.	60 MC 3P1	Analog Devices and Digital Circuits Laboratory	PC	4	0	0	4	2
9.	60 MC 3P2	Manufacturing Technology Laboratory	PC	4	0	0	4	2
10.	60 CG 0P2	Career Skill Development-II	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3[$]
			Total	**35**	**19**	**02**	**12**	**22**

- Tamils and Technology[&] additional1 credit is offered and not account for CGPA.
- UHV[#] additional 3 credit is offered and not accouted for CGPA

SEMESTER IV

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MC 401	Industrial Drives and Control	PC	3	3	0	0	3
2.	60 MC 402	Fluid Mechanics and Thermodynamics	PC	4	3	1	0	4
3.	60 MC 403	Metrology and Statistical Quality control	PC	3	3	0	0	3
4.	60 MC 404	Hydraulic and Pneumatic control	PC	5	3	0	2	4
5.	60 MC 405	Virtual Instrumentation and Applications	PC	4	2	0	2	3
6.	60 MC L0*	Open Elective-I	OE	3	3	0	0	3
PRACTICALS								
7.	60 MC 4P1	Industrial Drives and Control Laboratory	PC	4	0	0	4	2
8.	60 MC 4P2	Applied Mechanics Laboratory	PC	4	0	0	4	2
9.	60 CG 0P3	Career Skill Development-III	CG	2	0	0	2	1*
10.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3*
			Total	**33**	**17**	**2**	**14**	**24**

SEMESTER V

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MC 501	Microprocessors and Microcontrollers	PC	3	3	0	0	3
2.	60 MC 502	System Design and Control	PC	4	3	1	0	4
3.	60 MC 503	Kinematics and Dynamics of Machines	PC	4	3	1	0	4
4.	60 HS 003	Total Quality Management	HS	3	3	0	0	3
5.	60 MY 00*	Start-ups and Entrepreneurship	MY	2	2	0	0	0
6.	60 MC E1*	Elective-I	PE	3	3	0	0	3
7.	60 MC L0*	Open Elective-II	OE	3	3	0	0	3
PRACTICALS								
8.	60 MC 5P1	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
9.	60 MC 5P2	Metrology and Dynamics Laboratory	PC	4	0	0	4	2
10.	60 CG 0P4	Career Skill Development-IV	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3*
			Total	**32**	**20**	**02**	**10**	**24**

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

SEMESTER VI

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MC 601	Industrial Automation Controllers	PC	4	3	1	0	4
2.	60 MC 602	Machine Design	PC	4	3	1	0	4
3.	60 MC 603	Computer Aided Design and Manufacturing	PC	3	3	0	0	3
4.	60 MC E2*	Elective-II	PE	3	3	0	0	3
5.	60 MC E3*	Elective-III	PE	3	3	0	0	3
6.	60 MC L0*	Open Elective-III	OE	3	3	0	0	3
PRACTICALS								
7.	60 MC 6P1	Computer Aided Manufacturing Laboratory	PC	4	0	0	4	2
8.	60 MC 6P2	Design Thinking and Industrial Automation Laboratory	PC	4	0	0	4	2
9.	60 MC 6P3	Mini Project	PC	2	0	0	2	1[&]
10.	60 CG 0P5	Comprehension Test	CG	2	0	0	2	1*
11.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3*
			Total	**30**	**18**	**02**	**10**	**24**

Comprehension Test* -one additional credit is offered and not accounted for CGPA calculation
Miniproject[&] - 1 additional credit is offered and not accounted for CGPA calculation

SEMESTER VII

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MC 701	Robotics Engineering	PC	3	3	0	0	3
2.	60 MC 702	Embedded System	PC	3	3	0	0	3
3.	60 MC 703	Automation in Automobiles	PC	3	3	0	0	3
4.	60 MC E4*	Elective-IV	PE	4	2	0	2	3
5.	60 AC 001	Research Methodology – I	AC	1	1	0	0	0
6.	60 AB 00*	NCC\NSS\NSO\YRC\RRC\Yoga\Fine Arts[%]	HS	4	2	0	2	3[%]
PRACTICALS								
7.	60 MC 7P1	Embedded System Laboratory	PC	4	0	0	4	2
8.	60 MC 7P2	Robotics and Machine Vision Laboratory	PC	4	0	0	4	2
9.	60 MC 7P3	Project Work - Phase I	CG	4	0	0	4	2
10.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3*
			Total	**26**	**12**	**0**	**14**	**18**

NCC[%] - Course can be waived with 3 credits in VII semester or offered as extra 3 credits.
NSS/NSO/YRC/RRC/Fine Arts[%] 3 extra credits not accounted for CGPA

SEMESTER VIII

S. No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
THEORY								
1.	60 MC E5*	Elective-V	PE	3	3	0	0	3
2.	60 AC 002	Research Methodology – II	AC	1	1	0	0	0
PRACTICALS								
3.	60 MC 8P1	Project Work - Phase II	CG	16	0	0	16	8
4.	60 CG 0P6	Internship	CG	-	-	-	-	1/2/3*
			Total	**20**	**4**	**0**	**16**	**11**

Internship*, MY* & GE* - Extra Credit is offered

TOTAL NUMBER OF CREDITS TO BE EARNED FOR AWARD OF THE DEGREE = 163

Note: HS- Humanities and Social Sciences including Management Courses, BS- Basic Science Courses, ES-Engineering Science Courses, PE-Professional Core Courses, PE-Professional Elective Courses, GE- General Elective Courses, OE- Open Elective Courses, CG - Career Enhancement Course, MY- Mandatory Courses

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BoS Chairman

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

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

FIRST SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 EN 001	Professional English-I	2	40	60	100	45	100
2	60 MA 001	Matrices and Calculus	2	40	60	100	45	100
3	60 PH 001	Engineering Physics	2	40	60	100	45	100
4	60 EE 001	Basic Electrical and Electronics Engineering	2	40	60	100	45	100
5	60 ME 004	Engineering Mechanics	2	40	60	100	45	100
6	60 MY 001	Environmental Studies and Climate Change	2	40	60	100	45	100
PRACTICAL								
7	60 ME 0P1	Fabrication and Reverse Engineering Laboratory	3	60	40	100	45	100
8	60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory	3	60	40	100	45	100

* CA evaluation pattern will differ from course to course and for different tests.This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

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Passed in the BoS Meeting Held on 24/11/2023

Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 EN 001	Professional English – I	Category	L	T	P	Credit
		HS	1	0	2	2

Objective

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

Prerequisite

Basic knowledge of reading and writing in English.

Course Outcomes

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

CO1	Listen and comprehend complex academic texts	Understand
CO2	Read and infer the denotative and connotative meanings of technical texts	Analyze
CO3	Write definitions, descriptions, narrations, and essays on various topics	Apply
CO4	Speak fluently and accurately in formal and informal communicative contexts	Apply
CO5	Express their opinions effectively in both oral and written medium of communication	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	3	3	2	3	2	2
CO2								2	3	3	2	3	2	2
CO3								2	3	3	2	3	2	2
CO4								2	3	3	2	3	2	2
CO5								2	3	3	2	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Knowledge (Kn)	10	10	10
Apply (Ap)	20	20	40
Analyse (An)	30	30	50
Create (Cr)	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
Professional English I								
Common to All Branches								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	1	0	2	45	2	40	60	100

Introduction to Fundamentals of Communication **Listening:** General information-specific details-conversation: introduction to classmates – audio / video (formal & informal). **Speaking:** Self Introduction; Introducing a friend; conversation - politeness strategies. **Reading:** Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails. **Writing:** Writing letters – informal and formal – basics and format orientation **Language Focus:** Present Tenses; word formation (affixes); synonyms, antonyms and contranyms, and phrasal verbs; abbreviations & acronyms (as used in technical contexts).	**[09]**
Narration and Summation **Listening:** Podcast, anecdotes / stories / event narration; documentaries and interviews with celebrities. **Speaking:** Narrating personal experiences / events; Interviewing a celebrity; reporting / and summarizing of documentaries / podcasts/ interviews. **Reading:** Biographies, travelogues, newspaper reports, excerpts from literature, and travel & technical blogs. **Writing:** Paragraph writing, short report on an event (field trip etc.). **Language Focus**: Past tenses and prepositions; One-word substitution.	**[09]**
Description of a process / product **Listening:** Listen to a product and process descriptions; advertisements about products or services **Speaking**: Picture description; giving instruction to use the product; presenting a product. **Reading**: Advertisements, gadget reviews and user manuals. **Writing:** Definitions; instructions; and product /process description. **Language Focus**: Imperatives; comparative adjectives; future tenses. Homonyms; and Homophones, discourse markers (connectives & sequence words)	**[09]**
Classification and Recommendations **Listening:** TED Talks; scientific lectures; and educational videos. **Speaking**: Small Talk; Mini presentations **Reading**: Newspaper articles and Journal reports **Writing:** Note-making / Note-taking; recommendations; Transferring information from non-verbal (chart, graph etc, to verbal mode) **Language Focus**: Articles; Pronouns -Possessive & Relative pronouns; ; subject-verb agreement; collocations.	**[09]**
Expression **Listening:** Debates/ discussions; different viewpoints on an issue; and panel discussions. **Speaking**: Group discussions, debates & role plays. **Reading**: Editorials; and opinion blogs. **Writing**: Essay Writing (Descriptive or narrative). **Language Focus**: Punctuation; Compound Nouns; simple, compound & complex sentences. cause& effect expressions.	**[09]**
Total Hours	**45**

Text Book(s):

1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020

Reference(s):

1.	Paul Emmerson and Nick Hamilton, 'Five Minute Activities for Business English', Cambridge University Press, New York, 2005
2.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003
3.	Michael McCarthy and Felicity O Dell, 'English Vocabulary in Use: Upper Intermediate', Cambridge University Press, N.York, 2012
4.	Lakshmi Narayanan, 'A Course Book on Technical English'Scitech Publications (India) Pvt. Ltd. 2020

*** SDG- 04- Quality Education**

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Introduction to Fundamentals of Communication**	
1.1	Listening for general information and Specific details	1
1.2	Self-introduction	1
1.3	Narrating personal experiences	1
1.4	Reading relevant to technical contexts and emails	1
1.5	Writing letters – informal	1
1.6	Writing letters - formal	1
1.7	Present Tenses	1
1.8	synonyms, antonyms and contranyms, and affixes	1
1.9	phrasal verbs; abbreviations & acronyms	1
2	**Narration and Summation**	
2.1	Listening to podcasts, documentaries and interviews with celebrities	1
2.2	Narrating personal experiences	1
2.3	Summarizing of documentaries	1
2.4	Reading travelogues, and excerpts from literature	1
2.5	Paragraph writing	1
2.6	Short report on an event (field trip etc.).	1
2.7	Past tenses	1
2.8	Prepositions	1
2.9	One-word substitution	1
3	**Description of a process / product**	
3.1	Listen to a product and process descriptions	1
3.2	Picture description	1
3.3	Giving instruction to use the product	1
3.4	Reading Advertisements, gadget reviews and user manuals	1
3.5	Writing Definitions and instructions	1
3.6	Future Tenses	1
3.7	Homonyms and Homophones	1
3.8	Imperatives	1
3.9	Comparative adjectives, and discourse markers	1
4	**Classification and Recommendations**	
4.1	Listening to TED Talks and educational videos	2
4.2	Listening to scientific lectures	1
4.3	Small Talk and mini presentations	2
4.4	Reading newspaper articles and journal reports	2
4.5	Note-making / Note-taking	1
4.6	Recommendations	1
4.7	Transferring information from non-verbal	1
4.8	Articles and Pronouns	2
4.9	Subject-verb agreement and collocations	
5	**Expression**	
5.1	Listening to debates and panel discussions	1
5.2	Group discussions	2
5.3	Role plays	1
5.4	Reading editorials and opinion blogs	1
5.5	Essay Writing (Descriptive or narrative)	1
5.6	Punctuation and cause & effect expressions.	1
5.7	Compound Nouns	1
5.8	Simple, compound & complex sentences	1
	Total	**45**

Course Designers

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

R1/ w.e.f.27/12/2023
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BoS Chairman

60 MA 001	MATRICES AND CALCULUS	Category	L	T	P	Credit
		BS	3	1	0	4

Objective

- To familiarize the students with basic concepts in Cayley-Hamilton theorem and orthogonal transformation.
- To get exposed to the fundamentals of differential calculus in various methods.
- To acquire skills to understand the concepts involved in Jacobians and maxima and minima.
- To solve various linear differential equations and method of variation of parameters.
- To learn various techniques and methods in solving definite and indefinite integrals.

Prerequisite

NIL

Course Outcomes

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

CO1	Apply Cayley-Hamilton theorem and reduce the quadratic form into canonical form.	Remember, Apply, Evaluate
CO2	Apply differential calculus in solving various Engineering problems.	Remember, Understand, Apply
CO3	Analyze Jacobian methods and constrained maxima and minima of the functions.	Remember, Understand, Analyze
CO4	Apply various methods in solving the differential equations.	Remember, Apply
CO5	Evaluate definite and indefinite integrals using different techniques.	Remember, Apply, Evaluate

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3							2		3
CO2	3	3	2	2	2							2		3
CO3	3	3	3	2	2							2		3
CO4	3	3	3	3	2							2		3
CO5	3	3	3	2	3							2		3
3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Exam (Marks)	End Sem Examination (Marks)
	1	2		
Remember (Re)	10	10	10	10
Understand (Un)	10	10	10	10
Apply (Ap)	30	20	40	40
Analyze (An)	0	20	20	20
Evaluate (Ev)	10	0	20	20
Create (Cr)	0	0	0	0
Total	60	60	100	100

K.S.Rangasamy College of Technology–Autonomous								R2022
60 MA 001 - Matrices and Calculus								
Common to MECH, ECE, EEE, CSE, MCT, CIVIL, IT, TXT, BT, FT, AI&DS, AI&ML								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	40	60	100

Matrices Characteristic equation - Eigen values and Eigen vectors of a real matrix - Properties of Eigen values and Eigen vectors - Cayley-Hamilton theorem - Orthogonal transformation of a symmetric matrix to diagonal form - Reduction of quadratic form to canonical form by an Orthogonal transformation - Nature of quadratic form - Applications: Stretching of an elastic membrane.	**[09]**
Differentiation Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Successive Differentiation - Leibnitz's theorem - **Applications: Maxima and Minima of functions of one variable*.**	**[09]**
Functions of Several Variables Partial differentiation - Homogeneous functions and Euler's theorem - Jacobians - Taylor's series for functions of two variables - **Applications: Maxima and minima of functions of two variables - Constrained maxima and minima: Lagrange's Method of Undetermined Multipliers*.**	**[09]**
Differential Equations Linear differential equations of second and higher order with constant coefficients - R.H.S is of the form $e^{ax}, sin\, ax, cos\, ax, x^n, n > 0$ - Differential equations with variable coefficients: Cauchy's and Legendre's form of linear equations - Method of variation of parameters.	**[09]**
Integration Definite and Indefinite integrals – Substitution rule - Techniques of Integration: Integration by parts, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals - Applications: Hydrostatic force and pressure, moments and centres of mass.	**[09]**
Total Hours: 45 + 15 (Tutorial)	**60**

Text Book(s):	
1.	Grewal B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi, 2017.
2	Kreyszig Erwin, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Limited, New Delhi, 2016.
Reference(s):	
1.	Dass H.K, "Higher Engineering Mathematics", 3 rd (Revised) Edition, S.Chand & Company Ltd, New Delhi, 2014.
2.	Veerarajan T, "Engineering Mathematics", for Semesters I & II, 1 st Edition, Tata McGraw Hill Publishing
3.	Kandasamy P, Thilagavathy K and Gunavathy K, "Engineering Mathematics - I", S.Chand & Company Ltd, New Delhi, 2017.
4.	Bali N P and Manish Goyal," A text book of Engineering Mathematics",10th Edition, Laxmi Publications (P) Ltd, 2016.

*SDG: 4 – Quality Education

Course Contents and Lecture Schedule

S.No.	Topic	Number of Hours
1	**Matrices**	
1.1	Characteristic equation	1
1.2	Eigen values and Eigen vectors of a real matrix	1
1.3	Properties of Eigen values and Eigen vectors	1
1.4	Cayley-Hamilton theorem	1
1.5	Tutorial	2
1.6	Orthogonal transformation of a symmetric matrix to diagonal form	1
1.7	Reduction of quadratic form to canonical form by Orthogonal transformation	1
1.8	Nature of quadratic form	1
1.9	Stretching of an elastic membrane	1
1.10	Tutorial	2
2	**Differentiation**	
2.1	Representation of functions	1
2.2	Limit of a function and Continuity	1
2.3	Differentiation rules (sum, product, quotient, chain rules)	2
2.4	Successive differentiation	1
2.5	Tutorial	2
2.6	Leibnitz's theorem	1
2.7	Maxima and minima of functions of one variable	2
2.8	Tutorial	2
3	**Functions of Several Variables**	
3.1	Partial differentiation	1
3.2	Homogeneous functions and Euler's theorem	1
3.3	Jacobians	2
3.4	Tutorial	2
3.5	Taylor's series for functions of two variables	1
3.6	Maxima and minima of functions of two variables	1
3.7	Lagrange's Method of Undetermined Multipliers	2
3.8	Tutorial	2
4	**Differential Equations**	
4.1	Linear differential equations of second and higher order with constant co-efficient	1
4.2	R.H.S is of the form $e^{ax}, \sin ax, \cos ax, x^n, n > 0$	2
4.3	Tutorial	2
4.4	Differential equations with variable coefficients: Cauchy's form of linear equations	2
4.5	Differential equations with variable coefficients: Legendre's form of linear equations	2
4.6	Method of variation of parameters	1
4.7	Tutorial	2
5	**Integration**	
5.1	Definite and Indefinite integrals	1
5.2	Substitution rule	1
5.3	Techniques of Integration: Integration by parts	1
5.4	Integration of rational functions by partial fraction	1
5.5	Tutorial	2
5.6	Integration of irrational functions	1
5.7	Improper integrals	1
5.8	Hydrostatic force.	1
5.9	Pressure, moments and centres of mass.	1
5.10	Tutorial	2
	Total	**60**

Course Designers

1. Dr.C.Chandran - cchandran@ksrct.ac.in
2. Mr.G.Mohan - mohang@ksrct.ac.in

R1/ w.e.f.27/12/2023
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BoS Chairman

List of MATLAB Programmes:

1. Introduction to MATLAB.
2. Matrix Operations - Addition, Multiplication, Transpose, Inverse and Rank.
3. Solution of system of linear equations.
4. Computation of Eigen values and Eigen vectors of a Matrix.
5. Finding ordinary and partial derivatives.
6. Solving first and second order ordinary differential equations.
7. Computing Maxima and Minima of a function of one variable.
8. Computing Maxima and Minima of a function of two variables.

60 PH 001	ENGINEERING PHYSICS COMMON TO MECH, MCT	Category	L	T	P	Credit
		BS	3	0	0	3

Objective(s)

1. To make the students to understand the basics of crystallography, crystal growth and its importance in studying materials properties.
2. To establish a sound grasp of knowledge on optics, laser and its applications
3. To understand the dielectric properties of materials including magnetic materials, applications of dielectrics and magnetic materials
4. To introduce advanced materials and nano technology for various modern engineering applications
5. To instil the knowledge on next generation energy device and its applications

Prerequisite

Nil

Course Outcomes

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

CO1	Comprehend the basics of crystallography and its importance for varied materials properties	Understand, Apply & Analyse
CO2	Assess the fundamentals of optics, laser technology and apply the concepts in industry	Understand & Apply
CO3	Impart the knowledge on magnetic properties of materials and their applications in sensors	Understand & Apply
CO4	Interpret the properties of advanced materials and nano materials for potential applications	Apply & Analyse
CO5	Recognize the next generation energy device and its applications in electric vehicles	Understand & Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	3	2	2	3	3	3	3	-	2
CO2	3	3	3	3	2	3	3	3	3	2	3	3	2	2
CO3	3	3	3	3	2	3	3	3	2	3	3	3	2	2
CO4	3	3	3	3	2	3	2	2	3	2	3	3	2	2
CO5	3	3	3	3	3	2	3	2	3	3	3	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	30
Understand	20	20	30
Apply	30	30	30
Analyse	0	0	10
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
Engineering Physics								
Common to MECH, MCT								
Semester	Hours / Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	0	0	45	3	40	60	100

***Crystal Physics** Lattice - Unit cell – crystal systems and Bravais lattice - Crystal planes and Miller indices - d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for HCP structure - Crystal growth techniques – solution (Slow solvent evaporation and slow cooling)- melt (Bridgman and Czochralski) - Imperfections in crystals.	**[09]**
***Optics And Laser Technology** **Optics:** Reflection, refraction and diffraction of light waves - interference - Application of interference in thin films: Newton's ring and Air wedge experiment - Overview of linear and nonlinear optics. **Laser:** Theory of laser - characteristics - Einstein's coefficients - population inversion - Nd-YAG laser, CO_2 laser - Applications of lasers in industry: Drilling, welding, cutting micro machining, measurement of long distances and IR Thermography	**[09]**
***Magnetic And Dielectric Materials** **Magnetic Materials:** Origin of magnetic moment - Bohr magnetron - Classification of magnetic materials - Domaintheory - Hysteresis - soft and hard magnetic materials - Applications - Giant Magneto Resistance(GMR). **Dielectric Materials:** Polarization - Electronic, ionic, orientational and space	**[09]**
***Advanced Materials And Nanotechnology** **Advanced Materials:** Metallic glasses - preparation, properties and applications - Shape memory alloys (SMA) -characteristics, properties of NiTi alloy applications. **Nano Technology:** Properties- Top-down process: Ball Milling method - Bottom-up process: Vapour Phase Deposition - Carbon Nano Tube (CNT): Properties, preparation by electric arc method, Applications of carbon nano tube:Mechanical reinforcement & Sensors.	**[09]**
****Next Generation Energy Device** Introduction - Capacitor-Battery-Comparison – Supercapacitor (SC)- Role of active materials, electrodes, electrolyte and separator in SC - Types of SC – Principle, construction and working of Electric double layer capacitor (EDLC), Pseudocapacitor and hybrid capacitor- Advantages and disadvantages of SC – Construction, working, and performance of hybrid (supercapacitor/ battery) device and its application in electric vehicles.	**[09]**
Total Hours: 45 + 15 (Tutorial)	**60**

Text Book(s):

1.	M. N. Avadhanulu, P. G. Kshirsagar, TVS Arun Murthy "A Text Book of Engineering Physics", S Chand Publications, New Delhi, 2022.
2	H. K. Malik, A. K. Singh "Engineering Physics" McGraw Hill Education Private Limited, New Delhi.
3	D. R. Joshi "Engineering Physics" McGraw Hill Education Private Limited, New Delhi. 2010

Reference(s):

1.	S.O. Pillai "A Text Book Of Engineering Physics" New Age International (P) Limited, New Delhi, 2014B. R. Puri, L.R. Sharma, and S. P. Madan. Principles of Physical Chemistry: Vishal Publishing Company. Gumber Market, Old Railway Road, Jalandhar.
2.	B. B. Laud " Lasers and Non-Linear Optics" New Age International Publications, New Delhi, 2015B.S. Bahl, G.D. Tuli, Arun Bahl. Essentials of Physical Chemistry. S.Chand and Company, Ltd. New Delhi.
3.	S. Rajagopal, R. Pulapparambil Vallikkattil, M. Mohamed Ibrahim, D.G.Velev, Electrode Materials for Supercapacitors in Hybrid Electric Vehicles: Challenges and Current Progress. Condens. Matter 2022, 7, 6. https://doi.org/10.3390/ condmat7010006

*** SDG:4- Quality Education**
**** SDG:7 - Affordable, reliable, sustainable and modern energy for all**

Course Contents and Lecture Schedule

S. No.	Topic	No.of Hours
1.0	**CRYSTAL PHYSICS**	
1.1	Introduction to Lattice ,Unit cell	1
1.2	Crystal systems and Bravais lattice	2
1.3	Crystal planes and Miller indices	1
1.4	d spacing in cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing factor for HCP structure	2
1.5	Crystal growth techniques – solution (Slow solvent evaporation and slow cooling	1
1.6	Melt growth technique(Bridgman and Czochralski)	1
1.7	Imperfections in crystals	1
2.0	**OPTICS AND LASER TECHNOLOGY**	
2.1	**Optics:** Reflection, refraction and diffraction of light waves -	1
2.2	Interference -Application of interference in thin films:	1
2.3	Newton's ring and Air wedge experiment	1
2.4	Overview of linear and nonlinear optics.	1
2.5	**Laser:** Theory of laser - characteristics.	1
2.6	Einstein's coefficients- Population inversion	1
2.7	Nd-YAG laser, CO_2 laser	1
2.8	Applications of lasers in industry: Drilling, welding, cutting micro machining,	1
2.9	Measurement of long distances and IR Thermography.	1
3.0	**MAGNETIC AND DIELECTRIC MATERIALS**	
3.1	**Magnetic Materials:** Origin of magnetic moment - Bohr magnetron	1
3.2	Classification of magnetic materials	1
3.3	Domaintheory - Hysteresis	1
3.4	Soft and hard magnetic materials - Applications	1
3.5	Giant Magneto Resistance(GMR)	1
3.6	**Dielectric Materials:** Polarization - Electronic, ionic, orientational and space charge	1
3.7	Frequency and Temperature dependence ofpolarization	1
3.8	Breakdown mechanisms	1
3.9	Applications of dielectrics in Capacitor and Transformer.	1
4.0	**ADVANCED MATERIALS AND NANOTECHNOLOGY**.	
4.1	**Advanced Materials:** Metallic glasses - preparation, properties and applications	2
4.2	Shape memory alloys (SMA) -characteristics, properties of NiTi alloy applications	2
4.3	**Nano Technology:** Properties- Top-down process: Ball Milling method	2
4.4	Bottom-up process: Vapour Phase Deposition	1
4.5	Carbon Nano Tube (CNT): Properties, preparation by electric arc method, Applications of carbon nano tube .	1
4.6	Mechanical reinforcement & Sensors	1
5.0	**NEXT GENERATION ENERGY DEVICE**	
5.1	Introduction - Capacitor-Battery-Comparison	1
5.2	Supercapacitor (SC)	1
5.3	Role of active materials, electrodes, electrolyte and separator in SC	1
5.4	Types of SC – Principle, construction and working of Electric double layer capacitor (EDLC)	1
5.5	Principle, construction and working of Pseudocapacitor	1
5.6	Principle, construction and working of hybrid capacitor	1
5.7	Advantages and disadvantages of SC	1
5.8	Construction, working, and performance of hybrid (supercapacitor/battery)device	1
5.9	Its application in electric vehicles	1

Course Designers

Dr. V. Vasudevan
Dr. M. Malarvizhi
Mr.S. Vanchinathan

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 EE 001	Basic Electrical and Electronics Engineering	Category	L	T	P	Credit
		ES	3	0	0	3

Objective

This course aims to impart the knowledge of basics of electric circuits, working principles and applications of DC and AC electrical machines, various electrical installation, analyze the characteristics of various analog electronic devices and their applications, construction and working of various analog measuring Instrument.

Prerequisite

NIL

Course Outcomes

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

CO1	Apply the basic laws of electric circuits to calculate the unknown quantities.	Apply
CO2	Acquire knowledge on different electrical machines and select suitable machines for industrial applications.	Analyze
CO3	Recognize the significance of various components of low voltage electrical installations and create awareness on electrical safety.	Understand
CO4	Realize the operation and characteristics of semiconductor devices.	Analyze
CO5	Understandthe operating principles of measuring instruments and choose suitab instrument for measuring the parameters.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	2	-	-	-	-	2	3	-	2	3
CO2	3	3	1	1	-	-	2	-	2	-	2	1	2	3
CO3	3	3	-	2	-	2	-	-	-	-	2	2	2	3
CO4	2	2	3	-	2	-	2	1	-	2	1	3	2	3
CO5	2	3	1	2	-	-	3	2	-	-	2	3	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	Continuous Assessment Tests (Marks)			End Sem Examination (Marks)
	1	2	3	
Remember	10	20	20	30
Understand	20	30	30	30
Apply	30	10	10	30
Analyse	0	0	0	10
Evaluate	0	0	0	0
Create	0	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K.S.Rangasamy College of Technology–Autonomous								
60 EE 001 - Basic Electrical and Electronics Engineering								
Common to CSE, IT, AIDS, AIML, MECH, MCT, BT, FT and CIVIL Branches								
	Hours/Week				Credit	Maximum Marks		
Semester	L	T	P	Total Hrs.	C	CA	ES	Total
I/II	3	0	0	45	3	40	60	

Electrical Circuits DC Circuits: Circuit Components: Resistor, Inductor, Capacitor – Ohm's Law - Kirchhoff's Laws–Simple problems. Introduction to AC Circuits and Parameters: Waveforms, Average value and RMS Value of Sinusoidal Waveform real power, reactive power and apparent power, power factor – Steady state analysis of RLC series circuits- Simple problems. Introduction to three phase AC circuits	**[10]**
Electrical Machines* Construction and Working principle - Separately and Self excited DC Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.	**[10]**
Electrical Installations* Domestic wiring, types of wires and cables, earthing,protective devices- switch fuse unit- Miniature Circuit Breaker-Moulded Case Circuit Breaker- Earth Leakage Circuit Breaker, Batteries and types, UPS,Safety precautions and First Aid.	**[09]**
Analog Electronics* Introduction to Semiconductor Materials– PN Junction Diodes, Zener Diode –Characteristics and Applications – Bipolar Junction Transistor-Biasing and Configuration (NPN) - Regulated power supply unit, switched mode power supply.	**[08]**
Measurements And Instrumentation* Functional elements of an instrument, Standards and calibration, Operating Principle, types -Moving Coil and Moving Iron meters, Operating principles and Types of Wattmeter, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition**.**	**[08]**
Total Hours	**45**

Text Book(s):

1.	Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition, McGraw Hill Education, 2020.
2	A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements & Instrumentation', Dhanpat Rai and Co, 2015.

Reference(s):

1.	Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill Education,
2.	Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition, 2017.
3.	Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
4.	H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010.

SDG No.9 – Industry Innovation and Infrastructure

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**ELECTRICAL CIRCUITS**	
1.1	Circuit Components: Resistor, Inductor, Capacitor	1
1.2	Ohm's Law - Kirchhoff's Laws	1
1.3	Ohm's Law - Kirchhoff's Laws - Problems	2
1.4	Introduction to AC Circuits and Parameters: Waveforms, Average value and RMS Value of Sinusoidal Waveform	2
1.5	Real power, reactive power and apparent power, power factor	1
1.6	Steady state analysis of RLC series circuits	1
1.7	RLC series circuits - Problems	1
1.8	Introduction to three phase system	1
2	**ELECTRICAL MACHINES**	
2.1	Construction and Working principle of DC Generator	1
2.2	Types and Applications of Separately and Self excited DC Generators	1
2.3	EMF equation of DC Generator	1
2.4	Working Principle of DC motors	1
2.5	Torque Equation	1
2.6	Types and Applications	1
2.7	Construction, Working principle and Applications of Transformer	1
2.8	Construction, Working principle and Applications of Three phase Alternator	1
2.9	Construction, Working principle and Applications of Synchronous motor	1
2.10	Construction, Working principle and Applications of Three Phase Induction Motor	1
3	**ELECTRICAL INSTALLATIONS**	
3.1	Domestic wiring, types of wires and cables	1
3.2	Earthing, protective devices	2
3.3	Switch fuse unit- Miniature Circuit Breaker	1
3.4	Molded Case Circuit Breaker- Earth Leakage Circuit Breaker	1
3.5	Batteries and types	2
3.6	UPS	1
3.7	Safety precautions and First Aid	1
4	**ANALOG ELECTRONICS**	
4.1	Introduction to Semiconductor Materials	1
4.2	Characteristics and Applications of PN Junction Diodes	1
4.3	Characteristics and Applications of Zener Diode	1
4.4	Bipolar Junction Transistor	1
4.5	Biasing & Configuration (NPN)	2
4.6	Regulated power supply unit	1
4.7	Switched mode power supply	1
5	**MEASUREMENTS AND INSTRUMENTATION**	
5.1	Functional elements of an instrument	1
5.2	Standards and calibration	1
5.3	Moving Coil meters - Operating Principle, types	1
5.4	Moving Iron meters - Operating Principle, types	1
5.5	Operating principles and Types of Wattmeter	1
5.6	Energy Meter	1
5.7	Instrument Transformers – CT& PT	1
5.9	DSO- Block diagram- Data acquisition	1
	Total	45

Course Designers

1. Mr.S.Srinivasan - srinivasan@ksrct.ac.in
2. Ms.R.Radhamani -radhamani@ksrct.ac.in
3. Ms.S.Jaividhya - jaividhya@ksrct.ac.in
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5. Mr.T.Prabhu - prabhut@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 ME 004	Engineering Mechanics	Category	L	T	P	Credit
		ES	3	1	0	4

Objective

- To learn a process for analysis of static objects, concepts of force, moment, and mechanical equilibrium in two and three dimensions.
- To learn the equilibrium of rigid bodies such as frames, trusses, beams.
- To identify the properties of surfaces and solids by using different theorem.
- To learn the principle of frictional forces at the contact surfaces and impart basic concept of dynamics of particles.
- To acquire the concept of elements of rigid body dynamics

Prerequisite

NIL

Course Outcomes

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

CO1	Use scalar and vector analytical techniques for analysing forces in statically determinate structures.	Understand & Apply
CO2	Apply basic knowledge of scientific concepts to solve real-world problems.	Understand & Apply
CO3	Calculate the properties of surfaces and solids using various theorems.	Understand & Apply
CO4	Determine the effect of frictional forces and the dynamic forces exerted in the particle	Understand & Apply
CO5	Analysis of rigid body dynamics and calculation of member forces in the rigid body	Understand & Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	3								2	2	2
CO2	3	2	2	3								2	2	2
CO3	3	2	2	3								2	2	2
CO4	3	2	2	3								2	2	2
CO5	3	2	2	3								2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	Continuous Assessment Tests(Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	30	30	50
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
60 ME 004 - Engineering Mechanics								
MECH & MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I	3	1	0	60	4	40	60	100

Basics and Statics of Particles Introduction -Units and Dimensions-Laws of Mechanics–Principle of transmissibility-Lame's theorem, Parallelogram and triangular Law of forces–Vectors–Vectorial representation of forces and moments	**[12]**
Vector operations Addition, subtraction, dot product, cross product-Coplanar Forces–Resolution and Composition of forces–Equilibrium of a particle–Forces in space-Equilibrium of a particle in space-Equivalent systems of forces-Single equivalent force.	**[12]**
Equilibrium of Rigid Bodies Free body diagram–Types of supports and their reactions–requirements of stable equilibrium–Static determinacy, Moments and Couples–Moment of a force about a point and about an axis–Vectorial representation of moments and couples–Varignon's theorem-Equilibrium of Rigid bodies in two	**[12]**
Properties of Surfaces and Solids Determination of Areas and Volumes-Centroid, Moment of Inertia of plane area (Rectangle, circle, triangle using Integration Method; T section, I section, Angle section, Hollow section using standard formula) - Parallel axis theorem and perpendicular axis theorem- Polar moment of inertia -Mass moment of inertia of thin rectangular section. **Friction** Frictional force–Laws of Coloumb friction–Simple contact friction–Ladder friction-Rolling resistance–Ratio of tension in belt.	**[12]**
Dynamics of Particles Displacement, Velocity, acceleration and their relationship–Relative motion -Projectile motion in horizontal plane– Newton's law–Work Energy Equation – Impulse and Momentum. **Elements of Rigid Body Dynamics** Translation and Rotation of Rigid Bodies: Velocity and acceleration–General Plane motion: Crank and Connecting rod mechanism.	**[12]**
Total Hours	**60**

Text Book(s):

1.	Rajasekaran, S., Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt. Ltd., 3rd Edition, 2017.
2	Beer, F.P and Johnson Jr. E.R, "Vector Mechanics for Engineers", Statics and Dynamics, McGraw-Hill International, 11th Edition, 2016.

Reference(s):

1.	Jayakumar, V. and Kumar, M, "Engineering Mechanics", PHI Learning Private Ltd, New Delhi, 2012
2.	Hibbeller, R.C., "Engineering Mechanics", Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd.,
3.	Bansal R.K," Engineering Mechanics" Laxmi Publications (P) Ltd, 2011.
4.	Irving H. Shames, Engineering Mechanics: Statics and Dynamics", Pearson Education Asia Pvt. Ltd, 4th Edition, 2003.
5	James M. Gere and Timoshenko, "Mechanics of Materials", CBS Publisher, New Delhi, 6th Edition, 2012

SDG 9 – Industry Innovation and Infrastructure

Course Contnts and Lecture Schedule

S.No	Topic	No.of Hours
1	**BASICS AND STATICS OF PARTICLES**	
1.1	Introduction, Units and Dimensions, Laws of Mechanics	1
1.2	Principle of transmissibility, Lame's theorem,	1
1.3	Parallelogram and triangular Law of forces	1
1.4	Tutorial	2
1.5	Vectors, Vectorial representation of forces and moments	1
1.6	Vector operations, Coplanar Forces–Resolution and Composition of forces	2
1.7	Equilibrium of a particle, Forces in space	1
1.8	Equivalent systems of forces-Single equivalent force.	1
1.9	Tutorial	2
2	**EQUILIBRIUM OF RIGID BODIES**	
2.1	Free body diagram, Types of supports and their reactions	1
2.2	Requirements of stable equilibrium, Static determinacy	1
2.3	Moments and Couples–Moment of a force about a point and about an axis	2
2.4	Vectorial representation of moments and couples	1
2.5	Tutorial	2
2.6	Varignon's theorem	1
2.7	Equilibrium of Rigid bodies in two dimensions	2
2.8	Tutorial	2
3	**PROPERTIES OF SURFACES AND SOLIDS**	
3.1	Determination of Areas and Volumes-Centroid	1
3.2	Moment of Inertia of plane area (Rectangle, circle, triangle using Integration Method)	2
3.3	Tutorial	2
3.4	Moment of Inertia of plane area(T section, I section, Angle section)	1
3.5	Moment of Inertia of plane area(Hollow section)	1
3.6	Parallel axis theorem and perpendicular axis theorem	1
3.7	Polar moment of inertia	1
3.8	Mass moment of inertia of thin rectangular section.	1
3.9	Tutorial	2
4	**FRICTION & DYNAMICS OF PARTICLES**	
4.1	Frictional force, Laws of Coloumb friction, Simple contact friction	1
4.2	Ladder friction	1
4.3	Rolling resistance–Ratio of tension in belt	1
4.4	Tutorial	2
4.5	Displacement, Velocity, acceleration and their relationship, Relative motion	1
4.6	Projectile motion in horizontal plane	1
4.7	Newton's law	1
4.8	Work Energy Equation	1
4.9	Impulse and Momentum	1
4.10	Tutorial	2

5	**ELEMENTS OF RIGID BODY DYNAMICS**	
5.1	Translation and Rotation of Rigid Bodies	1
5.2	Translation and Rotation of Rigid Bodies - Velocity	2
5.3	Translation and Rotation of Rigid Bodies - acceleration	2
5.4	Tutorial	2
5.5	General Plane motion	1
5.6	General Plane motion - Crank and Connecting rod mechanism	2
5.7	Tutorial	2
	Total	60

Course Designers

1. Mr.S.KARTHICK -skarthick@ksrct.ac.in

60 MY 001	Environmental Studies and Climate Change (Common to all)	Category	L	T	P	Credit
		BS	2	0	0	0

Objectives

- To understand the importance of ecosystem and biodiversity.
- To analyze the impacts of pollution, control and legislation.
- To enlighten awareness and recognize the social responsibility in environmental issues.
- To enlighten the waste management

Prerequisite

-Nil-

Course Outcomes

On the successful completion of the course, students will be able to		
CO1	Understand the impacts of pollution on climate change	Understand
CO2	Enhance the awareness the methods of waste management.	Apply
CO3	Examine the value of sustainable future	Evaluate
CO4	Evaluate the clean and green development for environmental problem	Evaluate
CO5	Analyze the role of Geo-science in environmental management	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	3	3	3	1	3	2	3		
CO2	3	3	3	3	2	3	3	3	3	2	2	3		
CO3	3	3	3	3	3	3	3	3	2	2	2	3		
CO4	2	2	3	3	-	1	3	3	2	2	1	2		
CO5	3	3	3	3	3	3	3	3	3	2	2	3		
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	Continuous Assessment Tests			Terminal Examination
	1	2	3	
Remember	10	10	10	-
Understand	20	20	20	
Apply	30	30	30	
Analyze	30	30	30	-
Evaluate	-	-	-	-
Create	-	-	-	-

K.S.Rangasamy College of Technology–Autonomous								R2022
60 MY 001 - Environmental Studies and Climate Change								
(Common to all)								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I / II	2	0	0	30	0	100	-	100

Pollution and its impact on climate change* Pollution: Sources and impacts of air pollution – green house effect- global warming- climate change - ozone layer depletion - acid rain. Carbon Footprint - Climate change on various sectors – Agriculture, forestry and ecosystem – climate change mitigation and adaptation. Action plan on climate change. IPCC, UNFCCC, Kyoto Protocol, Montreal Protocol on Climatic Changes. Activity: Study of carbon emission nearby place or industry.	**[06]**
Integrated Waste Management* Waste - Types and classification. Principles of waste management (5R approach) - Swachh Bharat Abhiyan – Commercial waste, plastic waste, domestic waste, e-waste and biomedical waste - risk management: Collection, segregation, treatment and disposal methods. Waste water treatment-ASP Activity: Analysis and design of waste management systems, prepare a model / project -wealth from	**[06]**
Sustainable development practices** Sustainable development goals (SDGs) **–** Green computing- Carbon trading - Green building – Eco-friendly plastic – Alternate energy: Hydrogen – Bio-fuels – Solar energy – Wind – Hydroelectric power. Water scarcity- Watershed management, ground water recharge and rainwater harvesting. Activity: Select a topic and analyze the value of sustainable development.	**[06]**
Environment and Agriculture*: Organic farming – bio-pesticides- composting, bio composting, vermi-composting, roof gardening and irrigation. Waste land reclamation. Climate resilient agriculture. Green auditing Activity: Prepare a green auditing report on energy, water etc.	**[06]**
Geo-science in natural resource management Data base software in environment information, Digital image processing applications in forecasting. GPS, Remote Sensing and Geographical Information System (GIS), World wide web (www), Environmental information system (ENVIS). Activity: Prepare the report using IT tool.	**[06]**
Total Hours	**30**

Text Book(s):

1.	AnubhaKaushik , C P Kaushik. Perspectives In Environmental Studies, New Age International publishers; Sixth edition (1 January 2018)

Reference(s):

1.	G.Tyler Miller Environmental Science 14th Edition Cengage Publications, Delhi, 2013
2.	Gilbert M.Masters and Wendell P. Ela,"Environmental Engineering And Science", Phi Learning Private Limited, 3rd Edition,2015
3.	ErachBharucha. Text Book of Environmental Studies for Undergraduate Courses, Universities Press,

***SDG:3 – Climate Action**
****SDG:6 – Clean Water and Sanitation**
****SDG:7 – Affordable and Clean Energy**

Course Contents and Lecture Schedule		
S.No.	**Topic**	**No.of Hours**
1.0	**Pollution and its impact on climate change**	
1.1	Pollution: Sources and impacts of air pollution – green house effect- Global warming- climate change - ozone layer depletion - acid rain	2
1.2	Climate change on various sectors: Agriculture, forestry and ecosystem. – climate change mitigation and adaptation	1
1.3	Action plan on climate change - IPCC, UNFCCC, Kyoto Protocol, Montreal Protocol on Climatic Changes	1
2.0	**Integrated Waste Management**	
2.1	Waste - Types and classification. Principles of waste management (5R approach) - Swachh Bharat Abhiyan	1
2.2	Commercial waste, plastic waste, domestic waste, e-waste and biomedical waste	1
2.3	Risk management: Collection, segregation, treatment and disposal methods.	1
2.4	Waste water treatment- ASP	1
3.0	**Sustainable development practices**	
3.1	Sustainable development goals (SDGs) **–** Green computing- Carbon trading - Green building – Eco- friendly plastic	1
3.2	Alternate energy: Hydrogen – Bio-fuels – Solar energy – Wind – Hydroelectric power	2
3.3	Water scarcity- Watershed management, ground water recharge and rainwater harvesting	1
4.0	**Environment andAgriculture**	
4.1	Organic farming – bio-pesticides	1
4.2	Composting, bio composting, vermi-composting	1
4.3	Roof gardening and irrigation	1
4.4	Waste land reclamation. Climate resilient agriculture, Green auditing	1
5.0	**Geo-science in natural resource management**	
5.1	Data base software in environment information, Digital image processing applications in forecasting	2
5.2	GPS, Remote Sensing and Geographical Information System (GIS)	1
5.3	World wide web (www), Environmental information system (ENVIS)	1
	Total	30

CourseDesigners

Dr.T.A.SUKANTHA
Dr.B.SRIVIDHYA
Dr.K.PRABHA
Dr.S.MEENACHI
Mr.K.TAMILARASU
Ms.D.KIRTHIGA

60 ME 0P1	Fabrication and Reverse Engineering Laboratory (Common to All branches)	Category	L	T	P	Credit
		ES	0	0	4	2

Objectives

- To acquire skills in operating hand tools and instruments.
- To provide hands-on training on Carpentry, Sheet metal, Fitting and Welding.
- To provide hands-on training on household wiring and electronic circuits.
- To offer real time activity on plumbing connections in domestic applications.
- To provide hands-on activities on dismantling, and assembling the Home Appliance, Center lathe operations, computer's internal components and peripherals.

Pre-requisite

Nil

Course Outcomes

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

CO1	Perform power tools operations.	Apply
CO2	Make a wooden model using carpentry Process	Apply
CO3	Make a model using sheet metal, filing and joining a MS Plate	Apply
CO4	Repair and Maintenances of water lines for home applications	Apply
CO5	Trouble shoots the electrical and electronic circuits, Electrical Machines and realizes the reputation of house wiring, home Appliance, computer internal components and peripherals.	Apply

Mapping with Programme outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3		2		3		3	2	3		2	3		
CO2	3	3	3		3	2		2	3	3		3		
CO3	3	3	3		3	2	2	2	3	3	2	3		
CO4	3	3	3	2	3	3	2	3	3			3		
CO5	3	3	3	3	3	2	2	2	3	2	2	3		
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology–Autonomous								R2022
60 ME 0P1 – Fabrication and Reverse Engineering Laboratory								
(Common to All branches)								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
I / II	0	0	4	45	2	40	60	100

Performs of Power Tools
Drilling in different Walls and Materials Fitting of Hand shower mount, Shirt hanger, Towel hanger and Pipe with clamps

Carpentry Process
Design and Development of Wooden Model using the Carpentry Process T / Cross Joint / different joints

Sheet Metal and Filling Process
Design and Development of Metal Model - Make a Tray Components using Sheet Metal Process and Mating of Square joint in MS Plate using the Filling Process

Welding Process
Fabrication of Models with MS Plate using Arc Welding- Lap Joint, Butt Joint, T Joint

Plumbing Process
Repair and Maintenances of Pipe Fitting for Home Applications Study of plumbing tools, assembly of G.I. pipes/ PVC and pipe fittings, cutting of threads in G.I. Pipes by thread cutting dies.

Residential house wiring
Design and Excusion of Residential house wiring With and Without UPS- 1 BHK - 2 BHK. Design and fabrication of domestic LED lamps - Circuit designing (calculation of components)

Electronic Circuit wiring
PCB fabrication – Soldering - Assembling of Audio Amplifiers- Connecting USB/Bluetooth MP3 player board - Connecting Volume controllers - Connecting bass & treble filter boards - Connecting Surround and sub-woofer filter board

Assembling and dismantling of Electronics Machines
Iron box, Induction stove, Water heater, Mixer, Table fan, Ceiling fan

Study Exercises
Demonstration of Centre Lathe operations Facing, Turning, and drilling and its components. Assemble and dismantle of Vacuum Cleaner / Refrigerator and its components

Computer Hardware Study Exercises
Identify internal components of computer - Assemble and dismantle desktop computer systems

List of Experiments

1. Fitting of Wall mounting Parts using Power Tools

a) Drilling in different Walls and Materials
b) Fitting of Hand shower mount, Shirt hanger, Towel hanger and Pipe with Clamps.

2. Making of Wooden model using the Carpentry Process

a) T / Cross Joint
b) Mortise and Tenon Joint / different joints

3. Making of Metal Model

a) Making of Components using Sheet Metal Process
b) Mating of Components using the Filling Process

4. Fabrication of Welded model

5. Repair and Maintenance of Pipe Fitting for Home Applications

a) Assembly of GI pipes/PVC and Pipe Fitting
b) Cutting of Threads in GI pipes by thread Cutting Dies

6. Assembling and dismantling of

a) Iron box
b) Induction stove
c) Water heater
d) Mixer
e) Table fan
f) Ceiling fan

7. Design and Execution of Residential house wiring

a) 1 BHK
b) 2 BHK

8. Design and Execution of Residential house wiring with UPS.

a) 1 BHK
b) 2 BHK

9. Design and fabrication of domestic LED lamps

a) Circuit designing (calculation of components)
b) PCB fabrication
c) Soldering

10. Assembling of Audio Amplifiers

a) Connecting USB/Bluetooth MP3 player board
b) Connecting Volume controllers
c) Connecting bass & treble filter boards
d) Connecting Surround and sub-woofer filter board

Study Exercises

1. Demonstration of Centre Lathe and its operations like Facing, Turning, and drilling.
2. Dismantle and Assemble of Vacuum Cleaner / Refrigerator.
3. Study of components of computer. Dismantle and assemble of desktop computer systems

Course Designers

1. Mr.S Sakthivel - sakthivel_s@ksrct.ac.in
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3. Mr. K. Raguvaran – raguvaran@ksrct.ac.in

60 EE 0P1	Basic Electrical and Electronics Engineering Laboratory (Common to Civil, Mech, MCT and FT Branches)	Category	L	T	P	Credit
		ES	0	0	4	2

Objectives

- To acquire knowledge in conducting basic electrical laws
- To gain knowledge on three phase power measurement
- To train the students in conducting load tests on electrical machines
- To gain practical experience in characterizing electronic devices
- To gain practical experience in using measuring devices

Course Outcomes

CO1	Practice experimental methods to verify the Ohm's and Kirchhoff's Laws.	Apply
CO2	Calculate the three-phase power measurement	Apply
CO3	Analyze experimentally the load characteristics of electrical machines.	Analyze
CO4	Analyze the characteristics of basic electronic devices.	Analyze
CO5	Calibrate the measuring devices	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	2			2		3	3	2	
CO2	3	3	3	3	2	2		3			3	3	2	
CO3	3	3	3	3	2	2			2		3	3	2	
CO4	3	3	3	3	2	2	2	2		2	3	3	2	
CO5	3	3	3	3	2	2	2				3	3	2	
3- Strong;2-Medium;1-Some														

List of Experiments

1. Verification of Ohm's and Kirchhoff's Laws.
2. Measurement of Three Phase Power.
3. Load test on DC Shunt Motor.
4. Load test on Self Excited DC Generator.
5. Load test on Single phase Transformer.
6. Load test on Induction Motor.
7. Characteristics of PN and Zener Diodes.
8. Characteristics of BJT (CE).
9. Calibration of Single-Phase Energy Meter.
10. Mini Project.

SDG No.9 – Industry Innovation and Infrastructure

Course Designers

1. Mr.S.Srinivasan - srinivasan@ksrct.ac.in
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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

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

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

SECOND SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 EN 002	Professional English II	2	40	60	100	45	100
2	60 MA 003	Integrals, Partial Differential Equations and Laplace Transform	2	40	60	100	45	100
3	60 ME 001	Engineering Drawing	2	40	60	100	45	100
4	60 CS 001	C Programming	2	40	60	100	45	100
5	60 CH 001	Chemistry for Mechanical Sciences	2	40	60	100	45	100
6	60 GE 001	Heritage of Tamils / தமிழர் மரபு	2	100	0	100	0	100
PRACTICAL								
8	60 CP 0P1	Physics & Chemistry Laboratory	3	60	40	100	45	100
9	60 CS 0P1	C Programming Laboratory	3	60	40	100	45	100
10	60 CG 0P1	Career Skill Development-I	3	100	-	100	-	-

* CA evaluation pattern will differ from course to course and for different tests.This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

R1/ w.e.f.27/12/2023

Passed in the BoS Meeting Held on 24/11/2023

Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 EN 002	Professional English II	Category	L	T	P	Credit
		HS	1	0	2	2

Objective

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

Pre-requisite

Basic knowledge of reading and writing in English and should have completed Professional English I.

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	3	3	2	3	3	2
CO2								2	3	3	2	3	3	2
CO3								2	3	3	2	3	2	2
CO4								2	3	3	2	3	3	3
CO5								2	3	3	2	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Knowledge (Kn)	10	10	10
Apply (Ap)	20	20	40
Analyse (An)	30	30	50
Create (Cr)	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
60 EN 002 Professional English II								
Common to All Branches								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	2	45	2	40	60	100

Making Comparisons **Listening:** Evaluative Listening: Advertisements, Product Descriptions, - Audio / video; filling a graphic organiser (choosing a product or service by comparison) **Speaking:** Marketing a product, persuasive speech techniques. **Reading:** Reading advertisements, user manuals and brochures. **Writing:** Professional emails, Email etiquette - compare and contrast essay. **Language Focus:** mixed tenses, prepositional phrases, same words used in different contexts and discourse markers	**[09]**
Expressing Causal Relations in Speaking and Writing **Listening:** Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects. **Speaking:** Describing and discussing the reasons of accidents or disasters based on news reports. **Reading:** longer technical texts– cause and effect essays, and letters / emails of complaint, **Writing:** Writing responses to complaints **Language Focus:** Active Passive Voice transformations, Infinitive and Gerunds – Word Formation (Noun-Verb-Adj-Adv), Adverbs.	**[09]**
Problem Solving **Listening:** Listening to / watching movie scenes/ documentaries depicting a technical problem and suggesting solutions. **Speaking:** Group Discussion (based on case studies), - techniques and Strategies. **Reading:** Case Studies, excerpts from literary texts, news reports etc. **Writing:** Letter to the Editor, Checklists, Problem solution essay / Argumentative Essay **Language Focus:** Error correction; If conditional sentences - Compound Words, Sentence Completion.	**[09]**
Reporting of Events and Research **Listening:** Listening Comprehension based on new report and documentaries – **Speaking:** Interviewing, presenting oral reports, Mini presentations on select topics. **Reading:** Newspaper articles. **Writing:** Recommendations, Transcoding, Accident Report, Precis writing and Summarising **Language Focus:** Reported Speech – Modals - Conjunctions- use of Prepositions	**[09]**
The Ability to put Ideas or Information Coherently **Listening:** Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance). **Speaking:** Participating in role plays, virtual interviews, making presentations with visual aids **Reading:** excerpts of interview with professionals **Writing:** Job / Internship application – Cover letter & Résumé **Language Focus:** Numerical Adjectives, question types: Wh/ Yes or No/ and Tags; Relative Clauses - Idioms.	**[09]**
Total Hours	**45**

Text Book(s):	
1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020
Reference(s):	
1.	Raman. Meenakshi, Sharma. Sangeeta, 'Professional English'. Oxford university press. New Delhi. 2019
2.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003
3.	Prof. R.C. Sharma & Krishna Mohan, 'Business Correspondence and Report Writing', Tata McGraw Hill & Co. Ltd., New Delhi, 2001
4.	V.N. Arora and Laxmi Chandra, 'Improve Your Writing', Oxford University Press, New Delhi, 2001

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Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1.	**Making Comparisons**	
1.1	Evaluative Listening	1
1.2	Product Descriptions and filling a graphic organiser	1
1.3	Marketing a product by using persuasive techniques	2
1.4	Reading advertisements, user manuals and brochures	1
1.5	Writing professional emails	1
1.6	Compare and contrast essay	1
1.7	Mixed tenses and prepositional phrases	1
1.8	Same words used in different contexts	1
2	**Expressing Causal Relations in Speaking and Writing**	
2.1	Listening to longer technical talks	1
2.2	Listening to process/event descriptions	1
2.3	Describing and discussing the reasons of accidents or disasters	1
2.4	Reading longer technical texts– cause and effect essays	1
2.5	Writing responses to complaints	1
2.6	Active Passive Voice transformations	2
2.7	Infinitive and Gerunds	1
2.8	Word Formation (Noun-Verb-Adj-Adv), Adverbs.	1
3	**Problem Solving**	
3.1	Listening to documentaries and suggesting solutions	1
3.2	Group Discussion (based on case studies)	2
3.3	Reading Case Studies, excerpts from literary texts and news reports	1
3.4	Letter to the Editor	1
3.5	Checklists	1
3.6	Problem solution and argumentative essays	1
3.7	Error correction and Sentence Completion	1
3.8	If conditional sentences	1
4	**Reporting of Events and Research**	
4.1	Listening Comprehension	1
4.2	Interviewing and presenting oral reports	1
4.3	Mini presentations on select topics	1
4.4	Reading newspaper articles	1
4.5	Recommendations	1
4.6	Transcoding	1
4.7	Precis writing and Summarising	1
4.8	Reported Speech, Modals	1
4.9	Conjunctions	
5	**The Ability to put Ideas or Information Coherently**	
5.1	Listening to Formal job interviews	1
5.2	Role plays	2
5.3	Virtual interviews	1
5.4	Reading Company profiles	1
5.5	Writing Statement of Purpose (SoPs)	1
5.6	Writing Résumé	1
5.7	Numerical Adjectives and Relative Clauses - Idioms	1
5.8	question types: Wh/ Yes or No/ and Tags	1
	Total	**45**

Course Designers

Dr.A.Palaniappan - palaniappan@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MA 003	Integrals, Partial Differential Equations and Laplace Transform	Category	L	T	P	Credit
		BS	3	1	0	4

Objectives

- To provide exposure in handling the situations involving multiple integrals
- To familiarize the basic concepts in Vector calculus.
- To get exposed to the fundamentals of analytic functions.
- To develop the mathematical skills in solving partial differential equations.
- To facilitate the concepts in Laplace transform techniques.

.

Pre-requisite

-NIL-

Course Outcomes

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

CO1	Evaluate double and triple integrals.	Remember, Apply, Evaluate
CO2	Analyze the basic concepts of vector calculus.	Remember, Analyze, Evaluate
CO3	Construct the analytic functions and evaluate complex integrals.	Remember, Understand, Apply
CO4	Compute the solution of partial differential equations using different methods.	Remember, Apply
CO5	Apply Laplace transform techniques for solving differential equations.	Remember, Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3							2	3	2
CO2	3	3	2	2	3							2	3	2
CO3	3	3	3	2	2							2	3	2
CO4	3	3	3	3	2							2	3	2
CO5	3	3	2	3	3							2	3	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	Continuous AssessmentTests (Marks)		End Sem Examination (Marks)
	1	2	
Knowledge	10	10	10
Apply	0	10	10
Analyse	20	40	40
Create	10	0	20

K.S.Rangasamy College of Technology–Autonomous								R2022
60 MA 003 – Integrals, Partial Differential Equations and Laplace Transform								
Common to MECH, ECE, EEE, CSE, MCT, CIVIL, IT, TXT, BT, FT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	1	0	60	4	40	60	100

Multiple Integrals Double integration – Cartesian and polar co-ordinates – Change of order of integration – Area as double integral – Triple integration in Cartesian co-ordinates – Change of variables - Cartesian to polar co-ordinates and Cartesian to Cylindrical co-ordinates.	**[09]**
Vector Calculus* Introduction - Gradient of a scalar point function –Directional derivative – Angle of intersection of two surfaces – Divergence and curl (excluding vector identities) – Solenoidal and irrotational vectors – Application : Green's theorem in the plane – Gauss divergence theorem -Stokes' theorem (statement only) .	**[09]**
Analytic Functions And Integrals Analytic function – Necessary and Sufficient conditions (statement only)-Properties – Harmonic function – Construction of an analytic function – Cauchy's Integral theorem (statement only) – Cauchy's integral formula – Classification of singularities – Application: Cauchy's residue theorem.	**[09]**
Partial Differential Equations* Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions – Non-Linear partial differential equations of first order – Lagrange's linear equations – Application: Homogeneous Linear partial differential equations with constant coefficients.	**[09]**
Laplace Transform Conditions for existence – Transforms of elementary functions – Basic properties - Derivatives and integrals of transforms - Initial and final value theorem – Transform of periodic functions. Inverse Laplace transform – Convolution theorem (excluding proof) – Application: Solution of second order ordinary differential equations with constant co-efficients.	**[09]**
Total Hours: 45 + 15 (Tutorial)	**60**

Text Book(s):	
1.	Grewal B.S, "Higher Engineering Mathematics", 44th Edition, Khanna Publishers, Delhi, 2017.
2	Veerarajan T, "Engineering Mathematics", for Semesters I & II, 1st Edition, Tata McGraw Hill Publishing Co., New Delhi, 2019.
Reference(s):	
1.	Kreyszig Erwin, "Advanced Engineering Mathematics", 10th Edition, John Wiley and Sons (Asia) Limited, New Delhi, 2016.
2.	Kandasamy P, Thilagavathy K and Gunavathy K, "Engineering Mathematics - I", S.Chand & Company Ltd, New Delhi, 2017
3.	Bali N P and Manish Goyal, "A text book of Engineering Mathematics",10th Edition, Laxmi Publications (P) Ltd, 2016.
4.	Dr.P.N.Agrawal, Dr.D.N.Pandey ,"Integral Equations, Calculus of Variations and its Applications", NPTEL online video courses.

***SDG 4 – Quality Education**

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Multiple Integrals**	
1.1	Double integration	1
1.2	Cartesian and polar coordinates	1
1.3	Change of order of integration	1
1.4	Area as double integral	1
1.5	Tutorial	2
1.6	Triple integration in Cartesian coordinates	1
1.7	Change of variables	1
1.8	Cartesian to polar coordinates	1
1.9	Cartesian to Cylindrical coordinates	1
1.10	Tutorial	2
2	**Vector Calculus**	
2.1	Introduction: Gradient of a scalar point function	1
2.2	Directional derivative	1
2.3	Angle of intersection of two surfaces	1
2.4	Divergence and curl (excluding vector identities)	1
2.5	Tutorial	2
2.6	Solenoidal and irrotational vectors	1
2.7	Application: Green's theorem in the plane	1
2.8	Gauss divergence theorem	1
2.9	Stokes' theorem (statement only)	1
2.10	Tutorial	2
3	**Analytic Functions And Integrals**	
3.1	Analytic function	1
3.2	Necessary and Sufficient conditions (statement only)	1
3.3	Properties	1
3.4	Harmonic function	1
3.5	Tutorial	2
3.6	Construction of an analytic function	1
3.7	Cauchy's Integral theorem (statement only), Cauchy's integral formula	1
3.8	Classification of singularities	1
3.9	Applications : Cauchy's residue theorem.	1
3.10	Tutorial	2
4	**Partial Differential Equations**	
4.1	Formation of partial differential equations by eliminating arbitrary constants	1
4.2	Formation of partial differential equations by eliminating arbitrary functions	2
4.3	Tutorial	2
4.4	Non- linear partial differential equations of first order	2
4.5	Lagrange's linear equations	1
4.6	Application : Homogeneous Linear partial differential equations with constant coefficients.	2
4.7	Tutorial	2

5	**Laplace Transform**	
5.1	Conditions for existence	1
5.2	Transforms of elementary functions	1
5.3	Basic properties	1
5.5	Derivatives and integrals of transforms, Initial and final value theorem	1
5.6	Tutorial	1
5.7	Transform of periodic functions	2
5.8	Inverse Laplace transform	1
5.9	Convolution theorem (excluding proof)	1
5.10	Application: Solution of second order ordinary differential equation with constant co-efficient.	1
5.11	Tutorial	2
	Total	60

Course Designers

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List of MATLAB Programmes:

1. Evaluating double and triple integrals.
2. Area as double integral.
3. Volume as triple integral.
4. Plotting and visualizing single variable functions.
5. Plotting and visualizing functions of two and three variables.
6. Evaluating Gradient, divergence and curl.
7. Evaluating Laplace & Inverse Laplace transforms.
8. Applying Laplace transform techniques to solve differential equations

60 ME 001	Engineering Drawing	Category	L	T	P	Credit
		ES	2	0	4	4

Objective

- To convey to acquire various concepts of dimensioning, conventions and standards.
- To impart the graphic skills for converting pictorial views of solids in to orthographic views.
- To learn the concept in projection of solids.
- To draws the section of solids and to know development of different types of surfaces.
- To learn the concept in isometric projection.

Prerequisite

Basic knowledge of Higher Secondary Mathematics, Binary Operations & Mathematical Logic.

Course Outcomes

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

CO1	Use the drafting instruments for construct the conic sections	Remember/ Understand/Apply
CO2	Convert the pictorial views of solids in to orthographic views	Remember/ Understand/Apply
CO3	Draw the projections of regular solids	Remember/ Understand/Apply
CO4	Draw the true shape of sections and develop the lateral surfaces of right solids.	Remember/ Understand/Apply
CO5	Sketch the three-dimensional view of solids for given orthographic views	Remember/ Understand/Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3										3	3
CO2	3	3	3										3	3
CO3	3	3	3		3			3					3	3
CO4	3	3	3		3			3					3	3
CO5	3	3	3										3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End SemExamination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	30	30	50
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
60 ME 001- Engineering Drawing								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	2	0	4	90	4	40	60	100

Introduction to Engineering Drawing and Plane Curves* Use of drawing instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning – Drawing sheet layouts - Title block – Line types – Scales: plain, diagonal and vernier scales. Construction of ellipse, parabola and hyperbola (Eccentricity method) - Construction of rectangular hyperbola - Construction of cycloids, epicycloids and hypocycloids	**[6+12]**
Orthographic Projection* Introduction to orthographic projections – Planes of projection – Projection of points and lines inclined to both planes – Projection of planes (Inclined to one plane and parallel to other – Inclined to both planes) - Conversions of pictorial views to orthographic views	**[6+12]**
Projection of Solids* Projections of simple solids: prism, pyramid, cylinder and cone (Axis of solid inclined to both HP and VP).	**[6+12]**
Sections of solids and Development of surfaces* Sections of solids :Prism, Cylinder, Pyramid, Cone – Auxiliary Views - Draw the sectional orthographic views of geometrical solids, objects from industry - Development of surfaces of Right solids – Prism, Pyramid, Cylinder and Cone	**[6+12]**
Isometric Projection and Introduction to AutoCAD* Principles of isometric projection – Isometric scale – Isometric projections of simple solids: Prism, pyramid, cylinder and cone - Isometric projections of frustum and truncated solids - Combination of two solid objects in simple vertical positions.	**[6+12]**
Total Hours(Lecture=30 Hours + Practice=60 Hours)	**90**

Text Book(s):	
1.	Bhatt N.D., —Engineering Drawing‖, Charotar Publishing House Pvt. Ltd., 53rd Edition, Gujarat, 2019
2.	Basant Agarwal and C.M.Agarwal., “Engineering Drawing”, McGraw Hill Education, 2013.
Reference(s):	
1.	Shah M.B., Rana B.C., and V.K.Jadon., —Engineering Drawing‖, Pearson Education, 2011.
2.	Natarajan K.V., —A Text Book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2014.
3.	Venugopal K., “Engineering Graphics”, New Age International (P) Limited, 2014.
4.	Dhawan, R.K., “A Text Book of Engineering Drawing” 3 rd Revised Edition, S. Chand Publishing, New Delhi, 2012.

***SDG 4 – Quality Education**

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**Introduction to Engineering Drawing and Plane Curves**	
1.1	Use of drawing instruments	1
1.2	BIS conventions and specifications – Size, layout and folding of drawing sheets	1
1.3	Lettering and dimensioning -Drawing sheet layouts - Title block - Line types	2
1.4	Scales: plain, diagonal and vernier scales	2
1.5	Construction of ellipse	1
1.6	Construction of parabola	2
1.7	Construction hyperbola by eccentricity method	1
1.8	Practice class for ellipse, parabola and hyberbola	2
1.9	Construction of rectangular hyperbola	2
1.10	Construction of cycloids	1
1.11	Construction of epicycloids and hypocycloids	2
1.12	Practice class for cycloids and hypocycloids	1
2	**Orthographic Projection**	
2.1	Introduction to orthographic projections	2
2.2	Planes of projection	2
2.3	Projection of points	1
2.4	Projection of lines inclined to both planes	2
2.5	Projection of planes	2
2.6	Projection of planes Inclined to both planes	2
2.7	Conversions of pictorial views to orthographic views	3
2.8	Practice class for pictorial views to orthographic views	2
2.9	Practice class for pictorial views to orthographic views	2
3	**Projection of Solids**	
3.1	Projections of simple solids: prism	2
3.2	Projections of simple solids: cylinder	3
3.3	Projections of simple solids: pyramid	3
3.4	Projections of simple solids: Cone	2
3.5	Practice class for Projection of Solids	3
3.6	Axis of solid inclined to both HP and VP	5
4	**Sections of solids and Development of surfaces**	
4.1	Section of solids for Prism	2
4.2	Section of solids for Cylinder	2
4.3	Section of solids for Pyramid	2
4.4	Section of solids for Cone	2
4.7	Auxiliary Views - Draw the sectional orthographic views of geometrical solids	2
4.8	Draw the sectional orthographic views of objects from industry	2
4.9	Development of surfaces of Right solids Prism	2
4.10	Development of surfaces of Right solids Pyramid	2
4.11	Development of surfaces of Right solids Cylinder and Cone	2

5	**Isometric Projection and Introduction to AutoCAD**	
5.1	Principles of isometric projection	2
5.2	Isometric scale	2
5.3	Isometric projections of simple solids: Prism	2
5.4	Isometric projections of simple solids: Pyramid	2
5.5	Isometric projections of simple solids: Cylinder	2
5.6	Isometric projections of simple solids: Cone	2
5.7	Isometric projections of frustum	2
5.8	Isometric projections of truncated solids	2
5.9	Combination of two solid objects in simple vertical positions	2
	Total Hours	**90**

Course Designers

1. Dr.G.Venkatachalam-venkatachalam@ksrct.ac.in

60 CS 001	C PROGRAMMING	Category	L	T	P	Credit
		ES	3	0	0	3

Objective

- To learn most fundamental element of the C language and to examine the execution of branching, looping statements,
- To examine the concepts of arrays, its characteristics and types and strings.
- To understand the concept of functions, pointers and the techniques of putting them to use
- To apply the knowledge of structures and unions to solve basic problems in C language
- To enhance the knowledge in file handling functions for storage and retrieval of data

Prerequisite

NIL

Course Outcomes

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

CO1	Construct the fundamental building blocks of structured Programming in C	Apply
CO2	Implement the different operations on arrays and strings	Apply
CO3	Develop simple real world applications utilizing functions, recursion and pointers.	Apply
CO4	Demonstrate the concepts of structures ,unions ,user defined data types and preprocessor	Apply
CO5	Interpret the file concepts using proper standard library functions for a given application	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		3				2	2		2	3	3
CO2	3	3	3		3				2	2		2	3	3
CO3	3	3	3		3				2	2		2	3	3
CO4	3	3	3		3				2	2		2	3	3
CO5	3	3	3		3				2	2		2	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Cognitive Levels	Continuous Assessment Tests		End Semester Examination (Marks)
	1	2	
Remember	10	10	20
Understand	10	10	20
Apply	40	40	60
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

K.S.Rangasamy College of Technology–Autonomous								R2022
60 CS 001 – C Programming								
Common to all Branches								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

Basics of C, I/O, Branching and Loops* Structure of a C Program – Data types – Keywords - Variables – Type Qualifiers - Constants – Operators–expressions and precedence- Console I/O– Unformatted and Formatted Console I/O - Conditional Branching and Loops-Writing and evaluation of conditionals and consequent branching	**[09]**
Arrays and Strings* Arrays: One Dimensional Arrays - Two Dimensional Arrays – Matrix Manipulation - Character arrays – Strings: String Manipulation with and without String Handling Functions.	**[07]**
Functions and Pointers* Functions: Scope of a Function – Library Functions and User defined functions - Function Prototypes – Call by value and Call by reference – Function Categorization- Arguments to main function— Recursion and application - Passing Arrays to Functions– Storage class Specifiers. Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions - Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers– Function and pointers - Dynamic memory allocation.	**[11]**
Structures, Unions, Enumerations, Typedef and Preprocessors* Structures - Introduction to Structures and Initialization - Arrays of Structures- Arrays and Structures, Nested Structures - Passing Structures to Functions - Structure Pointers - Unions – Bit Fields - Enumerations - typedef –The preprocessor and commands.	**[09]**
File Handling* File: Streams –Reading and Writing Characters - Reading and Writing Strings - File System functions – File Manipulation-Sequential access - Random Access Files – Command Line arguments.	**[09]**
Total Hours	**45**

Text Book(s):	
1.	Herbert Schildt, “The Complete Reference C”, Fourth Edition, Tata McGraw Hill Edition, 2010.
2.	Byron Gottfried, “Programming with C”, Third Edition, McGraw Hill Education, 2014.
Reference(s):	
1.	E.Balagurusamy, “Programming in ANSI C”, Seventh Edition, Tata McGraw Hill Edition, New Delhi, 2016.
2.	Brian W. Kernighan and Dennis M. Ritchie, “C Programming Language”, Prentice-Hall.
3.	ReemaThareja, “Computer Fundamentals and Programming in C”, Second Edition, Oxford Higher Education, 2016.
4.	K N King, “C Programming: A Modern Approach”, Second Edition, W.W.Norton, New York, 2008.

*SDG:4- Quality Education

Course Contents and Lecture Schedule

Module No.	Topic	No. of Hours
1	**Basics of C, I/O, Branching and Loops**	
1.1	Structure of a C Program, Keywords	1
1.2	Data types, Type Qualifiers	1
1.3	Variables and Constants	1
1.4	Operators–expressions and precedence	1
1.5	Console I/O– Unformatted and Formatted Console I/O	1
1.6	Conditional Branching	1
1.7	Iteration and loops	2
1.8	Writing and evaluation of conditionals and consequent branching	1
2	**Arrays and Strings**	
2.1	One Dimensional Array	1
2.2	Two-Dimensional Array and Matrix Manipulation	1
2.3	Character arrays and Strings Basics	1
2.4	String Manipulation without String Handling Functions	2
2.5	String Manipulation with String Handling Functions	2
3	**Functions and Pointers**	
3.1	Scope of a Function – Library Functions, User defined functions and Function Prototypes	1
3.2	Function Call by value and Function Call by reference, Function Categorization	2
3.3	Arguments to main function	1
3.4	Recursion and application	1
3.5	Passing Arrays to Functions	1
3.6	Storage class Specifiers	1
3.7	Introduction to Pointer Variables - The Pointer Operators - Pointer Expressions	1
3.8	Pointers and Arrays - Generating a Pointer to an Array - Indexing Pointers	1
3.9	Function and pointers	1
3.10	Dynamic memory allocation	1
4	**Structures, Unions, Enumerations, Typedef and Preprocessors**	
4.1	Introduction to Structures and Initialization	1
4.2	Arrays and Structures, Arrays of Structures	1
4.3	Structures within Structures, Passing Structures to Functions	2
4.4	Structure Pointers	1
4.5	Unions and Bit Fields.	1
4.6	Enumerations - typedef	1
4.7	Preprocessor commands	2
5	**File Handling**	
5.1	File Streams –Reading and Writing Characters - Reading and Writing Strings	2
5.2	File System functions and File Manipulation	2
5.3	Sequential access	2
5.4	Random Access Files	2
5.5	Command Line arguments and files	1
	Total Hours	**45**

Course Designers

1. Dr.P.Kaladevi - kaladevi@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 CH 001	CHEMISTRY FOR MECHANICAL SCIENCES (Common to Mechanical and Mechatronics)	Category	L	T	P	Credit
		BS	3	0	0	3

Objective(s)

- To help the learners, analyze the hardness of water and its removal.
- To endow an overview corrosion and its control.
- To rationalize the types of engineering materials.
- To analyze the concepts of advanced materials and its applications.
- To recall the basics of fuel and combustion technique.

Prerequisite

Nil

Course Outcomes

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

CO1	Identify the types of hardness of water and its removal.	Understand, Apply & Analyse
CO2	Understand the concept of electrochemistry, corrosion and its control	Understand & Apply
CO3	Deduce the application of protective coatings	Apply
CO4	Interpret the principles of sensors in various applications.	Apply & Analyse
CO5	Recognize the types of batteries and fuel calls.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2	3	3	2	3	3	3	3		2
CO2	3	3	3	3	-	3	3	3	2	2	3	3	3	3
CO3	3	3	3	3	1	3	3	3	3	2	3	3		1
CO4	2	2	2	2	-	2	3	2	2	1	2	2	2	3
CO5	3	3	3	3	3	3	3	3	3	2	3	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests		Terminal Examination
	1	2	
Remember	10	10	20
Understand	20	20	40
Apply	20	20	20
Analyze	10	10	20
Evaluate	-	-	-
Create	-	-	-

Course Level Assessment Questions

Course Outcome 1 (CO1):

1. Distinguish Soft and Hard water.
2. 1 gm of $CaCO_3$ was dissolved in HCl and the solution was made up to one liter with distilled water. 20 ml of the above solution required 18 ml of EDTA solution on titration. 20 ml of hard water sample required 10 ml of same EDTA solution on titration. 20 ml boiled off water, cooling and filtering required 6 ml of EDTA solution on titration. Calculate the total, temporary and permanent hardness of water in ppm.
3. Analyze the disadvantages of hard water in various industries.

Course Outcome 2 (CO2):

1. Derive the Nernst equation for single electrode potential.
2. List out the advantages of potentiometric titration.
3. Interpret the role of cathodic protection mechanism in corrosion control.

Course Outcome 3 (CO3):

1. Differentiate paint and varnish and analyze the applications.
2. Discuss Enamels and lacquers.
3. Explain electrochemical etching for conductors and semiconductors

Course Outcome 4 (CO4)

1. Discuss the characteristics of chemical sensors.
2. Illustrate the role of chemical sensors in detectors & indicators.
3. Discuss the mechanism of enzyme sensors

Course Outcome 5 (CO5)

1. Discuss the applications of microbial fuel cell.
2. Explain the fabrication and Working of Lithium Ion Batteries.
3. Summarize the working principle and applications of solar cell in electronic Industries.

K.S.Rangasamy College of Technology–Autonomous								R2022
60 CH 001 – CHEMISTRY FOR MECHANICAL SCIENCES								
(Common to Mechanical and Mechatronics)								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	3	0	0	45	3	40	60	100

WATER TECHNOLOGY* Introduction – Commercial and industrial uses of water - hardness - types – estimation of hardness by EDTA method- Internal conditioning (colloidal, phosphate, calgon and carbonate conditioning methods) – external conditioning (Zeolite process, demineralization process) - Desalination methods (Reverse Osmosis and Electro dialysis). Flash evaporation	**[07]**
ELECTROCHEMISTRY AND CORROSION*** Electrode potential - Nernst Equation - derivation and problems - reversible and irreversible cells - Types of Electrodes and its applications - reference electrodes - pH, conductometric and Potentiometric titrations. Electrochemical corrosion, Corrosion due to dissimilar metal cells (galvanic cells), Corrosion due to differential aeration - Factors influencing corrosion - Corrosion control: cathodic protection (sacrificial anodic protection, impressed current cathodic protection)	**[10]**
PROTECTIVE COATINGS*** Protective coatings: Classification - Metallic coating: Electroplating – electroless plating - diffusion coating. Paint: types and Characteristics of paints - Constituents - Drying process. Varnishes: characteristics - Constituents. Enamels and lacquers (natural resins). Electro polishing of mild steel- electrochemical machining – electro phoretic painting in automotive industry, technology of electro priming – Electrochemical etching for conductors and semiconductors – Electroforming – Electro winning of Aluminium – Anodizing of Aluminium.	**[09]**
CHEMICAL SENSORS*** Sensors – Chemical Sensors – Characteristics – Elements and Characterization - Potentiometric Sensors - Amperometric Sensors – Sensors Based on Electrochemical Methods – Electrochemical Biosensors – Optical Biosensors : Enzyme Sensors – Bio affinity Sensors - DNA Sensors. Chemical Sensors as Detectors and Indicators: Indicators for Titration Processes – Separation Methods. Nano technology in chemical sensors.	**[10]**
ENERGY STORAGE DEVICES ** * ****** Reversible and Irreversible Cells – Batteries - Types of Batteries. Fabrication and Working of Alkaline Battery - Lead-Acid Battery-Ni-Cd-Lithium Ion Batteries – Fuel Cells: Hydrogen-Oxygen fuel cell - microbial fuel cell (MFC). Organic Solar Cells-working principle and applications organic transistors-construction-working principle and applications in electronic Industries**.**	**[09]**
Total Hours	**45**

Text Book(s):

1.	O.G. Palanna “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 2017.

Reference(s):

1.	Jain. P.C. and Monica Jain, “Engineering Chemistry”, Dhanpatrai publishing co. New Delhi, 14th edition, 2015.
2.	Pletcher D and Walsh F C, “Industrial Electrochemistry”, Chapman and Hall, 2nd Edition, New York, 1990
3.	O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers and Technologists, Springer Science Business Media, New York, 2nd Edition, 2013.
4.	Shikha Agarwal, “Engineering Chemistry-Fundamentals and Applications”, Cambridge University Press, Delhi, 2nd Edition, 2019

***SDG 6 Improve Clean Water and Sanitation**
****SDG 7 Affordable and clean energy**
*****SDG 9 Industry, innovation and infrastructure**
******SDG 12 Responsible consumption and production**

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

Course Contents and Lecture Schedule

S. No.	Topic	No. of hours
1.0	**Water Technology**	
1.1	Introduction – Commercial and Industrial uses of water	1
1.2	Hardness - types	1
1.3	Estimation of Hardness of ater by EDTA method	1
1.4	Internal conditioning (Colloidal, Phosphate, Calgon and Carbonate)	1
1.5	External conditioning (Zoelite process & Demineralization process)	1
1.6	Desalination methods (Reverse Osmosis and Electrodialysis)	1
1.7	Flash Evaporation	1
2.0	**Electrochemistry And Corrosion**	
2.1	Electrode potential - Nernst Equation - derivation and problems	1
2.2	Reversible and irreversible cells	1
2.3	Types of Electrodes and its applications	2
2.4	Reference electrodes - pH	1
2.5	Conductometric and Potentiometric titrations	1
2.6	Electrochemical corrosion, Corrosion due to dissimilar metal cells (galvanic cells),	1
2.7	Corrosion due to differential aeration - Factors influencing corrosion	2
2.8	Corrosion control: cathodic protection (sacrificial anodic protection, impressed current cathodic protection).	1
3.0	**Protective Coatings**	
3.1	Protective coatings: Classification	1
3.2	Metallic coating: Electroplating – electroless plating - diffusion coating.	1
3.3	Paint: types and Characteristics of paints - Constituents - Drying process.	1
3.4	Varnishes: characteristics - Constituents. Enamels and lacquers (natural resins).	1
3.5	Electro polishing of mild steel- electrochemical machining – electro phoretic painting in automotive industry,	2
3.6	technology of electro priming – Electrochemical etching for conductors and semiconductors	2
3.7	Electroforming – Electro winning of Aluminium – Anodizing of Aluminium.	1
4.0	**Chemical Sensors**	
4.1	Sensors – Chemical Sensors - Characteristics	1
4.2	Elements and Characterization	1
4.3	Potentiometric Sensors, Amperometric Sensors	1
4.4	Sensors Based on Electrochemical Methods	1
4.5	Electrochemical Biosensors	1
4.6	Optical Biosensors : Enzyme Sensors – Bio affinity Sensors	1
4.7	DNA Sensors. Chemical Sensors as Detectors and Indicators	1
4.8	Indicators for Titration Processes	1
4.9	Separation Methods. Nano technology in chemical sensors.	2
5.0	**Energy Storage Devices**	
5.1	Reversible and Irreversible Cells – Batteries - Types of Batteries.	2
5.2	Fabrication and Working of Alkaline Battery	1
5.3	Lead-Acid Battery	1
5.4	Ni-Cd-Lithium Ion Batteries	1
5.5	Fuel Cells: Hydrogen-Oxygen fuel cell	1
5.6	Microbial fuel cell (MFC).	1
5.7	Organic Solar Cells-working principle and applications organic transistors	1
5.8	Construction-working principle and applications in electronic Industries.	1

Course Designers

Dr.T.A.SUKANTHA
Dr.K.PRABHA
Dr.S.MEENACHI
Ms.D.KIRTHIGA

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 GE 001	Heritage of Tamils (Common to all Branches)	Category	L	T	P	Credit
		GE	1	0	0	1

Objectives:

- To learn the extensive literature of classical Tamil.
- To review the fine arts heritage of Tamil culture.
- To realize the contribution of Tamils in Indian freedom struggle.

Prerequisite:

Nil

Course Outcomes:

On the successful completion of the course, students 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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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		
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology–Autonomous								R2022
60 GE 001 – Heritage of Tamils								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	0	15	1	100	-	100

Language and Literature* 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.	**[03]**
Heritage - Rock Art Paintings to Modern Art – Sculpture* 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, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.	**[03]**
Folk and Martial Arts* Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.	**[03]**
Thinai Concept of Tamils* 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.	**[03]**
Contribution of Tamils to Indian National Movement and Indian Culture* 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.	**[03]**
Total Hours	**15**

Text Book(s):

1.	*தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை* (*வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்*).
2.	*கணினித்தமிழ் – முனைவர் இல. சுந்தரம்.* (*விகடன் பிரசுரம்*).
3.	*கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம்* (*தொல்லியல் துறை வெளியீடு*).
4.	*பொருநை - ஆற்றங்கரை நாகரீகம்* (*தொல்லியல் துறை வெளியீடு*).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

***SDG:4- Quality Education**

60 GE 001	தமிழர் மரபு (அனைத்து துறைகளுக்கும் பொதுவானது)	Category	L	T	P	Credit
		GE	1	0	0	1

பாடத்தின் நோக்கங்கள்:

- தமிழ் மொழியின் இலக்கணச் செறிவைக் கற்றுணர்தல்.
- தமிழர் பண்பாட்டின் நுண்கலைகள் பற்றிய ஒரு மீள்பார்வை.
- இந்திய சுதந்திரப் போராட்டத்தில் தமிழர்களின் பங்களிப்பை உணருதல்.

முன்கூட்டிய துறைசார் அறிவு:

தேவை இல்லை

பாடம் கற்றதின் விளைவுகள்:

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

CO1	தமிழ் மொழியின் செந்தண்மை மற்றும் இலக்கியம் குறித்த தெரிதல்.	புரிதல்
CO2	தமிழர்களின் சிற்பக்கலை, ஓவியக்கலை மற்றும் இசைக்கருவிகள் குறித்த தெளிவு.	புரிதல்
CO3	தமிழர்களின் நாட்டுப்புறக்கலைகள் மற்றும் வீரவிளையாட்டுகள் குறித்த தெளிவு.	புரிதல்
CO4	தமிழர்களின் திணைக் கோட்பாடுகள், சங்ககால வணிகம் மற்றும் சோழர்களின் வெற்றிகள் குறித்த தகவல்கள்.	புரிதல்
CO5	இந்திய தேசிய இயக்கம், சுயமரியாதையை இயக்கம் மற்றும் சித்த மருத்துவம் பற்றிய புரிதல்.	புரிதல்

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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		
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology–Autonomous								R2022
60 GE 001 – *தமிழர் மரபு*								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	1	0	0	15	1	100	-	100

***மொழி மற்றும் இலக்கியம்*:** *இந்திய மொழிக் குடும்பங்கள் – திராவிட மொழிகள் – தமிழ் ஒரு செம்மொழி – தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை – சங்க இலக்கியத்தில் பகிர்தல் அறம் – திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள் - தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் – பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி – தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.*	**[03]**
***மரபு – பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை–சிற்பக் கலை*:** *நடுகல் முதல் நவீன சிற்பங்கள் வரை – ஐம்பொன் சிலைகள் – பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை – சுடுமண் சிற்பங்கள் – நாட்டுப்புறத் தெய்வங்கள் – குமரிமுனையில் திருவள்ளுவர் சிலை – இசைக் கருவிகள் – மிருதங்கம், பறை, வீணை, யாழ், நாதஸ்வரம் – தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.*	**[03]**
***நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்*:** *தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.*	**[03]**
***தமிழர்களின் திணைக் கோட்பாடுகள்*:** *தமிழகத்தின் தாவரங்களும், விலங்குகளும் – தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்க காலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி – கடல்கடந்த நாடுகளில் சோழர்களின் வெற்றி.*	**[03]**
***இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு*:** *இந்திய விடுதலைப்போரில் தமிழர்களின் பங்கு – இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் – இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு – கல்வெட்டுகள், கையெழுத்துப்படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.*	**[03]**
Total Hours	**15**

Text Book(s):

1.	*தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).*
2.	*கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).*
3.	*கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).*
4.	*பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).*
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

***SDG:4- Quality Education**

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 CP 0P1	PHYSICS AND CHEMISTRY LABORATORY (CIVIL, MECH & MCT))	Category	L	T	P	Credit
		BS	0	0	4	2

Objective(s)

1. To infer the practical knowledge by applying the experimental methods to correlate with the Physics theory.
2. To demonstrate an ability to make physical measurements and understand the limits of precision in measurements
3. To analyze the behavior and characteristics of various materials for its optimum utilization
4. Test the knowledge of theoretical concepts and develop the experimental skills of the learners.
5. To facilitate data interpretation and expose the learners to various industrial and environmental applications

Prerequisite

Nil

Course Outcomes

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

CO1	Apply the concept of stress, strain and elastic limit for a given sample to find their properties	Apply
CO2	Recognize the concept of quantum Physics & magnetic properties by experimental verification	Apply
CO3	Recall the knowledge of properties of light and fiber optic cable	Apply
CO4	Apply the concepts of chemistry and develop analytical skills for applications in engineering to determine the rate of corrosion	Apply
CO5	Analyze the pH, electrode potential, conductance sample solutions	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2	3	2	2	2	3		
CO2	3	3	3	2	2	2	2	2	1	3	2	2	2	
CO3	3	2	3	3	3	2	3	1	2	2	1	2	2	
CO4	3	3	3	3	3	3	3	3	2	2	3	3	3	2
CO5	3	3	3	3	2	2	3	2	2	-	2	3	1	2
3- Strong;2-Medium;1-Some														

PHYSICS LABORATORY

(B.E CIVIL, MECH & MCT)

List of Experiments

1. Determination of Young's modulus of a given material - Uniform bending
2. Determination of rigidity modulus of a wire - Torsional pendulum.
3. Determination of Planck's constant.
4. Magnetic field along the axis of current carrying coil – Stewart and Gee.
5. (a) Laser- Determination of the wave length of the laser using grating.
   (b) Optical fibre -Determination of Numerical Aperture and acceptance angle.

Course Designers

Dr. V.Vasudevan
Mr.S. Vanchinathan
Dr. M.Malarvizhi

CHEMISTRY LABORATORY

(B.E CIVIL, MECH & MCT)

List of Experiments

1. Estimation of hardness of water sample by complexometric method.
2. Determination of Dissolved Oxygen in water sample by Winkler's method
3. Determination of corrosion by weight loss method
4. Estimation of HCl by pH meter.
5. Estimation of mixture of acids by conductivity meter.

Case studies/Activity report

1. Case study on Dissolved Oxygen in various water samples.
2. Activity report for determination of HCl using conductometric titration

***SDG 6: Improve Clean Water and Sanitation**
***SDG 9: Industry, Innovation, and Infrastructure**
***SDG 8: Decent Work and Economic Growth**

Course Designers

Dr.T.A.SUKANTHA

Dr.B.SRIVIDHYA

Dr.K.PRABHA

Dr.S.MEENACHI

60 CS 0P1	C PROGRAMMING LABORATORY	Category	L	T	P	Credit
		ES	0	0	4	2

Objective

- To enable the students to apply the concepts of C to solve simple problems
- To use selection and iterative statements in C programs
- To apply the knowledge of library functions in C programming
- To implement the concepts of arrays, functions, structures and pointers in C
- To implement the file handling operations through C

Prerequisite

NIL

Course Outcomes

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

CO1	Read, display basic information and use selection and iterative statements.	Apply
CO2	Demonstrate C program to manage collection of related data.	Apply
CO3	Design and Implement different ways of passing arguments to functions, Recursion and implement pointers concepts.	Apply
CO4	Develop a C program to manage collection of different data using structures, Union, user-defined data types and preprocessor directives.	Apply
CO5	Demonstrate C program to store and retrieve data using file concepts.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3		3				2	2		2	3	3
CO2	3	3	3		3				2	2		2	3	3
CO3	3	3	3		3				2	2		2	3	3
CO4	3	3	3		3				2	2		2	3	3
CO5	3	3	3		3				2	2		2	3	3
3- Strong;2-Medium;1-Some														

List of Experiments

1. Implementation of Simple computational problems using various formulas.
2. Implementation of Problems involving Selection statements.
3. Implementation of Iterative problems e.g., sum of series.
4. Implementation of 1D Array manipulation.
5. Implementation of 2D Array manipulation.
6. Implementation of String operations.
7. Implementation of Simple functions and different ways of passing arguments to functions and Recursive Functions.
8. Implementation of Pointers
9. Implementation of structures and Union.
10. Implementation of Bit Fields, Typedef and Enumeration.
11. Implementation of Preprocessor directives.
12. Implementation of File operations.

SDG:4- Quality Education

Course Designers

1. Dr.P.Kaladevi - kaladevi@ksrct.ac.in

60 CG 0P1	CAREER SKILL DEVELOPMENT I	Category	L	T	P	Credit
		CG	0	0	2	1*

Objective

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

Prerequisite

Basic knowledge of reading and writing in English.

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	3	3	2	3		
CO2								2	3	3	2	3		2
CO3								2	3	3	2	3	2	2
CO4								2	3	3	2	3		
CO5								2	3	3	2	3	2	2
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology–Autonomous								R2022
60 CG 0P1 -Career Skill Development I								
Common to All Branches								
Semester	Hours/Week			Total Hrs.	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
II	0	1	0	25	0	100	00	100

Listening Listening for general information-specific details - audio / video (formal & informal) - Listen to podcasts/ TED talks/ anecdotes / stories / event narration / documentaries and interviews with celebrities - Listen to a product and process descriptions, advertisements about products or services.	**[05]**
Speaking Self-Introduction; Introducing a friend; conversation - politeness strategies - Narrating personal experiences / events; Interviewing a celebrity; reporting / and summarizing of documentaries / podcasts/ interviews - Picture description; giving instruction to use the product; presenting a product - Small Talk; Mini presentations - Group discussions, debates & role plays.	**[05]**
Reading Loud reading vs Silent reading, Skimming & Scanning of passages, reading brochures (technical context), social media messages relevant to technical contexts and emails - Biographies, travelogues, newspaper reports and travel & technical blogs - Advertisements, gadget reviews and user manuals - Newspaper articles and Journal reports - Editorials; and opinion blogs	**[05]**
Writing Writing letters – informal and formal – basics and format orientation - paragraph texting, short report on an event (field trip etc.) - Definitions; instructions; and product /process description - Note-making / Note-taking; recommendations; transferring information from non-verbal (charts, graphs to verbal mode) - Essay texting	**[05]**
Verbal Ability I Reading Comprehension (MCQs) – Cloze Test - Sequencing of sentences – Summarizing and paraphrase – Error Detection – Spelling Test – Sentence Improvement - Preposition	**[05]**
Total Hours	25

Reference(s):

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

SDG- 04- Quality Education

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1		
1.1	Listening for general information and Specific details	1
1.2	Listening to podcasts, documentaries and interviews with celebrities	1
1.3	Narrating personal experiences	1
1.4	Readingrelevant to technical contexts and emails	1
1.5	Listen to a product and process descriptions	1
2	**Speaking**	
2.1	Self-introduction	1
2.2	Summarizing of documentaries& Picture Narration	1
2.3	Small Talk; Mini presentations	1
2.4	Group discussions, debates & role plays.	1
2.5	Group discussions	1
3	**Reading**	
3.1	Loud reading vs Silent reading, Skimming & Scanning of passages	1
3.2	Reading social media messages relevant to technical contexts	1
3.3	Reading newspaper reports and travel & technical blogs	1
3.4	Reading advertisements, gadget reviews and user manuals	1
3.5	Reading newspaper articles and journal reports	1
4	**Writing**	
4.1	Writing letters – informal and formal	1
4.2	Paragraph Texting	1
4.3	Definitions and instructions	1
4.4	Note-making / Note-taking	1
4.5	Essay texting	1
5	**Verbal Ability**	
5.1	Reading Comprehension (MCQs) and Cloze Test	1
5.2	Sequencing of sentences	1
5.3	Paraphrasing and Summarizing	1
5.4	Error Detection and Spelling Test	1
5.5	Prepositions	1
	Total	**25**

Course Designers

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

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

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

THIRD SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MA 007	Statistics and Numerical Methods	2	40	60	100	45	100
2	60 MC 301	Analog Devices and Digital Circuits	2	40	60	100	45	100
3	60 MC 302	Sensors and Instrumentation	2	50	50	100	45	100
4	60 MC 303	Manufacturing Technology	2	40	60	100	45	100
5	60 MC 304	Mechanics of Solids	2	40	60	100	45	100
6	60 MY 002	Universal Human Values	2	100	0	100	0	100
7	60 GE 002	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	2	100	0	100	0	100
PRACTICAL								
8	60 MC 3P1	Analog Devices and Digital Circuits Laboratory	3	60	40	100	45	100
9	60 MC 3P2	Manufacturing Technology Laboratory	3	60	40	100	45	100
10	60 CG 0P2	Career Skill Development-II	3	100	-	100	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests.This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

60 MA 007	Statistics and Numerical Methods	Category	L	T	P	Credit
		BS	3	1	0	4

Objective

- To familiarize the basic concepts of probability and random variables.
- To familiarize various distributions and testing of hypothesis.
- To learn basics of descriptive statistics.
- To get exposed to various techniques to solve equations numerically.
- To know the concepts of interpolation and numerical integration.

Prerequisite

NIL

CourseOutcomes

Attheendofthe course,the studentswillbeableto

CO1	Understand the basic concepts of probability and random variables.	Remember, Understand, Apply
CO2	Apply Student's t test, F test and Chi-square test for testing the statistical hypothesis.	Remember, Understand, Apply
CO3	Compute measures of central tendency, measures of dispersion and correlation coefficient.	Remember, Understand, Analyze
CO4	Employvarious iteration techniques for solving algebraic, transcendental and system of linear equations.	Remember, Understand, Apply
CO5	Apply different techniques to find the intermediate values and to evaluate single definite integrals.	Remember, Understand, Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	2							2		3
CO2	3	3	3	3	3							2		3
CO3	3	3	3	3	2							2		3
CO4	3	3	3	2	3							2		3
CO5	3	3	3	2	3							2		3
3 - Strong;2 - Medium;1 – Some														

Assessment Pattern

Bloom'sCategory	ContinuousAssessmentTests (Marks)		End Sem Examination (Marks)
	1	2	
Remember(Re)	10	10	10
Understand (Un)	10	10	20
Apply (Ap)	30	30	60
Analyse (An)	10	10	10
Evaluate (Ev)	0	0	0
Create (Cr)	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MA 007 – Statistics and Numerical Methods								
Common to CIVIL, MECH & MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	40	60	100

Probability and Random Variables Axioms of probability - Conditional probability - Baye's theorem - Random variable - Expectation - Probability mass function - Probability density function - Moment generating function.	**[9]**
Standard Distributions and Testing of Hypothesis* Binomial distribution - Poisson distribution – Type I and Type II errors - Test of significance of small samples - Student's 't' test - Single mean - Difference of means - F-test - Chi-square test - Goodness of fit - Independence of attributes.	**[9]**
Empirical Statistics **Measures of central tendency***: Mean, Median, Mode - Measures of dispersion: Range - Quartile deviation - Standard deviation - Measures of skewness: Bowley's co-efficient of skewness - Pearson's co-efficient of skewness- Correlation.	**[9]**
Solutions of Equations and Eigen Value Problem Algebraic and Transcendental equations - Newton Raphson method – Regula Falsi method -Gauss elimination method - Gauss Jordan method - Iterative methods: Gauss Jacobi method - Gauss Seidel method - Eigen value of a matrix by Power method.	**[9]**
Interpolation and Numerical Integration **Lagrange's and Newton's divided difference interpolation (unequal intervals)** - Newton's forward and backward interpolation (equal intervals)** - Two point and three point Gaussian quadrature - Trapezoidal, Simpson's 1/3 and 3/8 rule (single integral).	**[9]**
Total Hours: 45 + 15 (Tutorial)	**60**

Textbook(s):

1.	Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.
2.	V. K. Kapoor and S.C.Gupta , "Fundamentals of Mathematical Statistics ", Sultan Chand & sons 12th Edition, New Delhi, 2020.

Reference(s):

1.	Veerarajan,T., "Probability, Statistics and Random Processes (with Queueing Theory and Queueing Networks)", Tata McGraw-Hill 4th Edition, New Delhi, 2015.
2.	Johnson R.A and Gupta C.B., "Miller and Freund's Probability and statistics for Engineers'', 11th Edition, PearsonEducation,Asia,2011.
3.	KandasamyP.,ThilakavathyK.andGunavathyK.,"NumericalMethods",3rdEdition,S.ChandandCo.,NewDelhi, 2003.
4.	Faires, J.D. and Burden, R., "Numerical Methods", Brookes / Cole (Thomson Publications), 4th Edition, New Delhi, 2011.

***SDG:4 Quality Education,**
****SDG:9 Industry, Innovation, and Infrastructure**

List of MATLAB Programs:

1. Calculate the standard parameters by using Binomial distribution.
2. Determine the Measures of central tendency.
3. Compute the measures of dispersion.
4. Solve the Equation by using Gauss Seidel method.
5. Numerical integration using Trapezoidal and Simpson's rules.
6. Compute eigen values and eigen vectors by using power method

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**Probability and Random Variables**	
1.1	Axioms of probability	1
1.2	Conditional probability	1
1.3	Baye's theorem	1
1.4	Tutorial	2
1.5	Random variable	1
1.6	Expectation	1
1.7	Probability mass function	1
1.8	Probability density function	1
1.9	Momentgenerating function	1
1.10	Tutorial	2
2	**STANDARD DISTRIBUTIONS AND TESTING OF HYPOTHESIS**	
2.1	BinomialDistribution	1
2.2	Poisson Distribution	1
2.3	Fit a Binomial and Poisson Distribution	1
2.4	t test	1
2.5	Tutorial	2
2.6	F test	1
2.7	Chi- squaretest	1
2.8	TestforIndependency	1
2.9	Goodness offit.	1
2.10	Tutorial	2
3	**EMPIRICAL STATISTICS**	
3.1	Mean, Median and Mode	1
3.2	Range, Quartile deviation	1
3.3	Standard deviation	1
3.4	Tutorial	2
3.5	Pearson's co-efficient ofskewness	1
3.6	Bowley's co-efficient ofskewness	1
3.7	Measures of skewness	1
3.8	correlation	2
3.9	Tutorial	2
4	**SYSTEM OF EQUATIONS AND EIGEN VALUE PROBLEM**	
4.1	Newton Raphson method	1
4.2	Gauss elimination method	1
4.3	Gauss Jordan method	1
4.4	Gauss Jacobimethod	1
4.5	Tutorial	2
4.6	Gauss Seidelmethod	1
4.7	Matrix inversion by Gauss Jordan method	1
4.8	Eigen values of a matrix by powermethod	1
4.9	Tutorial	2
5	**INTERPOLATIONANDNUMERICALINTEGRATION**	
5.1	Lagrange's interpolations	1
5.2	Newton's divided difference interpolations	2
5.3	Tutorial	2
5.4	Newton's forward and backward difference interpolations	2
5.5	Two and three point Gaussian quadratures	2
5.6	Single integration using Trapezoidal andSimpson's1/3and3/8rules	2
5.7	Tutorial	2
	Total	60

Course Designer

Dr.C.Chandran - cchandran@ksrct.ac.in

60 MC 301	Analog Devices and Digital Circuits	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To procure the fundamental knowledge in semiconductor diodes and applications
- To impart the fundamental knowledge in the areas of transistors and amplifiers.
- To equip learners with Boolean algebra and design of combinational logic circuits.
- To acquaint learners with fundamentals and design of sequential circuits
- To educate learners with the basics of memory devices and implement combinational circuits

Prerequisite

Basic Electrical and Electronics Engineering

Course Outcomes

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

CO1	Describe the concepts and characteristics of Semiconductor Diodes	Understand
CO2	Describe the characteristics of transistor and amplifiers	Understand
CO3	Practice the Boolean techniques and design combinational circuits.	Apply
CO4	Design Synchronous sequential circuit using flipflops.	Analyze
CO5	Construct combinational logic functions using programmable logic devices	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	2	1					1	1	2	3	3
CO2	3	2	2	1	1					1		2	3	3
CO3	3	2	2	2	1				1	1		2	3	3
CO4	3	2	1	1	1				1	1		2	3	3
CO5	3	1	1	2	1				1	1	1	2	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	30	20	30
Understand	30	25	30
Apply	0	10	30
Analyse	0	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC 301 – Analog Devices and Digital Circuits								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Semiconductor Diodes and Applications Intrinsic and Extrinsic semiconductors - drift and diffusion current - Formation of PN junction – VI characteristics of diode – Static and dynamic resistance. Zener diode – Photo diode – Light emitting diode – Laser diode – Optocoupler- Clipperand Clamper - Voltage regulator and multipliers	**[09]**
Transistor and Operational Amplifiers Construction & operation of BJT - Transistor characteristics - CE, CB and CC configuration - Construction & operationof JFET and MOSFET – FET characteristics - Ideal Op-Amp characteristics – Open loop , Closed loop configurations- Inverting & non-inverting amplifier – voltage follower - Summing amplifier- Comparators -Schmitt Trigger – Instrumentation Amplifier.	**[09]**
Boolean Algebra and Combinational Circuits Boolean postulates and laws - Minimization of Boolean expressions - Karnaugh map minimization - Quine-McCluskeymethod of minimization. Combinational circuits: Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – BCD adder – Multiplexer – Demultiplexer – encoder – decoder– parity checker – parity generators – Simulation of Combinational Circuits.	**[09]**
Sequential Circuits Latches, Flip-flops – SR, JK, D, T and Master-Slave – Characteristic equation – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops –Synchronous and Asynchronous Up/Down counters – Modulo–n counter-Registers.	**[09]**
Memory and Programmable Logic Devices Classification of memories: ROM – PROM – EPROM – EEPROM – RAM – Write operation – Read operation – Static RAM Cell - Dynamic RAM cell –Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) – Field Programmable Gate Arrays (FPGA) – Implementation of combinational logic circuits using PROM, PLA and PAL.	**[09]**
Total Hours	45

Text book(s) : :

1	Thomas L. Floyd, “Electronic Devices“, Prentice Hall of India Pvt. Ltd.,/ Pearson Education Pvt. Ltd., New Delhi,10th Edition, 2017.
2	Satish K Karna, “Digital Electronics”, Vikas Publishing House Pvt. Ltd, New Delhi, 2nd Edition, 2017

Reference(s) :

1	David A.Bell, “Electronic Devices and Circuits”, Oxford University Press, New Delhi, 5th Edition 2013.
2	Salivahanan S and Arivazhagan S, “Digital Circuits and Design”, Vikas Publishing House Pvt. Ltd, New Delhi,4th Edition, 2013.
3	Bishnu Charan Sarkar and Suvra Sarkar, “Analog Electronics Devices and Circuits”, Damodar Group, West Bengal , 2019.
4	B.L. Theraja, A.K. Theraja, “A Text Book of Electrical Technology, Electronic Devices and Circuits”, S. Chand Reprint, 2013

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**Semiconductor Diodes and Applications**	
1.1	Intrinsic and Extrinsic semiconductors	1
1.2	drift and diffusion current	1
1.3	formation of PN junction	1
1.4	VI characteristics of diode	1
1.5	static and dynamic resistance	1
1.6	Zener diode – photo diode – light emitting diode	2
1.7	laser diode – optocoupler-	2
1.8	Clipperand Clamper - voltage regulator and multipliers	2
2	**Transistor and Operational Amplifiers**	
2.1	Construction & operation of BJT	1
2.2	Transistor characteristics -	1
2.3	CE, CB and CC configuration -.	1
2.4	Construction & operationof JFET and MOSFET – FET characteristics -	1
2.5	Ideal Op-Amp characteristics - Open loop , Closed loop configurations	1
2.6	Inverting & non-inverting amplifier –	1
2.7	voltage follower	1
2.8	Summing amplifier.	1
2.9	Comparators -Schmitt Trigger.	1
2.10	Instrumentation Amplifier.	1
3	**Boolean Algebra and Combinational Circuits** Boolean postulates and laws	
3.1	Minimization of Boolean expressions - Karnaugh map minimization	1
3.2	Quine-McCluskeymethod of minimization	2
3.3	Combinational circuits: Design procedure – Half adder – Full Adder	1
3.4	Half subtractor – Full subtractor	1
3.5	–BCD adder	2
3.6	Multiplexer – Demultiplexer	1
3.7	encoder – decoder	1
3.8	Code Converters	1
4	Synchronous devices	
4.1	Latches, Flip-flops –	1
4.2	SR, JK	1
4.3	D, T	1
4.4	Master-Slave –	1
4.5	Characteristic equation – Edge triggering – Level Triggering –	2
4.6	Realization of one flip flop using other flip flops –	1
4.7	Synchronous and Asynchronous Up/Down counters - Modulo–n counter	1
4.8	Registers	
5	**Memory and Programmable Logic Devices**	
5.1	Classification of memories: ROM – PROM – EPROM – EEPROM – RAM – Write operation – Read operation	1
5.2	Static RAM Cell - Dynamic RAM cell	1
5.3	Programmable Logic Devices	1
5.4	Programmable Logic Array (PLA)	1
5.5	Programmable Array Logic (PAL)	1
5.6	Field Programmable Gate Arrays	1
5.7	Implementation of combinational logic circuits using PROM, PLA and PAL	1
	Total	45

Course Designers

Mrs V Indumathi- indumathi@ksrct.ac.in

60 MC 302	Sensors and Instrumentation	Category	L	T	P	Credit
		PC	3	0	2	4

Objective

- To create a conceptual understanding of the basic principles of sensors, actuators, and their operations
- To analyze the real-world problems and provide solutions using sensors and actuators
- To promote awareness regarding recent developments in the fields of sensors and actuators
- To introduce about advancements in sensor technology.
- To educate the advance trends and application of sensors.

Preequisite

Basics of Electrical and Electronics Engineering, Analog Devices and Digital Circuits

Course Outcomes

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

CO1	Classify different Sensors & Actuators based on various physical phenomena and differentiate their performance characteristics	Remember and Understand
CO2	Interpret the working principles of thermal and optical sensor	Understand
CO3	Infer the functional principles of Electromagnetic and Mechanical Sensors	Understand
CO4	Illustrate the working and characteristics of Acoustic and Chemical Sensors	Understand
CO5	Select the relevant sensors to design real-time data acquisition from ambience via case studies	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3		1	2	1	1	1	1	3	2
CO2	3	3	3	1	1	1		2	2	1		1	3	2
CO3	3	2	3	3	3			3	1	1	1	1	3	3
CO4	3	1	3	3	3	1	1	1	1		1	1	3	2
CO5	3	2	3	2	3			1	1	1	1	1	3	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 302 -Sensors and Instrumentation								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
III	3	0	2	60	4	50	50	100

Basics of Sensors The five senses: vision, hearing, smell, taste, and touch – Definitions: Sensors & Actuators – Overview of Sensor classifications – Performance characteristics of Sensors : Transfer Function, Range, Span, Input and Output Full Scale, Resolution, and Dynamic Range - Calibration & Reliability	**[09]**
Temperature and optical Sensors Thermoresistive sensors: Thermistors, Resistance temperature, and silicon resistive sensors – Thermoelectric sensors -Principles of Optics: Optical units – Quantum effects – Quantum-based Optical sensors – Photoelectric sensors – Charge coupled device (CCD) based – Thermal-based Optical sensors – Active infrared (AFIR) sensors – Optical Actuators – Case study: Liquid Level Indicator using Optical Sensor**s**	**[09]**
Electromagnetic and Mechanical Sensors Principles of Electric and Magnetic fields: Basic units – The Electric field: Capacitive Sensors – Magnetic sensors – Magnetoresistance – Magnetostrictive – Magnetometers Force Sensors: Strain Gauges, Semiconductor Strain Gauges & Tactile Sensors – Accelerometers: Capacitive Accelerometers, Strain Gauge Accelerometers & Magnetic Accelerometers – Pressure Sensors: Mechanical, Piezoresistive, Capacitive & Magnetic – Velocity sensing	**[09]**
Acoustic and Chemical Sensors Elastic waves and their properties – Microphones: Carbon, Magnetic, Ribbon and Capacitive Microphones – Piezoelectric effect – Piezoelectric Sensors – Acoustic sensors: Loudspeakers, Headphones and Buzzers - Magnetic and Piezoelectric – Ultrasonic sensors and actuators Chemical units and Definitions – Electrochemical sensors: Metal Oxide Sensors and Solid Electrolyte Sensors – Potentiometric smart sensors: Glass Membranes, Soluble Inorganic Salt Membrane and Polymer - Immobilized Ionophore Membranes sensors – Thermochemical, Optical, Mass humidity gas sensors	**[09]**
Recent sensor Applications Breathe analyzer using temperature Sensor -Liquid Level Indicator using Optical Sensor**s-**Speed sensing and odometer in a car using smart sensors-Tire-pressure monitoring system using smart sensors - Ultrasonic parking system -Water quality monitoring –Agriculture based moisture sensors.	**[09]**
Lab Experiments **Simulation Using LabVIEW** 1. Design and implementation of Breath analyzer using temperature sensors 2. Liquid Level Indicator using optical Sensor**s** 3. Demonstrate a simple parking system using ultrasonic sensors	15
Total	60

Text Book(s):	
1.	Nathan Ida, “Sensors, Actuators and their Interfaces - A Multidisciplinary Introduction”, 2020, 2nd Edition, IET, United Kingdom.
2	Renganathan S., ”Transducer Engineering”, Allied Publishers (P) Ltd., 2015
Reference(s):	
1.	Murthy, D.V.S., Transducers and Instrumentation, 2nd Edition, Prentice Hall of India Pvt. Ltd., NewDelhi, 2010.
2.	Jacob Fraden, “Handbook of Modern Sensors Physics, Designs, and Applications”, 2016, 5th Edition, Springer, Switzerland.
3.	Subhas Chandra Mukhopadhyay, Octavian Adrian Postolache, Krishanthi P. Jayasundera, Akshya K. Swain, “Sensors for Everyday Life Environmental and Food Engineering”, 2017, Volume 23, Springer, Switzerland.

SDG No.8,9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
	Basics of Sensors	
1.1	The five senses: vision, hearing, smell, taste, and touch	2
1.2	Definitions: Sensors & Actuators	2
1.3	Overview of Sensor classifications	2
1.4	Performance characteristics of Sensors : Transfer Function, Range, Span, Input and Output Full Scale	2
1.5	Resolution, and Dynamic Range - Calibration & Reliability	1
	Temperature and optical Sensors	
2.1	Thermoresistive sensors: Thermistors, Resistance temperature ,silicon resistive sensors – Thermoelectric sensors	2
2.2	Principles of Optics: Optical units	1
2.3	Quantum effects – Quantum-based Optical sensors Photoelectric sensors	2
2.4	Photoelectric sensors – Charge coupled device (CCD) based – Thermal-based Optical sensors	2
2.5	Active infrared (AFIR) sensors – Optical Actuators – Case study: Liquid Level Indicator using Optical Sensors.	2
	Electromagnetic and Mechanical Sensors	
3.1	Principles of Electric and Magnetic fields	1
3.2	Basic units – The Electric field	1
3.3	Capacitive Sensors	1
3.4	Magnetic sensors , Magnetostrictive , Magnetometers	1
3.5	Force Sensors: Strain Gauges	1
3.6	Semiconductor Strain Gauges & Tactile Sensors	1
3.7	Magnetic Accelerometers	1
3.8	Pressure Sensors: Mechanical, Piezoresistive	1
3.9	Capacitive & Magnetic – Velocity sensing	1
	Acoustic and Chemical Sensors	
4.1	Elastic waves and their properties	1
4.2	Microphones: Carbon, Magnetic, Ribbon and Capacitive Microphones	1
4.3	Piezoelectric effect , Piezoelectric Sensors	1
4.4	Acoustic sensors: Loudspeakers, Headphones and Buzzers	1
4.5	Magnetic and Piezoelectric – Ultrasonic sensors and actuators	1
4.6	Chemical units and Definitions – Electrochemical sensors	1
4.7	Potentiometric smart sensors: Glass Membranes, Soluble Inorganic	1
4.8	Immobilized Ionophore Membranes sensors	1
4.9	Thermochemical, Optical, Mass humidity gas sensors.	1
5	Recent sensor Applications	
5.1	Breathe analyzer using temperature	1
5.2	Liquid Level Indicator using Optical Sensors	1
5.3	Speed sensing and odometer in a car using smart sensors	2
5.4	Tire-pressure monitoring system using smart sensors	1
5.5	Ultrasonic parking system -Water quality monitoring	1
5.6	Water quality monitoring	1
5.7	Agriculture based moisture sensors	2
	Lab Experiments Simulation Using LabVIEW	
1	Design and implementation of Breath analyzer using temperature sensors	5
2	Liquid Level Indicator using optical Sensors	5
3	Demonstrate a simple parking system using ultrasonic sensors	5
	Total	60

Course Designers

Dr.M.Ravi – ravi@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 303	Manufacturing Technology	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To enlighten the learners about the concepts of casting and powder metallurgy techniques.
- To impart the fundamental knowledge in the area of metal joining.
- To endow with an overview of metal forming processes.
- To understand the working of conventional machine tools and CNC Machines
- To gain adequate knowledge in the metal finishing processes

Prerequisite

Nil

Course Outcomes

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

CO1	Recognize the concepts of casting and powder metallurgy process.(REMEMBER)	Remember
CO2	Understand the working of welding processes.	Remember
CO3	Describe the various types of forming processes.	Understand
CO4	Demonstrate and simulate the working principle of machine tools.	Apply
CO5	Understand the different finishing processes.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3				2		3				2	3	3	2
CO2	3				2		3				2	3	2	2
CO3	3				2		3				2	3	3	3
CO4	3				3		3				2	3	2	3
CO5	3				2		3				2	3	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember (Re)	30	10	10
Understand (Un)	30	20	40
Apply (Ap)	0	30	50
Analyze(An)	0	0	0
Evaluate (Ev)	0	0	0
Create(Cr)	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 303 – Manufacturing Technology								
B.E. Mechatronics Engineering								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

Casting and powder metallurgy Pattern: materials, types, allowances - Moulding: green sand moulding - moulding sand and its properties - Cores: types and making - Casting: sand mould casting, die casting and continuous casting - Casting defects: causes and remedies. Powder metallurgy processes - steps involved- characteristics of metal powders	**[09]**
Joining Processes Principle of arc and gas welding - Filler and flux materials - Flame types – Welding defects - Safety in welding - Resistance welding, ultrasonic welding, gas tungsten arc welding and gas metal arc welding - Electron beam welding and Laser beam welding - Brazing and soldering	**[09]**
Forming Processes Hot and cold working of metals –Die forging - Rolling: high roll mills - Extrusion: forward and backward, tube extrusion - Sheet metal work: Shearing, bending and drawing operations - Stretch forming	**[09]**
Machining Processes Introduction to conventional Lathe and simple operations – Single point and multipoint cutting tools – Simple drilling operations, Reaming and tapping – Gear milling operation – Shaper and Planer operations- Introduction to CNC Machines- G-Code and M-Code - CNC Trainer Simulation Tool – Machining operations: Turning, Drilling and Boring- Basics of Additive and Subtractive Processes.	**[09]**
Finishing Processes Types of grinding process: cylindrical grinding, surface grinding, centreless grinding, internal grinding, specifications and selection of grinding wheel – Lapping – Honing – Super finishing – Broaching machine: types and operations- Introduction to advanced coating processes-functionally graded coatings.	**[09]**
Total Hours	**45**

Text Book(s):

1.	J. P. Kaushish, Manufacturing Processes, Prentice Hall of India Learning Private Limited, New Delhi, 2nd Edition,2019.
2.	Rajput, R.K., "A Textbook of Manufacturing Technology", Laxmi publications Ltd, New Delhi, Third Edition, 2023.

Reference(s):

1.	Hajra Choudhury S.K, "Elements of workshop Technology, Vol I and II", Media Promotors, Bombay Edition 2011.
2.	P. N. Rao, "Manufacturing Technology - Vol I and II", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2018.
3.	Dr. Sushil Kumar Choudhary , Dr. R. S Jadoun, "Computer Integrated Manufacturing & Computer Aided Manufacturing" Walnut Publication, 2021
4.	J. T. Black, Ronald A. Kohser, "Materials and Processes in Manufacturing" 13th edition, John Wiley & Sons, 2020

SDG No. 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Casting and powder metallurgy**	1
1.1	Pattern: materials, types, allowances	1
1.2	Moulding: green sand moulding ,	1
1.3	Moulding sand and its properties	1
1.4	Cores: types and making, Casting types	1
1.5	Sand mould casting, die casting and continuous casting	2
1.6	Casting defects: causes and remedies.	1
1.7	Powder metallurgy processes - steps involved-	1
1.8	Characteristics of metal powders	1
2	**Joining Processes**	
2.1	Principle of arc and gas welding	1
2.2	Filler and flux materials,Flame types	1
2.3	Welding defects,Safety in welding	1
2.4	Resistance welding,	1
2.5	Ultrasonic welding, gas tungsten arc welding	1
2.6	Gas metal arc welding	1
2.7	Electron beam welding and Laser beam welding -	2
2.8	Brazing and soldering	1
3	**Forming Processes**	
3.1	Hot and cold working of metals	1
3.2	Die forging,Rolling: high roll mills	1
3.3	Extrusion: forward and backward	2
3.4	Tube extrusion	1
3.5	Sheet metal work: Shearing,	1
3.6	Bending and drawing operations	2
3.7	Stretch forming	1
4	**Machining Processes**	
4.1	Basics of Additive and Subtractive Processes	1
4.2	Introduction to conventional Lathe and simple operations –	1
4.3	single point and multipoint cutting tools	1
4.4	Simple drilling operations, Reaming and tapping	1
4.5	Gear milling operation – Shaper and Planer operations	1
4.6	Introduction to CNC Machines- G-Code and M-Code -	2
4.7	CNC Trainer Simulation Tool Machining operations:Turning, Drilling and Boring	2
5	**Finishing Processes**	
5.1	Types of grinding process,cylindrical grinding	1
5.2	Surface grinding, centreless grinding	1
5.3	Internal grinding,specifications and selection of grinding wheel	2
5.4	Lapping, Honing	1
5.5	Super finishing,Broaching machine:	1
5.6	Types and operations	1
5.7	Introduction to advanced coating processes	1
	Total	**45**

Course Designers

1. Dr.M.Baskaran - baskaranm@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 304	Mechanics of Solids	Category	L	T	P	Credit
		PC	3	1	0	4

Objective

- To understand the nature of stresses and strains induced in materials under different loads.
- To analyze biaxial stress under given loading conditions for various materials and to analyze cylindrical shells under circumferential and radial loading.
- To plot shear force and bending moment diagrams of beams under different types of loads.
- To understand the deflection of determinate beams using various methods.
- To analyze the stresses and deformations occurring in circular shafts and helical springs caused by torsional forces.

Prerequisite

Engineering Mechanics

Course Outcomes

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

CO1	Understand the concepts of stresses and strains in simple and composite bars	Remember / Understand / Apply
CO2	Determine the stresses and deformations of objects under external loadings	Remember / Understand / Apply
CO3	Develop shear force and bending moment diagrams for various types of beams with given loading conditions	Remember / Understand / Apply
CO4	Find the slope and deflection of beams using Macaulay's method and double integration method	Remember / Understand / Apply
CO5	Estimate torsional rigidity of given materials numerically using torsion equation, buckling effect of columns	Remember / Understand / Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	3	2				2		2	3	2
CO2	3	3	3	2	3	2				2		2	3	2
CO3	3	3	3	2	3	2				2		2	3	3
CO4	3	3	3	2	3	2				2		2	2	3
CO5	3	3	3	2	3	2				2		2	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Semester Examination (Marks)
	1	2	
Remember	10	10	15
Understand	10	10	15
Apply	40	40	70
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0
Total	60	60	100

K.S.Rangasamy College of Technology–Autonomous								R2022
60 MC 304 - Mechanics of Solids								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	1	0	60	4	40	60	100

Stresses and Strains Mechanical properties of materials - Stress and strain - tensile, compressive and shear stresses - Stress -Strain Diagram - Hooke's law, elastic constants and their relations - volumetric, linear and shear strains - Composite sections - Thermal stresses and strain	[9+3]
Principal Stresses, Thin Cylindrical and Spherical Shells Stresses on inclined planes - principal stresses and principal strains - Mohr's circle - Thin cylindrical and spherical shells subjected to internal pressure - circumferential and longitudinal stresses - Thick Cylinders - Lame's theory	[9+3]
Shear Force and Bending Moment of Beams Types of beams and loads - Shear force and bending moment diagrams - Point load, uniformly distributed load and uniformly varying load - Theory of simple bending – Bending stress and shear stress distribution – Simulation of shear force and bending movement diagram.	[9+3]
Deflection of Beams Elastic curve - computation of slopes and deflection applying Macaulay's method - Simply supported beam - Cantilever beam - Double integration method - Simulation of beam deflection - Cantilever beam and simply supported beam	[9+3]
Torsion and Columns Torsion in solid and hollow circular shafts - stresses and deformations in circular shafts - Stresses in open and closed coil helical springs - Theory of columns - Euler's theory, slenderness ratio – Rankine's formula	[9+3]
Total Hours	**60**

Text Book(s):	
1.	Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., New Delhi, Sixth Edition, 2022.
2.	Rajput R.K. "Strength of Materials", S.Chand & Company Ltd., New Delhi, Seventh Edition, 2022.
3.	Rattan S.S., "Strength of Materials", Tata McGraw Hill Education (P).Ltd., New Delhi, Third Edition, 2016
Reference(s):	
1.	Egor. P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India, New Delhi, 2015.
2.	Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole, "Mechanics of Materials", Tata McGraw Hill publishing co. Ltd., New Delhi., 2019.
3.	Subramanian R., Strength of Materials, Oxford University Press, Oxford Higher Education Series, Third Edition, 2016.
4.	Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2013

SDG No. 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	Stresses and Strains	
1.1	Mechanical properties of materials - Stress and strain	1
1.2	Tensile, compressive and shear stresses	1
1.3	Stress-Strain Diagram - Hooke's law	1
1.4	Elastic constants and their relations	1
1.5	Tutorial	2
1.6	Linear and shear strains	1
1.7	Volumetric strain	1
1.8	Composite sections	1
1.9	Thermal stresses and strain	1
1.10	Tutorial	2
2	Principal Stresses, Thin Cylindrical and Spherical Shells	
2.1	Stresses on inclined planes	1
2.2	Principal stresses and principal strains	1
2.3	Mohr's circle	1
2.4	Thin cylindrical shells subjected to internal pressure	1
2.5	Tutorial	2
2.6	Thin spherical shells subjected to internal pressure	1
2.7	Circumferential and longitudinal stresses	1
2.8	Thick Cylinders	1
2.9	Lame's theory	1
2.10	Tutorial	2
3	Shear Force and Bending Moment of Beams	
3.1	Types of beams and loads	1
3.2	Shear force and bending moment diagrams - Point load	1
3.3	Shear force and bending moment diagrams - Uniformly distributed load	1
3.4	Shear force and bending moment diagrams - Uniformly varying load	1
3.5	Tutorial	2
3.6	Theory of simple bending	1
3.7	Bending stress distribution	1
3.8	Shear stress distribution	1
3.9	Simulation of shear force and bending movement diagram	1
3.10	Tutorial	2
4	Deflection of Beams	
4.1	Elastic curve	1
4.2	Computation of slopes and deflection applying Macaulay's method	1
4.3	Simply supported beam	1
4.4	Cantilever beam	1
4.5	Tutorial	2
4.6	Double integration method - Simply supported beam	1
4.7	Double integration method - Cantilever beam	1
4.8	Simulation of beam deflection - Cantilever beam	1
4.9	Simulation of beam deflection - Simply supported beam	1

4.10	Tutorial	2
5	Torsion and Columns	
5.1	Torsion in solid and hollow circular shafts	1
5.2	Stresses and deformations in circular shafts	1
5.3	Stresses in open coil helical springs	1
5.4	Stresses in closed coil helical springs	1
5.5	Tutorial	2
5.6	Theory of columns	1
5.7	Euler's theory	1
5.8	Slenderness ratio	1
5.9	Rankine's formula	1
5.10	Tutorial	2

Course Designer

Dr. A. Ramesh Kumar – rameshkumar@ksrct.ac.in

60 MY 002	UNIVERSAL HUMAN VALUES

Category	L	T	P	Credit
MY	2	1	0	3*

Objective

- To identify the essential complementarily between 'values' and 'skills'
- To ensure core aspirations of all human beings.
- To acquire ethical human conduct, trustful and mutually fulfilling human behaviour
- To enrich interaction with Nature
- To achieve holistic perspective towards life and profession

Prerequisite

NIL

Course Outcomes

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

CO1	Understand the significance of value inputs in formal education and start applying them in their life and profession	Understand
CO2	Evaluate coexistence of the "I" with the body.	Analyze
CO3	Identify and evaluate the role of harmony in family, society and universal order.	Analyze
CO4	Classify and associate the holistic perception of harmony at all levels of existence and Nature	Analyze
CO5	Develop appropriate human conduct and management patterns to create harmony in professional and personal lives.	Create

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								3	2		2	3		
CO2						3		3	3			3		
CO3						3	3	3	3			3		
CO4						3	3	3	3			3		
CO5						3	3	3	3	3		3		
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)			End Semester Examination(Marks)
	1	2	Model	
Remember	10	10	20	No End Semester Examination
Understand	10	10	20	
Apply	20	20	30	
Analyse	20	20	30	
Evaluate	0	0	0	
Create	0	0	0	

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MY 002 - Universal Human Values								
Common to all								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III/IV	2	1	0	45	3*	100	0	100

Introduction to value Education* Understanding value Education-Self exploration as the process for value education-Continuous Happiness and prosperity-the basic human aspirations-right understanding-relationship and physical facility – happiness and prosperity - current scenario – **method to fulfill the basic human aspirations.****	**[9]**
Harmony in the Human Being* Understanding Human being as the Co-Existence of the self and the Body-Distinguishing between the needs of the self and the body-the body as an instrument of the self-**understanding harmony in the self-harmony of the self with the body**** – programme to ensure self-regulation and health	**[9]**
Harmony in the Family and Society* Harmony in the Family –the basic unit of human interaction-values in human- to - human relationship – 'Trust' the foundation value in relationship –'Respect'- as the right evaluation-understanding harmony in the society –vision for the universal human order.	**[9]**
Harmony in the Nature/Existence* Understanding harmony in the Nature-Interconnectedness, self-regulation and mutual fulfillment among the four orders of nature – realizing existence as co-existence at all levels –the holistic perception of harmony in existence.	**[9]**
Implications of the Holistic Understanding* Natural Acceptance of human values- definitiveness of human conduct- a basis for humanistic education, humanistic constitution and universal human order- competence in professional ethics –holistic technologies, production systems and management models-typical case studies – strategies for transition towards value base life and profession	**[9]**
Total Hours	**45**

Text Book(s):	
1.	A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana,
Reference(s):	
1.	Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.
2.	Human Values, A.N. Tripathi, New Age International. Publishers, New Delhi, 2004.

***SDG 3 – Good Health and Well – Being**
**** SDG 5 – Quality Education**

Course Contents and Lecture Schedule

S.No.	Topic	No. of Hours
1	**INTRODUCTION TO VALUE EDUCATION**	
1.1	Discussion on Present Education System and Skill Based Education	1
1.2	Understanding Value Education	1
1.3	Self exploration as the process for value education	1
1.4	Basic Human Aspirations - Continuous Happiness and Prosperity	1
1.5	Basic requirements to fulfill Human Aspirations - Right understanding, Relationship and Physical facility	1
1.6	Transformation from Animal Consciousness to Human Consciousness	1
1.7	Sources of Happiness and Prosperity – Harmony and Disharmony	1
1.8	Current Scenario and Role of Education	1
1.9	Outcome of Human Education and Method to fulfill the basic human aspirations	1
2	**HARMONY IN THE HUMAN BEING**	
2.1	Understanding Human being - As Co-Existence of the self and the Body - The Needs of the Self and the Body	1
2.2	Understanding Human being - As Co-Existence of the self and the Body - The Activities and Response of the Self and the Body	2
2.3	The body as an instrument of the self	1
2.4	Understanding harmony in the self	1
2.5	Harmony of the self with the body	2
2.6	Programme to ensure self-regulation and health	1
2.7	My Participation (Value) regarding Self and my Body - Correct Appraisal of our Physical needs	1
3	**HARMONY IN THE FAMILY AND SOCIETY**	
3.1	Harmony in the Family - Understanding Values in Human Relationships	1
3.2	Family as the basic Unit of Human Interaction	1
3.3	Values in human Relationships	1
3.4	Trust - the foundation value in relationship	1
3.5	Respect as the right evaluation, the Basis for Respect, Assumed Bases for Respect today	1
3.6	Harmony from Family to World Family: Undivided Society	1
3.7	Extending Relationship from family to society , Identification of the Comprehensive Human Goal	1
3.8	Programs needed to achieve the Comprehensive Human Goal: The Five Dimensions of Human Endeavour	1
3.9	Harmony from Family Order to World Family Order – Universal Human Order	1
4	**HARMONY IN THE NATURE / EXISTENCE**	
4.1	The Four Orders in Nature	1
4.2	Participation of Human Being in Entire Nature	1
4.3	Natural Characteristics - Tendency of Human Living with Animal Consciousness / The Holistic Perception of Harmony in Existence	1
4.4	Present day Problems	1
4.5	Recyclability and self-regulation in Nature	1
4.6	Relationship of Mutual Fulfillment	1
4.7	An Introduction to space, Co-existence of Units in Space	1
4.8	Harmony in Existence – Understanding Existence as Co- Existence	1
4.9	Natural Characteristic of Human Living with Human Consciousness	1
5	**IMPLICATIONS OF THE HOLISTIC UNDERSTANDING**	
5.1	Natural Acceptance of human values	1
5.2	Definitiveness of Ethical Human Conduct - Development of Human Consciousness	1
5.3	Identification of Comprehensive Human Goal	1
5.4	Basis for Humanistic Education and Humanistic Constitution	1
5.5	Ensuring Competence in professional Ethics	1
5.6	Issues in Professional Ethics-The Current Scenario	1
5.7	Holistic Technologies and Production Systems and management models -Typical Case Studies	2
5.8	Strategies for transition towards value based life and profession	1
	Total	45

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 GE 002	**Tamils and Technology** (Common to all Branches)

Category	L	T	P	Credit
GE	1	0	0	1

Objectives:

- To learn weaving, ceramic and construction technology of Tamils.
- To understand the agriculture, irrigation and manufacturing technology of Tamils.
- To realize the development of scientific Tamil and Tamil computing.

Pre requisite:

Nil

Course Outcomes:

On the successful completion of the course, students 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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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		
3- Strong;2-Medium;1-Some														

K. S. Rangasamy College of Technology – Autonomous								R2022
60 GE 002 – Tamils and Technology (Common to all Branches)								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	1	0	0	15	1	100	-	100

WEAVING AND CERAMIC TECHNOLOGY* Weaving Industry during Sangam Age – Ceramic Technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.	3
DESIGN AND CONSTRUCTION TECHNOLOGY* 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)- Thirumalai Nayakar Mahal – Chetti Nadu Houses , Indo – Saracenic architecture at Madras during British Period.	3
MANUFACTURING TECHNOLOGY* 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.	3
AGRICULTURE AND IRRIGATION TECHNOLOGY* Dam,Tank,Ponds,Sluice,Significance of Kumizhi Thoompu 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.	3
SCIENTIFIC TAMIL & TAMIL COMPUTING* 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.	3
Total Hours	**15**

Text Book(s):

1.	தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	கணினித்தமிழ் – முனைவர் இல. சுந்தரம். (விகடன் பிரசுரம்).
3.	கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம் (தொல்லியல் துறை வெளியீடு).
4.	பொருநை - ஆற்றங்கரை நாகரீகம் (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

***SDG:4- Quality Education**

60 GE 002	தமிழரும் தொழில்நுட்பமும் (அனைத்து துறைகளுக்கும் பொதுவானது)

Category	L	T	P	Credit
GE	1	0	0	1

பாடத்தின் நோக்கங்கள்:

- தமிழர்களின் சங்ககால நெசவு, பனை வனைதல் மற்றும் கட்டிட தொழில் நுட்பம் குறித்து அறிதல்.
- தமிழர்களின் சங்ககால வேளாண்மை, நீர்ப்பாசனம் மற்றும் உற்பத்தி முறைகள் குறித்த கற்றல்.
- நவீன அறிவியல் தமிழ் மற்றும் கணித்தமிழ் குறித்த புரிதல்.

முன்கூட்டிய துறைசார் அறிவு:

தேவை இல்லை

பாடம் கற்றதின் விளைவுகள்:

பாடத்தை வெற்றிகரமாக கற்று முடித்த பின்பு, மாணவர்களால் முடியும் விளைவுகள்

CO1	சங்ககாலத் தமிழர்களின் நெசவு மற்றும் பானை வனைதல் தொழில்நுட்பம் குறித்த கற்றுணர்தல்	புரிதல்
CO2	சங்ககாலத் தமிழர்களின் கட்டிட தொழில்நுட்பம் கட்டுமானப் பொருட்கள் மற்றும் அவற்றை விளக்கும் தளங்கள் குறித்த 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 கணித்தமிழ் குறித்த புரிந்துகொள்ளலும் மற்றும் பயன்படுத்துதலும்.	பகுப்பாய்வு

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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		
3- Strong;2-Medium;1-Some														

K. S. Rangasamy College of Technology – Autonomous								R2022
60 GE 002 – *தமிழரும் தொழில்நுட்பமும்*								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	1	0	0	15	1	100	-	100

நெசவு மற்றும் பானைத் தொழில்நுட்பம்: சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.	3
வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்: சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமானப் பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் – மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோயில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கல் - நாயக்கர் காலக் கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக் கலை.	3
உற்பத்தித் தொழில் நுட்பம்: கப்பல் கட்டும் கலை – உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருக்குதல், எஃகு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள் , கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.	3
வேளாண்மை மற்றும் நீர்பாசனத் தொழில் நுட்பம்: அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமுழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்கான வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மை சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன்வளம் - முத்து மற்றும் முத்துக்குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்.	3
அறிவியல் தமிழ் மற்றும் கணித்தமிழ் அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின்பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக்கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்.	3
Total Hours	**15**

Text Book(s):

1.	*தமிழக வரலாறு - மக்களும் பண்பாடும் கே. கே . பிள்ளை* (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்).
2.	*கணினித்தமிழ் – முனைவர் இல. சுந்தரம்.* (விகடன் பிரசுரம்).
3.	*கீழடி – வைகை நதிக்கரையில் சங்ககால நகர நாகரீகம்* (தொல்லியல் துறை வெளியீடு).
4.	*பொருநை - ஆற்றங்கரை நாகரீகம்* (தொல்லியல் துறை வெளியீடு).
5.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print).
6.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr.S.V.Subaramanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

***SDG:4- Quality Education**

60 MC 3P1	Analog Devices and Digital Circuits Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To Learn the Volt-Ampere characteristic of semiconductor diodes and assessing performance of rectifier circuit using filter.
- To Evaluate frequency response and understand the behavior of amplifier circuits
- To explore a basic knowledge of bit manipulation and Develop the ability to analyze and design digital electronic circuits
- To illustrate the different analog electronic circuits and their application in practice.
- To illustrate the different digital electronic circuits and their application in practice.

Pre-requisite

Basic Electrical and Electronics Engineering

Course Outcomes

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

CO1	Analyze the characteristics of semiconductor devices and determine the input and output parameters.	Remember, Understand and Apply
CO2	Identify the various operating regions and analyze the characteristics of BJT and MOSFET	Analyze
CO3	Understand the fundamentals of digital electronic circuit and their application in practice	Understand
CO4	Construct basic combinational circuits and verify their functionalities	Understand/Analyze
CO5	Design and implement synchronous and asynchronous sequential circuits.	Remember

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				3				1	1	1	1	3	3
CO2	2	3	2		1			1	3	2		1	3	3
CO3	2	2	1		2			1	2	2	1	1	3	3
CO4	2	3	2	2	2			2		2	1	1	3	3
CO5	2	3		2	2						1	1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

List of Experiments

1. Study the VI Characteristics of PN junction diode and Zener diode
2. Study the ripple and regulation characteristics of full wave rectifier with and without capacitor filter.
3. Construct the clipper and clamper circuit using PN junction diode
4. Combinational Logic and Circuit Simulation in LabVIEW
5. Determination of Input and Output Characteristics of MOSFET
6. Design and verify the summing amplifier using IC 741 in LabVIEW.
7. Design and implementation of 4 bit binary Adder/ Subtractor using IC 7483
8. Design and implementation of Multiplexer and De-multiplexer using IC 741XX
9. Construction and verification of 4 bit ripple counter and Mod-10 Ripple counters
10. Design and study the operation inverting and non inverting amplifier using IC741

SDG No.9

60 MC 3P2	Manufacturing Technology Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To enhance the working knowledge on Lathe.
- To conversant the drilling and shaping machine operations.
- Demonstration and study of the milling and grinding machine.
- To gain the knowledge on green sand moulding process.
- To enhance the working skill in CNC turning machine.

Prerequisite

Manufacturing Technology

Course Outcomes

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

CO1	Perform the various operations using conventional lathe.	Understand
CO2	Make the operations using drilling and shaping machine.	Understand
CO3	Develop a component using milling and grinding machine.	Understand
CO4	Prepare a model using green sand moulding process.	Apply
CO5	Perform the operation of given work piece using CNC turning machine.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2						2		2	2	3	3
CO2	3	2	2						2		2	2	3	3
CO3	3	2	2						2		2	2	3	3
CO4	3	2	2						2		2	2	3	3
CO5	3	2	2						2		2	2	3	3
3- Strong;2-Medium;1-Some														

List of Experiments

1. Machining a work piece by facing, plain turning and taper turning operations using a lathe.
2. Machining a work piece by knurling and external thread cutting operations using a lathe.
3. Performing a work piece by drilling reaming and tapping operations using a drilling machine.
4. Machining a work piece by hexagonal component using appropriate machine.
5. Machining a work piece by spur gear using milling machine.
6. Grinding a work piece by flat and cylindrical surfaces using grinding machine.
7. Preparation of stepped pulley mould using green sand moulding process.
8. Preparation of hollow cylindrical pipe mould using green sand moulding process.
9. Machining a work piece by facing and turning using CNC turning machine.
10. Machining a work piece by plain turning and step turning using CNC turning machine.
11. Demonstration on additive manufacturing process (3D Printing Machine)

SDG No.9

60 CG 0P2	CAREER SKILL DEVELOPMENT II

Category	L	T	P	Credit
CG	0	0	2	1*

Objective

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

Prerequisite

Basic knowledge of reading and writing in English.

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1								2	3	3	2	3		
CO2								2	3	3	2	3	2	
CO3								2	3	3	2	3		2
CO4								2	3	3	2	3		
CO5								2	3	3	2	3	2	2
3- Strong;2-Medium;1-Some														

K.S. Rangasamy College of Technology–Autonomous								R2022
60 CG 0P2-**Career Skill Development II**								
Common to All Branches								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	0	0	2	25	1*	100	0	100

Listening Evaluative Listening: Advertisements, Product Descriptions, - Audio / video; filling a graphic organiser (choosing a product or service by comparison) - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects, documentaries depicting a technical problem and suggesting solutions - Listening to TED Talks	**[5]**
Speaking Marketing a product, persuasive speech techniques - Describing and discussing the reasons of accidents or disasters based on news reports, Group Discussion (based on case studies), presenting oral reports, Mini presentations on select topics with visual aids, participating in role plays, virtual interviews	**[5]**
Reading Reading advertisements, user manuals and brochures - longer technical texts– cause and effect essays, and letters / emails of complaint - Case Studies, excerpts from literary texts, news reports etc. - Company profiles, Statement of Purpose (SoPs)	**[5]**
Writing Professional emails, Email etiquette - compare and contrast essay - Writing responses to complaints Precis writing, Summarizing and Plagiarism- Job / Internship application – Cover letter & Résumé	**[5]**
Verbal Ability II Reading Comprehension (Inferential fillups) – Spotting Errors – Verbal Analogies – Theme Detection – Change of Voice – Change of Speech – One word substitution	**[5]**
Total Hours	**25**

Reference(s):

1.	'English for Engineers & Technologists' Orient Blackswan Private Ltd. Department of English, Anna University, 2020
2.	Norman Lewis, 'Word Power Made Easy - The Complete Handbook for Building a Superior Vocabulary Book', Penguin Random House India, 2020
3.	Raman. Meenakshi, Sharma. Sangeeta, 'Professional English'. Oxford University Press. New Delhi. 2019
4.	Arthur Brookes and Peter Grundy,' Beginning to Write: Writing Activities for Elementary and Intermediate Learners', Cambridge University Press, New York, 2003

SDG 4 – Quality Education

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours	Mode of content Delivery
1	**Listening**		
1.1	Evaluative Listening: Advertisements, Product Descriptions	1	Activity Based
1.2	Listening to longer technical talks and completing– gap filling exercises.	1	Activity Based
1.3	Listening technical information from podcasts	1	Activity Based
1.4	Listening to process/event descriptions to identify cause & effects and documentaries depicting a technical problem and suggesting solutions	1	Activity Based
1.5	Listening to TED Talks	1	Activity Based
2	**Speaking**		
2.1	Marketing a product, persuasive speech techniques	1	Activity Based
2.2	Describing and discussing the reasons of accidents or disasters based on news reports,	1	Activity Based
2.3	Group Discussion (based on case studies)	1	Activity Based
2.4	Presenting oral reports, Mini presentations on select topics with visual aids	1	Activity Based
2.5	participating in role plays and virtual interviews	1	Activity Based
3	**Reading**		
3.1	Reading advertisements, user manuals and brochures	1	Activity Based
3.2	Reading - longer technical texts– cause and effect essays, and letters / emails of complaint	1	Activity Based
3.3	Case Studies, excerpts from literary texts, news reports etc.	1	Activity Based
3.4	Company profiles	1	Activity Based
3.5	Statement of Purpose (SoPs)	1	Activity Based
4	**Writing**		
4.1	Professional emails, Email etiquette	1	Activity Based
4.2	Compare and contrast essay	1	Activity Based
4.3	Writing responses to complaints	1	Activity Based
4.4	Precis writing, Summarizing and Plagiarism	1	Activity Based
4.5	Job / Internship application – Cover letter & Résumé	1	Activity Based
5	**Verbal Ability II**		
5.1	Reading Comprehension (Inferential fillups) and Theme Detection	1	Activity Based
5.2	Spotting Errors	1	Activity Based
5.3	Verbal Analogies	1	Activity Based
5.4	Change of Voice and Change of Speech	1	Activity Based
5.5	One word substitution	1	Activity Based
	Total	**25**	

Course Designer

1. Dr.A.Palaniappan - palaniappan@ksrct.ac.in

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

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022-2023 onwards)

FOURTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MC 401	Industrial Drives and Control	2	40	60	100	45	100
2	60 MC 402	Fluid Mechanics and Thermodynamics	2	40	60	100	45	100
3	60 MC 403	Metrology and Statistical Quality control	2	40	60	100	45	100
4	60 MC 404	Hydraulic and Pneumatic control	2	50	50	100	45	100
5	60 MC 405	Virtual Instrumentation and Applications	2	50	50	100	45	100
6	60 MC L0*	Open Elective-I	2	40	60	100	45	100
PRACTICAL								
8	60 MC 4P1	Industrial Drives and Control Laboratory	3	60	40	100	45	100
9	60 MC 4P2	Applied Mechanics Laboratory	3	60	40	100	45	100
10	60 CG 0P3	Career Skill Development-III	3	100	-	100	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests.This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

R1/ w.e.f.27/12/2023

Passed in the BoS Meeting Held on 24/11/2023

Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 401	Industrial Drives and Control

Category	L	T	P	Credit
PC	3	0	0	3

Objective

- To learn the structure of Electric Drive systems and their role in various loads
- To impart the knowledge on starting methods of DC and AC motors
- To understand the operation of D.C motor speed control using converters and choppers.
- To introduce the concept of control circuit for industrial drives.
- To provide the knowledge on construction, working and control strategies of special drives.

Prerequisite

Basic Electrical and Electronics Engineering

Course Outcomes

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

CO1	Understand the need of electrical drives and their applications in various loads.	Remember, Understand, Apply
CO2	Describe the starting methods of AC and DC Drives	Remember, Understand, Apply, Analyse
CO3	Apply the solid state speed control techniques in DC & AC Drives	Remember, Understand, Apply
CO4	Develop motor control circuit basics in industrial standard	Remember, Understand, Apply
CO5	Understand the principle of operation of special drives and their applications	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3			2	1	1	1	1	3	3
CO2	3	3	3	2	2			2	2	1		1	3	3
CO3	3	2	3	3	3			3	1	1	1	1	3	3
CO4	3	3	3	3	3			1	1		1	1	3	3
CO5	3	2	3	2	3			1	1	1	1	1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC 401 - Industrial Drives and Control								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Introduction Basic Elements — Types of Electric Drives — factors influencing the choice of electrical drives — heating and cooling curves — Loading conditions and classes of duty — Selection of power rating for drive motors with regard to thermal overloading and Load variation factors	**[09]**
Drive motor characteristics and Starting Methods Speed-Torque characteristics - Braking of Electrical motors -Types of D.C Motor starters — Typical control circuits for shunt and series motors — Types of A.C Motor starters- Three phase squirrel cage and slip ring induction motors	**[09]**
Solid State Speed Control of DC Drives & AC Drives Speed control of DC series and shunt motors — Armature and field control, Ward-Leonard control system — Using controlled rectifiers and DC choppers. Speed control of three phase induction motor — Voltage control, voltage / frequency control, slip power recovery scheme — Using inverters and AC voltage regulators.	**[09]**
Development Of Control Circuit Develop ladder diagram for control from one place, remote control, interlocking, DOL starter, Forward and reverse motoring, Automatic star delta starter, Automatic Plugging, Jogging and sequence speed control, Thyristor controlled DC Motor Drive and Induction motor drive.	**[09]**
Special motor Drives Stepper motors – Permanent magnet, Variable reluctance, Single and multi-stack configurations, Hybrid motor. Switched reluctance motors – AC & DC Servo motors – Brushless DC motors.	**[09]**
Total Hours	45

Text Book(s):	
1.	Gopal.K.Dubey ,"Fundamentals of Electrical Drives" Narosa Publishing House, 2nd Edition, 2013.
2	A.K., "A text book of Electrical Technology–Volume II (AC & DC Machines)"S.Chand & Company Ltd., New Delhi, 2005.
Reference(s):	
1.	Vedam Subrahmanyam, "Electric Drives Concepts and Applications" Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2001.
2.	M.D.Singh and K.B. Khanchandani, "Power Electronics", Tata Mc Graw Hill Publishing Company Ltd.,New Delhi, 2008.
3.	Shepherd Hullay&Liag,"Power Electronics & Motor Control", Cambridge University Press. .
4	Partab. H., "Art and Science and Utilisation of Electrical Energy", Dhanpat Rai and Sons, 2017

SDG No.8, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1.1	Basic Elements of electrical drives	2
1.2	Types of Electric Drives, factors influencing the choice of electrical drives	1
1.3	heating and cooling curves	2
1.4	Selection of power rating for drive motors with regard to thermal overloading Load variation factors	2
1.5	Loading condition & class of duty	1
1.6	Load variation factors of electrical drive	1
	Drive motor characteristics and Starting Methods	
2.1	Speed-Torque characteristics	1
2.2	Braking of Electrical motors	1
2.3	Types of D.C Motor starters, single phase three phase	1
2.4	Typical control circuits for shunt motors	2
2.5	Typical control circuits for series motors	1
2.6	Starters for Three phase squirrel cage.	2
2.7	Starting methods of slip ring induction motors ,	1
	Solid State Speed Control of DC Drives & AC Drives	
3.1	Speed control of DC series and shunt motors	1
3.2	Armature and field control	1
3.3	Ward-Leonard control system	1
3.4	Using controlled rectifiers and DC choppers	1
3.6	Speed control of three phase induction motor	1
3.7	Voltage control, voltage / frequency control	1
3.8	slip power recovery scheme	2
3.9	Using inverters and AC voltage regulators .	1
	Development Of Control Circuit	
4.1	Develop ladder diagram for control from one place, remote control, interlocking	1
4.2	DOL starter, Forward and reverse motoring	1
4.3	Automatic star delta starter	1
4.5	Automatic Plugging, Jogging	1
4.6	sequence speed control	1
4.8	sequence functions and applications	1
4.9	Thyristor controlled DC Motor Drive	1
4.10	Thyristor controlled Induction motor drive	1
5	**Special motor Drives**	1
5.1	Stepper motors	1
5.2	Permanent magnet, Variable reluctance	1
5.3	Single and multi-stack configurations	2
5.4	Hybrid motor .	1
5.5	Switched reluctance motors	1
5.6	AC & DC Servo motors	1
5.7	Brushless DC motors	1
	Total	45

Course Designer

1. Dr.M.Ravi - ravi@ksrct.ac.in

60 MC 402	Fluid Mechanics and Thermodynamics	Category	L	T	P	Credit
		PC	3	1	0	4

Objective

- To understand the properties of fluids, manometry and buoyancy
- To recognize mass and momentum conservation laws for fluid flows.
- To know the pressure and velocity variation in flow of fluids through pipes
- To know the basics of thermodynamics and evaluate the properties of changes in open and closed systems.
- To apply the concept of thermodynamics laws to various applications such as heat engine, heat pump and refrigeration systems.

Prerequisite

Nil

Course Outcomes

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

CO1	Estimate the properties of fluids, manometry and buoyancy	Remember
CO2	Identify the type of flow and apply the fluid dynamics concepts.	Understand
CO3	Evaluate the velocity and pressure variation in flow through pipes.	Understand
CO4	Describe the basic concepts of zeroth law and first law of thermodynamics and apply the conceptsof first law of thermodynamics to open and closed system.	Apply
CO5	Relate the concept of second laws of thermodynamics to heat engine, heat pump and refrigerator and discuss the concept of entropy.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2					1			1	3	3
CO2	3	3	2	2					1			1	3	3
CO3	3	3	2	2					1			1	3	3
CO4	3	3	2	2					1			1	3	3
CO5	3	3	2	2					1			1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	20	10	20
Understand	40	20	40
Apply	0	30	40
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology–Autonomous								R2022
60 MC 402 – Fluid Mechanics and Thermodynamics								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	1	0	60	4	40	60	100

Fluid Properties and Fluid Statics Fluid Definition and Classification – Properties of fluids: Density, Specific Weight, Specific Volume, Specific Gravity, Viscosity, Compressibility, Bulk Modulus, Capillary and Surface Tension – Fluid statics: Concept of fluid static pressure – Pascal's law –Absolute and Gauge pressures – Manometers: piezometer, U-tube Manometer and Pressure measurement – Concept of Buoyancy and	**[9+3]**
Fluid kinematics and fluid dynamics Fluid Kinematics: Types of fluid flow – Continuity equation in two and three dimensions – Velocity and Acceleration of fluid particle – Velocity potential function and Stream function. Fluid dynamics: Euler's equation along a streamline –Bernoulli's equation and applications – Venturi meter, Orifice meter and Pitot tube.	**[9+3]**
Flow through pipes: Laminar and Turbulent flow: Hagen-Poiseuille equation, Darcy friction factor, Darcy-Weisbach Equation-Major and Minor losses - application of Moody's chart —Hydraulic gradient and Total energy lines – Flow through pipes in series and in parallel – Power transmission through pipes.	**[9+3]**
Basics of Thermodynamics and First Law of Thermodynamics: Thermodynamics – Microscopic and macroscopic point of view – Systems, properties, process, path, cycle. Thermodynamic equilibrium – Zeroth law of Thermodynamics – internal energy, enthalpy, specific heat capacities CV and CP, Relationship between CV and CP. First law of Thermodynamics – Application to closed and open systems – Steady Flow Energy Equation (SFEE) – Simple	**[9+3]**
Second Law of Thermodynamics and Entropy: Second Law of thermodynamics – Kelvin Planck and Clausius Statements – Reversibility – Irreversibility, reversible cycle – Heat engine, heat pump and refrigerator. Carnot cycle and Clausius theorem. Entropy principle – General expression for entropy - property of entropy – P-V and T-S diagrams – Simple problems in entropy	**[9+3]**
Total Hours	45+15=60

TextBook(s):

1.	Bansal R.K., Fluid Mechanics and Hydraulic Machines‖, 11th Edition, Laxmi Publications, New Delhi,
2.	Cengel, Y. A., "Thermodynamics - An Engineering Approach", 9th Edition, Tata McGraw Hill Pub., New Delhi, 2019

Reference(s):

1.	Nag. P.K., "Engineering Thermodynamics", 6thEdition, Tata McGraw-Hill Publications, New Delhi, 2017.
2.	Moran, M. J. and Shapiro, H. N., "Fundamentals of Engineering Thermodynamics", 8th Edition, John Wiley andSons, 2014.
3.	Rajput, R.K., "A Textbook of Engineering Thermodynamics, 6th Edition, Laxmi Publications, 2023.
4.	Ramamrutham.S. "Hydraulics Fluid Mechanics and Fluid Machines", 8th Edition, DhanpatRai Publishingcompany (P) Ltd, New Delhi, 2014
5.	Frank M. White., —Fluid Mechanics‖, 9th Edition, Tata McGraw Hill Publishing Company, New Delhi,

SDG No.9

Course Contents and Lecture Schedule

S. No	Topic	No. of Hours
1	**Fluid Properties and Fluid Statics**	
1.1	Fluid Definition and Classification	1
1.2	Properties of fluids: Density, Specific Weight, Specific Volume,	1
1.3	Specific Gravity, Viscosity, Compressibility, Bulk Modulus, Capillary and Surface Tension Fluid statics: Concept of fluid static pressure	1
1.4	Pascal's law ,Absolute and Gauge pressures	2
1.5	Manometers: piezometer, U-tube Manometer and Pressure measurement	2
1.6	Concept of Buoyancy and Floatation.	1
1.7	Fluid Properties and Fluid Statics	1
2	**Fluid kinematics and fluid dynamics**	
2.1	Fluid Kinematics: Types of fluid flow	1
2.2	Continuity equation in two and three dimensions	1
2.3	Velocity and Acceleration of fluid particle	1
2.4	Velocity potential function and Stream function.	2
2.5	Fluid dynamics: Euler's equation along a streamline	2
2.6	Bernoulli's equation and applications	1
2.7	Venturi meter, Orifice meter and Pitot tube.	1
3	**Flow through pipes**	
3.1	Laminar and Turbulent flow	1
3.2	Hagen-Poiseuille equation, Darcy friction factor,	1
3.3	Darcy-Weisbach Equation	2
3.4	Major and Minor losses, Application of Moody's chart	2
3.5	Hydraulic gradient and Total energy lines	1
3.6	Flow through pipes in series and in parallel	1
3.7	Power transmission through pipes.	1
4	**Basics of Thermodynamics and First Law of Thermodynamics**	
4.1	Thermodynamics,Microscopic and macroscopic point of view	1
4.2	Systems, properties, process, path, cycle,	1
4.3	Thermodynamic equilibrium	1
4.4	Zeroth law of Thermodynamics,internal energy, enthalpy,	1
4.5	specific heat capacities CV and CP, Relationship between CV and CP.	1
4.6	First law of Thermodynamics	1
4.7	Application to closed and open systems	1
4.8	Steady Flow Energy Equation (SFEE)	1
4.9	Simple problems.	1
5	**Second Law of Thermodynamics and Entropy:**	
5.1	Second Law of thermodynamics	1
5.2	Kelvin Planck and Clausius Statements	1
5.3	Reversibility,Irreversibility, reversible cycle	1
5.4	Heat engine, heat pump and refrigerator.	1
5.5	Carnot cycle and Clausius theorem.	1
5.6	Entropy principle,General expression for entropy	1
5.7	Property of entropy, P-V and T-S diagrams	1
5.8	Simple problems in entropy	1
	Total	45

Course Designers

Dr.R.Senthil murugan- senthilmurugan@ksrct.ac.in
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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 403	Metrology and Statistical Quality Control	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To give insights on the basics of metrology and measurements.
- To facilitate the knowledge on the various measurement techniques.
- To provide exposure on the fundamental working of optical measuring techniques
- To deliver insights on the basics of different forms of measurements
- To familiarize the statistical tools in the quality analysis.

Prerequisite

Engineering physics

Course Outcomes

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

CO1	Describe the fundamental concepts of measurement.	Understand
CO2	Recognise the linear and angular measurement techniques to inspect the products.	Understand
CO3	Understand the optical measurement techniques to inspect the products.	Understand
CO4	Demonstrate and simulate the different forms of measurements.	Understand
CO5	Apply the statistical tools and control charts in measurements.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2					1			1	3	3
CO2	3	3	2	2					1			1	3	3
CO3	3	3	2	2					1			1	3	3
CO4	3	3	2	2					1			1	3	3
CO5	3	3	2	2					1			1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	10	30
Understand	20	20	30
Apply	20	20	25
Analyse	5	5	05
Evaluate	5	5	10
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC 403- Metrology and Statistical Quality Control								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Fundamentals of Metrology Measurements, classifications and its Characteristics - Evolution of Standards - Sources of errors – Calibration - Concepts of interchangeability and selective assembly - Limits, fits and tolerances - Limit gauges.	**[09]**
Linear and Angular Measurements Linear measurements : Vernier instruments, micrometres, Surface plates, V-Blocks, Feeler gauges, Thread gauges, Scribers, slip gauges - Angular measurements : Sine bar, bevel protractor, clinometers, angle gauges - Mechanical, optical and pneumatic comparators.	**[09]**
Advancements in Metrology Interference of two rays, Light source, Interference in testing - Interferometers : Michelson Interferometer, Twyman-Green Interferometer, N.P.L. Flatness Interferometer, Laser Interferometers - Coordinate measuring machines – Types, probes and applications - Machine vision system : Principle and applications.	**[09]**
Form Measurement Principle and Methods of straightness, flatness measurement, thread measurement, gear measurement, surface finish measurement and roundness measurement – Applications - Surface finish measurements with Gwyddion software.	**[09]**
Statistical Quality Control Introduction to quality control and quality assurance - Statistical process control - Statistical tools of quality control, Control charts for variable, objective, relation between $\bar{X}$,s,$\bar{R}$, control limits - Control charts for attributes – p chart and np chart - Process capability studies - Acceptance sampling. Creation of control charts using Minitab software.	**[09]**
Total Hours	45

TextBook(s):

1.	Samir Mekid, " Metrology and Instrumentation Practical Applications for Engineering and Manufacturing", John Wiley &Sons, 2021
2.	Douglas C. Montgomery, "Introduction to Statistical Quality Control", John Wiley &Sons, 2020

Reference(s):

1.	Anup Goel, " Metrology & Quality Control", Repro Books Limited, 2020
2.	Venkateshan, S. P., "Mechanical Measurements", Second edition, John Wiley &Sons, 2015
3.	Raghavendra, Krishnamurthy "Engineering Metrology & Measurements", Oxford Univ. Press, 2013.
4.	M. Mahajan, "Statistical Quality Control", Dhanpatrai Publications, 2016
5.	Jain R. K., "Engineering Metrology",21st Edition, Khanna Publications, 2020.

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Course Contents and Lecture Schedule

S. No	Topic	No. of Hours
1	**Fundamentals of Metrology**	
1.1	Introduction to Metrology and Measurement,	1
1.2	Classifications and its characteristics	1
1.3	Evolution of Standards	1
1.4	Sources of errors	2
1.5	Calibration	1
1.6	Concepts of interchangeability and selective assembly	1
1.7	Limits, fits and tolerances	1
1.8	Limit gauges	
2	**Linear And Angular Measurements**	
2.1	Introduction to measurements, Vernier instruments	1
2.2	Micrometers	1
2.3	Surface plates, V-Blocks	1
2.4	Feeler gauges, Thread gauges, Scribers	1
2.5	Slip gauges	1
2.6	Angular measurements - sine bar	1
2.7	Bevel protractor, clinometers, angle gauges	1
2.8	Comparators- Mechanical	1
2.9	Comparators- optical and pneumatic	1
3	**Advancements in metrology**	
3.1	Basics – Interference of two rays	1
3.2	Light source, Interference in testing	1
3.3	Interferometers - Michelson Interferometer, Twyman-Green Specialisation of Michelson Interferometer, N.P.L. Flatness Interferometer, Laser Interferometers	2
3.4	Coordinate measuring machines -Types	2
3.5	Coordinate measuring machines - Probes, applications	1
3.6	Machine vision system – Introduction	1
3.7	Machine vision system – Principle, and Applications	1
4	**Form Measurement**	
4.1	Principles and Methods of straightness	1
4.2	Flatness measurement	1
4.3	Thread measurement	2
4.4	Gear measurement	1
4.5	surface finish measurement, Surface finish measurements with Gwyddion and LAB View software	2
4.6	Roundness measurement	1
4.7	Applications of measurement	1
5	**Statistical Process Control**	
5.1	Introduction to quality control and quality assurance	1
5.2	Statistical process control, Statistical tools of quality control	1
5.3	Control charts for variable, objective, relation between $\bar{X}$,s,$\bar{R}$, control limits	2
5.4	Control charts for variable, control limits	1
5.5	Control charts for attributes, p chart and np chart, Creation of Control charts using minitab	2
5.6	Process capability studies	1
5.7	Acceptance sampling	1
	Total	45

Course Designers

Dr.S.Sathish - sathishs@ksrct.ac.in

60 MC 404	HYDRAULIC AND PNEUMATIC CONTROL	Category	L	T	P	Credit
		PC	3	0	2	4

Objective

- To familiarize about the basics fundamentals of hydraulic and pneumatic transmission power using pressurized fluids.
- To understand working principles, operation of hydraulic and pneumatic components.
- To expose to various techniques for choosing pumps, valves and pneumatics components for suitable application.
- Have exposure to diagnose / troubleshoot hydraulic, pneumatic, electro pneumatic circuits.
- To design the circuits using pneumatic / hydraulic components for a small scale industrial application.

Prerequisite

NIL

Course Outcomes

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

CO1	Explain the fundamental properties of fluids and understand the applications, advantages of fluid power system.	Remember, Understand, Apply
CO2	Identify the various pumps, valves, actuators and its working principles in hydraulic circuit.	Remember, Understand, Apply
CO3	Describe and illustrate the construction and working principles of various compressors, pneumatic valves and FRL unit importance in pneumatic circuit.	Remember, Understand, Apply
CO4	Design and develop the hydraulic and pneumatic circuit for various applications.	Remember, Understand, Apply
CO5	Know the significance of failures and troubleshooting, fluid power circuit for machine tool applications and software used in fluid power automation	Remember, Understand, Apply

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	2	2	2	2	1	2	2	2	2	3	3
CO2	2	2	2	1	1	1	2	1	2	1	2	2	2	2
CO3	2	2	1	2	2	1	2	1	2	1	2	2	3	2
CO4	2	3	3	2	3	2	1	1	2	2	2	2	2	3
CO5	2	2	2	2	3	1	1	1	2	1	3	2	2	3
3 - Strong; 2 - Medium; 1 - Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		Model Exam (Marks)	End Sem Examination (Marks)
	1	2		
Remember (Re)	10	10	10	20
Understand (Un)	20	20	30	30
Apply (Ap)	30	30	60	50
Analyze (An)	0	0	0	0
Evaluate (Ev)	0	0	0	0
Create (Cr)	0	0	0	0
Total	60	60	100	100

K.S.Rangasamy College of Technology – Autonomous							R2022
60 MC 404 – Hydraulic and Pneumatic Control							
B.E. Mechatronics Engineering							
Semester	Hours / Week			Total hrs	Credit	Maximum Marks	
	L	T	P		C	CA	ES	Total
IV	3	0	2	75	4	50	50	100

Fluid Power System

Introduction to fluid power - properties of fluids: Viscosity index, Oxidation index, Demulsibility, Lubricity, Rust prevention, Pour point, Flash point and Fire point, Types of hydraulic fluids - Advantages and drawbacks of fluid power - Applications of fluid power – Fluid power components and symbols- Pascal's law: Multiplication of Force - Analysis of simple hydraulic jack - Applications of Pascal's law: Hand operated hydraulic jack, Air to Hydraulic Pressure Booster [09]

Hydraulic Pumps, Actuator and Valves

Pumps Pumping theory - Pump classification - working principle of Gear pump, Vane pump, Screw pump - Hydraulic Actuators: Hydraulic motors – gear and vane motors, Hydraulic cylinders: single acting and double acting cylinders, Special type cylinders: rodless, tandem and telescopic - Hydraulic valves: Pressure Control Valve types, Direction control valve types, Flow control valve types, Counter balance valve. [09]

Pneumatic System

Properties of air-Compressors: Rotary compressor - Screw compressor, vane compressor - Piston Compressor: Single and Multi-Stage Compressor - Filter, Regulator and Lubricator Unit - Valves: Direction control valves, Two way, Three way, Four way valves - Pneumatic check valves - Flow control valve, Pneumatic shuttle valve - AND type valve - Quick exhaust valve. [09]

Design of Hydraulic and Pneumatic Circuits

Construction of Hydraulic circuits - Fail safe circuit - Regenerative circuit - pressure intensifier circuits - Accumulator circuits. Construction of Pneumatic circuits: Cascade method - sequence circuit. Electro - pneumatic circuit – IoT based solenoid valve. [09]

Industrial Automation

Fluid power circuit for hydraulic braking system-Fluid power circuit for robot arm for pick and placePneumatic automation for Industry 4.0-Hydraulic system for Industry 4.0- Trouble shooting of Fluid power system [09]

Hands on Session:

1. Assembling of hydraulic components for basic Hydraulic circuit.
2. Assembling of pneumatic components for basic Pneumatic circuit.
3. Assembling of pneumatic components for Meter in & Meter out circuit
4. Assembling of pneumatic components for Synchronizing circuit.
5. IoT based pneumatic circuit

Total Hours: 75

Text book(s) :

1	Anthony Esposito, "Fluid Power with Applications", Pearson Education New Delhi, 2015.
2.	Srinivasan R ,"Hydraulic and Pneumatic Controls",2nd Edition', Vijay Nicole Imprint (P) Ltd., Chennai, 2016.

Reference(s) :

1	S. R. Majumdar, "Oil Hydraulics", Tata McGraw Hill Publishing Company Pvt Ltd. New Delhi, 2014.
2	S. R. Majumdar, "Pneumatic systems - Principles and Maintenance", Tata McGraw HillPublishing Company Pvt Ltd. New Delhi, 2014.
3	Andrew Parr, Hydraulics and Pneumatics, Jaico Publishing House, 2015.
4	James L. Johnson, "Introduction to Fluid Power", Delmar Thomson Learning, 2013.

SDG No.9

Course Contents and Lecture Schedule

S. No.	Topic	No.of Hours
1.0	**Fluid Power System**	
1.1	Introduction to fluid power	1
1.2	Properties of fluids: Viscosity index, Oxidation index, Demulsibility, Lubricity, Rust prevention, Pour point, Flash point and Fire point, Types of hydraulic fluids	2
1.3	Advantages and drawbacks of fluid power - Applications of fluid power	1
1.4	Fluid power components and symbols	2
1.5	Pascal's law: Multiplication of Force	1
1.6	Analysis of simple hydraulic jack	1
1.7	Applications of Pascal's law: Hand operated hydraulic jack, Air to Hydraulic Pressure Booster	1
2.0	**Hydraulic Pumps, Actuator and Valves**	
2.1	Pumps Pumping theory	1
2.2	Pump classification - working principle of Gear pump, Vane pump, Screw pump	1
2.3	Hydraulic Actuators: Hydraulic motors	1
2.4	Gear and vane motors, Hydraulic cylinders: single acting and double acting cylinders	1
2.5	Special type cylinders: rodless, tandem and telescopic	1
2.6	Hydraulic valves: Pressure Control Valve types	1
2.7	Direction control valve types	1
2.8	Flow control valve types	1
2.9	Counter balance valve	1
3.0	**Pneumatic System**	
3.1	Properties of air-Compressors: Rotary compressor	1
3.2	Screw compressor, vane compressor	1
3.3	Piston Compressor: Single and Multi-Stage Compressor	1
3.4	Filter, Regulator and Lubricator Unit	1
3.5	Valves: Direction control valves, Two way, Three way, Four way valves	1
3.6	Pneumatic check valves.	1
3.7	Flow control valve	1
3.8	Pneumatic shuttle valve - AND type valve	1
3.9	Quick exhaust valve	1
4.0	**Design of Hydraulic and Pneumatic Circuits**	
4.1	Construction of Hydraulic circuits	2
4.2	Fail safe circuit - Regenerative circuit	2
4.3	Pressure intensifier circuits - Accumulator circuits	2
4.4	Construction of Pneumatic circuits: Cascade method	1
4.5	Sequence circuit. Electro	1
4.6	Pneumatic circuit – IoT based solenoid valve.	1
5.0	**Industrial Automation**	
5.1	Fluid power circuit for hydraulic braking system	1
5.2	Fluid power circuit for robot arm for pick and place	2
5.3	Pneumatic automation for Industry 4.0	2
5.4	Hydraulic system for Industry 4.0	2
5.5	Trouble shooting of Fluid power system	2

Course Designers

Dr.R.Senthilmurugan

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 405	Virtual Instrumentation and Applications	Category	L	T	P	Credit
		PC	2	0	2	3

Objective

- To understand the fundamentals of virtual instrumentation and basic concept of graphical programming with their functions in LabVIEW.
- To impart the fundamental knowledge on the software tools in virtual instrumentation.
- To develop programming through LabVIEW graphical programming environment.
- To know about the data acquisition and various types Interfaces used in VI.
- To familiarize students with various applications of VI.

Prerequisite

Sensors and Instrumentation

Course Outcomes

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

CO1	Understand the basic concepts about virtual instrumentation.	Remember, Understand and Apply
CO2	Interpret the software tools in virtual instrumentation	Analyze
CO3	Develop programming through LabVIEW graphical programming environment.	Understand
CO4	Describe the functions and the interface requirements in Data acquisition system.	Analyze
CO5	Understand the different applications and advanced concept of VI.	Remember

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	3			2					3	3
CO2	3	3	2	2	3	2			2				3	3
CO3	3	3	2	2	3	2				3			3	3
CO4	3	3	2	2	3		2				3	3	3	3
CO5	3	3	1	3	3						3	2	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	10	15	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	10	10	0
Create	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 405 - Virtual Instrumentation and Applications								
MCT								
Semester	Hours/Week			Total Hrs.	Credit	Maximum		
	L	T	P		C	CA	ES	Total
IV	2	0	2	60	3	50	50	100

Introduction to VI Historical perspective and Traditional bench-top instruments–General functional description of a digital instrument – Block diagram of a Virtual Instrument – Physical quantities and analog interfaces – Hardware and Software–Advantages of Virtual Instruments over conventional instruments– Architecture of a Virtual Instrument and its relation to the operating system.	[09]
VI Software Tools Graphical User Interfaces–Controls and Indicators–Modular programming–Data types–Data flow programming–Editing, Debugging and Running a Virtual Instrument–Graphical programming palettes and tools–Function and Libraries–VI and sub-VI, Structures: FOR Loops, WHILE loops, Shift Registers, CASE structure, Formula nodes, Sequence structures, Timed looped structures.	[09]
VI Programming Techniques Arrays and Clusters: Array operation – Bundle/Unbundle and Bundle/Unbundle by name – Plotting data: graphs and charts – String and File I/O: High level and Low level file I/O's – Attribute nodes – Local and globalvariables.	[09]
Data Acquisition and Interface System Introduction to data acquisition on PC, Sampling fundamentals. Concepts of Data Acquisition and terminology –Installing Hardware and drivers – Configuring and addressing the hardware – Digital and Analog I/O function –Real time Data Acquisition – USB based DAQ. Common Instrument Interfaces: Current loop – RS 232C – RS 485 and Bus Interfaces.	[09]
VI Applications Advantages and Applications–Advanced concepts–TCP / IP– PXI –Instrument Control–Image acquisition – Motion Control – Signal processing – Signal analysis: Power spectral analysis – Control design and simulation. **Hands on Sessions:** 1. Debugging a VI, sub VI's using LabVIEW. 2. Programming structure, arrays, clusters, and File I/O using LabVIEW. 3. Control of temperature using data acquisition card. 4. Model and simulate a LED interface unit using DAQ	[09]
Total Hours	60

Text Book(s):

1.	Jeffrey Travis, Jim Kring, "LabVIEW for Everyone: Graphical Programming Made Easy and Fun" (3rd Edition), Prentice Hall, 2022.
2	Sanjay Gupta,"Virtual instrumentation using LabVIEW : principles and practices of graphical programming",TMH,2017.

Reference(s):

1.	Jovitha Jerome, "Virtual Instrumentation using LabView", PHI Learning Pvt. Ltd, New Delhi, 2010
2.	Gary W. Johnson, Richard Jennings, "Lab-view Graphical Programming", McGraw Hill Professional Publishing, 2011.
3.	LabVIEW user manual, National Instruments,1998.
4.	Kevin James, "PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control", Newness, 2010.

SDG No.7, 8, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**Introduction to VI**	**09**
1.1	Historical perspective and traditional bench	1
1.2	Top instruments	1
1.3	General functional description of a digital instrument	2
1.4	Block diagram of a Virtual Instrument	1
1.5	Physical quantities and analog interfaces	1
1.6	Hardware and Software	1
1.7	Advantages of Virtual Instruments over conventional instrument	1
1.8	ArchitectureofaVirtualInstrumentanditsrelationtotheoperatingsystem	1
2	**VI Software Tools**	**09**
2.1	Graphical user interfaces	1
2.2	Controls and Indicators	1
2.3	Modular programming, Data types	1
2.4	Data flow programming ,Editing	1
2.5	Debugging and Running a Virtual Instrument	1
2.6	Graphical programming palettes and tools	1
2.7	Function and Libraries–VI and sub VI	1
2.8	Structures: FOR Loops ,WHILE loops ,Shift Registers	1
2.9	CASE structure ,Formula nodes ,Sequence structures, Timed looped structures.	1
3	**VI Programming Techniques**	**09**
3.1	Arrays and Clusters: Array operation	1
3.2	Bundle/Unbundle and Bundle/Unbundle by name	2
3.3	Plotting data: graphs and charts	1
3.4	String and File I/O: High level and Low level file I/O‘s	1
3.5	Local and global variables.	2
3.6	Debugging a VI, sub VI’s using LabVIEW- HANDS ON	1
3.7	Programming structure, arrays, clusters, and File I/O using LabVIEW- HANDS ON	1
4	**Data Acquisition and Interface System**	**09**
4.1	Introduction to data acquisition on PC, Sampling fundamentals	1
4.2	Concepts of Data Acquisition and terminology	1
4.3	Installing Hardware and drivers	1
4.4	Configuring and addressing the hardware	1
4.5	Digital and Analog I/O function	1
4.6	Real time Data Acquisition	1
4.7	USB based DAQ.	1
4.8	Common Instrument Interfaces: Current loop, RS 232C- RS485andBusInterfaces.	1
4.9	Control of temperature using Data Acquisition Card. - HANDS ON	1
5	**VI Applications**	**09**
5.1	Advantages and Applications	1
5.2	Advanced concepts	1
5.3	TCP/IP , PXI	1
5.4	Instrument Control	1
5.5	Image acquisition	1
5.6	Motion Control, Signal processing	1
5.7	Signal analysis, Power spectral analysis	1
5.8	Control design and simulation	1
5.9	Model and simulate a LED interface unit using DAQ- HANDS ON	1
	Total	45

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 4P1	Industrial Drives and Control Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To acquire knowledge about speed control of DC drives.
- To determine the performance characteristics of the given DC drives.
- To provide the knowledge about speed control of AC drives.
- To determine the performance characteristics of the given AC drives.
- To acquire the knowledge of solid state speed control of AC & DC drives.

Prerequisite

Basic Electrical and Electronics Engineering

Course Outcomes

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

CO1	Test the performance of DC motors under different load condition	Remember, Understand
CO2	Test the performance of induction motors under different load conditions.	Remember, Understand
CO3	Understand the performance of conventional speed control systems for DC motors	Understand
CO4	Design power electronics based speed control systems for DC drives.	Apply
CO5	Design power electronics based speed control systems for Induction motor drives	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2				3				1	1	1	1	3	3
CO2	2	3	2		1			1	3	2		1	3	3
CO3	2	2	1		2			1	2	2	1	1	3	3
CO4	2	3	2	2	2			2		2	1	1	3	3
CO5	2	3		2	2						1	1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	10	30
Understand	30	20	40
Apply	20	30	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

List of Experiments

1. Load characteristics of DC shunt motor and compound motor.
2. Load characteristics of DC series motor.
3. Load test on three-phase squirrel cage induction motor.
4. Load test on three-phase slip ring induction motor.
5. Load test on single phase induction motor.
6. Speed control of DC shunt motor.
7. Speed control of DC shunt motor using controlled rectifier.
8. Speed control of DC shunt motor using chopper.
9. Speed control of three–phase induction motor by V/F method.
10. Speed control of three phase induction motor (Voltage control)

SDG No. 8, 9

60 MC 4P2	Applied Mechanics Laboratory

Category	L	T	P	Credit
PC	0	0	4	2

Objective

- To study the mechanical properties of metals under tension, hardness, torsion, and impact by testing in laboratory.
- To study on the deflection of open and closed coil springs.
- To facilitate the experimental knowledge about coefficient of discharge using orifice meter.
- To emphasize the concept of fluid mechanics and machinery theory to determine friction factor.
- To analyse the performance characteristics of pumps and turbines.

Prerequisite

Strength of Materials, Fluid Mechanics

Course Outcomes

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

CO1	Determine the tensile, hardness, torsion and impact properties of metals.	Apply
CO2	Determine the stiffness of open and closed springs.	Apply
CO3	Estimate the coefficient of discharge using orifice meter	Analyse
CO4	Apply the fluid mechanics and machinery theory to determine the friction factor for various pipes.	Analyse
CO5	Determine the performance characteristics of pumps and turbines.	Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2				2	3		2	2		2	3	3
CO2	3	2				2	3		2	2		2	3	3
CO3	3	2				2	3		2	2		2	3	3
CO4	3	2				2	3		2	2		2	3	3
CO5	3	2				2	3		2	2		2	3	3
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 4P2 - Applied Mechanics Laboratory								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	4	60	2	40	60	100

List of Experiments

1. Determination of tensile behavior of metals.
2. Determination of Hardness of material (Rockwell and Brinell Hardness)
3. Determination of impact strength of metals using Charpy and Izod testers.
4. Determination of torsional strength on given material.
5. Determination of tension and compressive behavior of helical springs.
6. Determination of coefficient of discharge of orifice meter.
7. Determination of friction factor for a set of pipes.
8. Determination of Pelton wheel performance under various interval loads.
9. Determination of Kaplan turbine performance under various interval loads.
10. Determination of centrifugal pump performance under various interval loads.

Total Hours	60

SDG No.9

Course Designers

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60 CG 0P3	CAREER SKILL DEVELOPMENT III

Category	L	T	P	Credit
CG	0	0	2	1*

Objective

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

Prerequisite

Basic knowledge of Arithmetic and Logical Reasoning

Course Outcomes

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

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

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	3		3				2	3	3	1	
CO2	3	3	3	3		2				2	3	3	2	2
CO3	2	2	2	2		3				2	3	3		1
CO4	3	3	3	3		2				2	3	3	2	2
CO5	3	3	3	3		2				2	3	3	3	3
3- Strong;2-Medium;1-Some														

K.S.Rangasamy College of Technology – Autonomous								R2022
Career Skill Development III								
Common to All Branches								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	0	0	2	25	1*	100	00	100

Logical Reasoning Analogies - Alpha and numeric series - Number Series - Coding and Decoding - Blood Relations - Coded Relations - Order and Ranking – odd man out - Direction and distance	**[5]**
Quantitative Aptitude – Part 1 Number system - Squares & cubes - Divisibility - Unit digits - Remainder Theorem - HCF & LCM - Geometric and Arithmetic progression - Surds & indices	**[5]**
Critical Reasoning Syllogism - Statements and Conclusions, Cause and Effect, Statements and Assumptions - identifying Strong Arguments and Weak Arguments – Cause and Action -Data sufficiency	**[5]**
Quantitative Aptitude – Part 2 Average - Ratio and proportion – Ages – Partnership– Percentage - Profit & loss – Discount - Mixture and Allegation	**[5]**
Quantitative Aptitude – Part 3 Time & Work - Pipes and cistern – Time, Speed & distance - Trains - Boats and Streams - Simple interest and Compound interest	**[5]**
Total Hours	**25**

Reference(s):

1.	Aggarwal, R.S. 'A Modern Approach to Verbal and Non-verbal Reasoning', Revised Edition 2008, Reprint 2009, S.Chand & Co Ltd., New Delhi.
2.	Abhijit Guha, 'Quantitative Aptitude', McGraw Hill Education, 6th edition, 2016
3.	Dinesh Khattar, 'Quantitative Aptitude For Competitive Examinations', Pearson Education 2020
4.	Anne Thomson, 'Critical Reasoning: A Practical Introduction' Lexicon Books, 3rd edition, 2022. Warszaw

SDG 4 – Quality Education
SDG 8 – Decent work and Economic growth
SDG 9 – Industry, innovation and Infrastructure

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours	Mode of content Delivery
1	**Logical Reasoning**		
1.1	Analogies - Alpha and numeric series	1	Chalk & Board
1.2	Number Series - Coding and Decoding	1	Chalk & Board
1.3	Blood Relations - Coded Relations	1	Chalk & Board
1.4	Order and Ranking – odd man out	1	Chalk & Board
1.5	Direction and distance	1	Chalk & Board
2	**Quantitative Aptitude – Part 1**		
2.1	Number system	1	Chalk & Board
2.2	Squares & cubes - Divisibility	1	Chalk & Board
2.3	Unit digits - Remainder Theorem	1	Chalk & Board
2.4	HCF & LCM- Geometric and Arithmetic progression	1	Chalk & Board
2.5	Surds & indices	1	Chalk & Board
3	**Critical Reasoning**		
3.1	Syllogism	1	Chalk & Board
3.2	Statements and Conclusions, Cause and Effect	1	Chalk & Board
3.3	Statements and Assumptions	1	Chalk & Board
3.4	identifying Strong Arguments and Weak Arguments	1	Chalk & Board
3.5	Cause and Action -Data sufficiency	1	Chalk & Board
4	**Quantitative Aptitude – Part 2**		
4.1	Average - Ratio and proportion	1	Chalk & Board
4.2	Ages – Partnership	1	Chalk & Board
4.3	Percentage	1	Chalk & Board
4.4	Profit & loss	1	Chalk & Board
4.5	Discount - Mixture and Allegation	1	Chalk & Board
5	**Quantitative Aptitude – Part 3**		
5.1	Time & Work	1	Chalk & Board
5.2	Pipes and cistern	1	Chalk & Board
5.3	Time, Speed & distance - Trains	1	Chalk & Board
5.4	Boats and Streams	1	Chalk & Board
5.5	Simple interest and Compound interest	1	Chalk & Board
	Total	**25**	

Course Designer

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

(An Autonomous Institution affiliated to Anna University)

B.E. / B.Tech. Degree Programme

SCHEME OF EXAMINATIONS

(For the candidates admitted from 2022 –2023 onwards)

FIFTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MC 501	Microprocessors and Microcontrollers	2	40	60	100	45	100
2	60 MC 502	System Design and Control	2	40	60	100	45	100
3	60 MC 503	Kinematics and Dynamics of Machines	2	40	60	100	45	100
4	60 HS 003	Total Quality Management	2	40	60	100	45	100
5	60 MY 003	Start-ups and Entrepreneurship	2	100	0	100	0	100
6	60 MC E1*	Elective-I	2	40	60	100	45	100
7	60 MC L0*	Open Elective-II	2	40	60	100	45	100
PRACTICAL								
8	60 MC 5P1	Microprocessors and Microcontrollers Laboratory	3	60	40	100	45	100
9	60 MC 5P2	Metrology and Dynamics Laboratory	3	60	40	100	45	100
10	60 CG 0P4	Career Skill Development-IV	3	100	-	100	-	-
11	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests. This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

60 MC 501	Microprocessor and Microcontrollers	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To understand the concept of 8086 Microprocessor.
- To study about the8086-instruction set and addressing mode.
- To understand the concept of I/O Interfacing
- To understand the concept of 8051 microcontroller.
- To study about interfacing microcontroller

.

Prerequisite

NIL

Course Outcomes

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

CO1	Learn the architecture and pin configuration of 8086 Microprocessor	Remember, Understand and Apply
CO2	Write assembly language programs using 8086 microprocessor	Remember, Understand and Apply
CO3	Interface 8086 Microprocessors with peripheral devices	Remember, Understand and Analyse
CO4	Learn the architecture and pin configuration of 8051 Microcontroller.	Understand and Apply
CO5	Interface 8051 Microcontroller with peripheral devices	Understand and Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3								2	2	2	2
CO2								3			2	2	2	2
CO3	3	3	2	3		2			3	3	2	2	3	2
CO4	2	2		2	3		2	2			2	3	3	2
CO5	2	2	2	3	2						3	3	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 501- Microprocessor and Microcontrollers								
MCT								
	Hours/Week				Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

8085 Microprocessor: Microprocessor architecture and its operations- Memory, Input & output devices-The 8085 MPU- architecture, Pins and signals-Timing Diagrams- Logic devices for interfacing- Memory interfacing- Interfacing output displays- Interfacing input devices- Memory mapped I/O	**[09]**
8085 Instructions Set and Addressing Mode: Addressing modes – Instruction set and assembler- Flow chart symbols-Data Transfer operations- Arithmetic Operations-Logic Operations- Branch operation- Writing assembly language programs- Programming techniques: looping- counting and indexing- Additional data transfer and 16-bit arithmetic instruction-Logic operation: rotate, Compare operations – 8085 Interrupts-Assembly Language Programming examples.	**[09]**
16-bit Microprocessors (8086): Architecture- Pin Description- Physical address- segmentation-- memory organization-Addressing modes- Peripheral Devices- 8237 DMA Controller- 8255 programmable peripheral interface-8253/8254 programmable timer/counter- 8259 programmable interrupt controller- 8251 USART	**[09]**
8051 Microcontrollers: Architecture of 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – 8051 Real Time Control: Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters	**[09]**
Peripheral Interfacing and Applications: Programming Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface- Stepper Motor and Waveform generation. Assembly language program using 8051 and 8085 for Mechatronics Application and control.	**[09]**
Total Hours	45

Text Book(s):

1.	A.P.Godse, Jairaj Solankeand D.A.Godse, “Microprocessors and Microcontrollers”, Technical Publications, 2023
2	Yu-Cheng Liu, Glenn A. Gibson, “Microcomputer Systems: The 8086 / 8088 Family – Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2019

Reference(s):

1.	Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin Mc Kinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2019.
2.	Doughlas V.Hall, —Microprocessors and Interfacing, Programming and Hardware, TMH, 2019.
3.	A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata Mc GrawHill, 2019.
4.	Microprocessors and Microcontrollers 8085, 8086 and 8051 – Hardcover, Ganguly, Amar K.; Ganguly, Anuva, Alpha Science 2022

SDG No. 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**8086 MICROPROCESSOR**	
1.1	Introduction to 8086	1
1.2	Architecture	1
1.3	Pin Description	1
1.4	External memory interfacing	1
1.5	**B**us cycle, some important companion chips	1
1.6	Maximum mode bus cycle, memory interfacing	1
1.7	Minimum mode System configuration	1
1.8	Maximum mode system configuration	1
1.9	Interrupts processing,8086 Numeric data processor	1
2	**8086INSTRUCTION SET AND ADDRESSING MODE**	
2.1	Addressing modes, Instruction set and assembler directives	1
2.2	Assembly language programming using MASM	1
2.3	Modular Programming, Linking and Relocation	1
2.4	Stacks, Procedures, Macros, Byte and String Manipulation	1
2.5	Assembly language program using 8086 MASM software and 8086 microprocessor kit Addition	1
2.6	Subtraction, multiplication, division	1
2.7	Sorting, searching, string manipulation	1
2.8	Code conversion, matrix operation	2
3	**I/O INTERFACING**	
3.1	I/O interfacing, Parallel communication interface	1
3.2	Keyboard /display controller	2
3.3	Timer, D/A and A/D Interface, Serial communication interface	1
3.4	Interrupt controller, DMA controller	1
3.5	Programming and applications Case studies, Traffic Light control, LED display	2
3.6	Keyboard display interface and Alarm Controller, Assembly language program using 8086 kit	1
3.7	For interfacing with 8255, 8253, ADC and DAC,8251.	1
4	**8051 MICROCONTROLLER**	
4.1	Architecture of 8051	1
4.2	Special Function Registers(SFRs)	1
4.3	I/O Pins Ports and Circuits	1
4.4	Instruction set	1
4.5	Addressing modes	2
4.6	Assembly language programming	1
4.7	Assembly language program using 8051 kit addition	1
4.8	Subtraction, Multiplication and Division operations.	1
5	**INTERFACING MICROCONTROLLER**	
5.1	Programming 8051 Timers	1
5.2	Serial Port Programming	1
5.3	Interrupts Programming	1
5.4	LCD & Keyboard Interfacing, ADC, DAC & Sensor Interfacing	1
5.5	External Memory Interface	1
5.6	Stepper Motor and Waveform generation	2
5.7	Assembly language program using 8051 for Robotic Arm control	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	MPMC:https://onlinecourses.nptel.ac.in/noc24_ee46/preview

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 502	SYSTEM DESIGN AND CONTROL

Category	L	T	P	Credit
PC	3	1	0	4

Objective

- To describe feedback control and basic components of control systems
- To understand the various time domain and frequency domain tools for analysis and designof linear control systems.
- To study the methods to analyze the stability of systems from transfer function forms.
- To describe the methods of designing compensators
- To understand the concept of state space analysis

Course Outcomes

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

CO1	Understand the open loop and closed loop control system and able to design developmathematical model, Translations and Rotational systems transfer function	Remember, Understan and Apply
CO2	Learn about time domain specifications and about various types of test input.	Remember, Understan and Apply
CO3	Learn about frequency domain specifications and design and develop different frequencyresponse plots	Remember, Understan and Apply
CO4	Understand the concept of stability and knowledge about Root locus, Routh Hurwitz Criterion	Remember, Understan and Apply
CO5	Design Lag, Lead, Lag-lead network and knowledge about State space Analysis.	Understand and Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	1	1	1	2	1	2	1	2	3	2
CO2	3	3	3	3	1	1	1	2	1	2	1	2	3	2
CO3	3	3	3	2	1	1	1	2	1	2	1	2	3	2
CO4	3	3	3	3	1	1	1	2	1	2	1	2	3	3
CO5	3	3	3	3	1	2	1	2	1	2	1	3	3	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	15	15	30
Understand	20	20	40
Apply	15	15	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 502 - System Design and Control								
MCT								
Semester	**Hours / Week**			**Total Hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	40	60	100

Systems and Their Representation Introduction to Control System: Open and Closed Loop Systems- Examples Residential Heating System, Automobile Drive System, and Temperature Control System. Transfer function: Mathematical Model- Mechanical Model- Translational & Rotational Systems, Electrical Model, Block Diagram Reduction Techniques-Signal flowGraph using Manson's Gain Rule –Related problems.	**[09]**
Time Response Analysis Introduction – The Performance Specifications: Transient Response-Rise time, Peak time, Peak Overshoot, Settling time, Measure of performance of the Standard Second Order System -Steady State Response-Steady State Error Constants and System Type Numbers. Types of Test Inputs: Step, Ramp, Parabolic, Impulse -First and Second Order System Response. Feed Back Control System Characteristics: - Proportional, Integral, Derivative, PID Modes of Feedback Control.	**[09]**
Frequency Response Analysis Introduction –The Performance Specifications in Frequency Domain- The Bode Plots – The Polar Plots– NicholsChart-Determination of closed loop response from Open loop response.	**[09]**
Stability of Control Systems Introduction-Characteristic Equation, Location of Roots in S-plane for Stability. Stability Criterion: Bounded input Bounded output Stability, Zero input Stability, Routh Hurwitz Criterion. Root locus construction: Root locus Concept, Guidelines for Sketching Root Loci, Selected illustrative Root Loci- Gain Margin and Phase Margin. Nyquist Stability Criterion.	**[09]**
Compensator Design and State Space Analysis Performance criteria - Lag, Lead and Lag-lead networks-Compensator design using Bode Plot, Introduction to state space analysis-Simulation of First order system.	**[09]**
Total Hours	60

Text Book(s):	
1.	I.J Nagrath and M.Gopal "Control System Engineering", New Age international publisher, New Delhi,2020
2.	Katsuhiko Ogata, "Modern Control Engineering", 5th Edition, Pearson Education, New Delhi, 2019
Reference(s):	
1.	M.N. Bandyopadhyay, "Control Engineering Theory and Practice", Prentice Hall of India, 2018.
2.	Chesmond C.J. "Basic Control System Technology", Viva Low Priced Student Edition, 2016
3.	Leonard N.E. and William Levine, "Using MATLAB to Analyze and Design Control Systems"
4.	Gopal M. "Control System Principles and Design", 5th Edition ,Tata McGraw-Hill, New Delhi,2020

SDG No. 9

Course Contents and Lecture Schedule

S. No	Systems and Their Representation	No. of Hours
1	Introduction to Control System: Open and Closed loop Systems Examples	2
1.1	Residential Heating System, Automobile Drive System, and Temperature Control System	1
1.2	Transfer function: Mathematical Model, Mechanical Model	2
1.3	Translational & Rotational Systems, Electrical Model, Block Diagram Reduction Techniques Signal flowGraph using Manson's Gain Rule	2
1.4	Signal flowGraph using Manson's Gain Rule	1
1.5	Simple problems.	1
	Time Response Analysis	
2.1	Introduction, The Performance Specifications: Transient Response, Rise time, Peak time, Peak Overshoot, Settling time, Measure of performance of the Standard Second Order System	2
2.2	Steady State Response	1
2.3	Steady State Error Constants and System Type Numbers.	2
2.4	Types of Test Inputs: Step, Ramp, Parabolic, Impulse -First and Second Order System Response.	1
2.5	Feed Back Control System Characteristics: - Proportional, Integral, Derivative, PID Modes of Feedback Control.	
	Frequency Response Analysis	
3.1	Introduction	2
3.2	The Performance Specifications in Frequency Domain	1
3.3	The Bode Plot	2
3.4	The Polar Plot	1
3.5	NicholsChart	2
3.6	Determination of closed loop response from open loop response	1
	Stability of Control Systems	
4.1	Introduction-Characteristic Equation, Location of Roots in S-plane for Stability.	2
4.2	Stability Criterion: Bounded inputBounded output Stability, Zero input Stability, Routh Hurwitz Criterion.	2
4.3	Root locus construction: Root locus Concept	1
4.4	Guidelines for Sketching Root Loci, Selected illustrative Root Loci-Gain Margin and Phase Margin.	2
4.5	Nyquist Stability Criterion	2
	Compensator Design and State space Analysis	
5.1	Performance criteria - Lag, Lead and Lag-Lead	1
5.2	Compensator design using Bode Plot- Lag and Lead Network	2
5.3	Compensator design using Bode Plot-Lag-Lead Network	1
5.4	Introduction to state space analysis	2
5.5	Simulation of First order system	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	https://archive.nptel.ac.in/courses/107/106/107106081/

Course Designers

Dr.M.Ravii@ksrct.ac.in

60 MC 503	Kinematics & Dynamics of Machines	Category	L	T	P	Credit
		PC	3	1	0	4

Objective

- To learn various mechanisms and find their velocity and acceleration.
- To compute the velocity and acceleration for simple mechanisms and able to construct cam profile.
- To determine gear ratio for simple, compound, reverted and epi cyclic gear train.
- To understand the function of flywheel and to determine basic parameters of flywheel
- To perform vibration analysis and balancing of engines.

Pre-requisite

Engineering Mechanics

Course Outcomes

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

CO1	Create simple mechanisms based on the degrees of freedom	Remember, Understand
CO2	Design and analyze the velocity and acceleration of different mechanisms. the cam profile	Analyze
CO3	Solve and evaluate the kinematic aspects of gears and gear trains	Apply
CO4	Plot the turning moment diagram of crank rotation at various strokes and the process of providing continuous energy to the system	Analyze
CO5	analyze different types of vibrations and understanding of balancing of single and several masses in same or different planes	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3								2	2	3
CO2	3	3	3	3	3							2	3	2
CO3	3	3	3	3								2	2	2
CO4	3	3	3	3								2	2	3
CO5	3	3	3	3								2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 MC 503- Kinematics & Dynamics of Machines								
MCT								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	1	0	60	4	40	60	100

Simple Mechanism Introduction- Kinematic links, structure- comparison between machine and structure, joints, Kinematic pairs- classification- types of constrained motion. Kinematic chain-classification- degrees of freedom – Kutzbach criterion, Gruebler's criterion – Grashof's law - Mechanism - Inversions of four bar and slider crank chain – Mechanical advantage – Description of common mechanisms: Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.	**[9+3]**
Kinematic Analysis of Linkages and CAM Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method of velocity and acceleration diagram for four bar and slider crank chain - cam – Classification of cams and follower – radial cam nomenclature – analysis of follower motion - uniform velocity, simple harmonic motion, uniform acceleration & retardation and cycloidal motion – Construction of cam profile for a radial cam- Introduction to kinematic analysis software packages.	**[9+3]**
Gears and Gear Trains Gear tooth profiles - gear tooth action - Interference and undercutting - requirement of minimum number of teeth in gears - Gear trains - Simple and compound gear trains -Determination of speed and torque in epicyclic gear trains.	**[9+3]**
Turning Moments and Flywheels Introduction, turning moment diagram for a single cylinder double acting steam engine-Turning moment diagram for a four stroke internal combustion engine- Fluctuation of energy- determination of maximum fluctuation energy- co-efficient of fluctuation of energy-Flywheel: co-efficient of fluctuation of speed-energy stored in a flywheel- Dimensions of the flywheel rim- Introduction to governors and gyroscope.	**[9+3]**
Vibration and Balancing Free, forced and damped vibrations of single degree of freedom systems, Critical speed of shaft - logarithmic decrement – Force transmitted to supports. Static and dynamic balancing - balancing of revolving masses, single and multi-cylinder engines. Reciprocating masses - single cylinder engines.	**[9+3]**
Total Hours	60

Text Book(s):

1. R. S Khurmi and JK Gupta , "Theory of Machines", S.Chand and Company Ltd., New Delhi.2020.
2. Rattan S.S, "Theory of Machines", 4th Edition, Tata McGraw Hill Publishing Company, New Delhi, 2019.

Reference(s):

1. Ballaney P. L, "Theory of Machines", Khanna Publishers, New Delhi, 2005.
2. Rao J.S. and Dukkipati R.V., "Mechanism and Machine Theory", Bohem press, 2007
3. Sadhu Singh "Theory of Machines", Pearson Education, 2012.
4. John Joseph Uicker, G. R. Pennock, Joseph Edward Shigley "Theory of Machines and Mechanisms", Oxford University Press, 2017.

SDG No. 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	Simple Mechanism	
1.2	Introduction- Kinematic links, structure- comparison between machine and structure, joints	1
1.3	Kinematic pairs- classification	1
1.4	Types of constrained motion. Kinematic chain-classification	2
1.5	Degrees of freedom – Kutzbach criterion,	2
1.6	Gruebler's criterion – Grashof's law	1
1.7	Mechanism - Inversions of four bar and slider crank chain – Mechanical advantage	2
1.8	Description of common mechanisms	1
1.9	Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms	2
2	Kinematic Analysis of Linkages and CAM	
2.1	Displacement, velocity and acceleration analysis of simple mechanisms	1
2.2	Graphical method of velocity and acceleration diagram for four bar and slider crank chain.	2
2.3	CAM – Classification of cams and follower	1
2.4	Radial cam nomenclature – analysis of follower motion	1
2.5	Uniform velocity, simple harmonic motion	2
2.6	Uniform acceleration & retardation	2
2.7	Cycloidal motion	1
2.8	Construction of cam profile for a radial cam	2
2.9	Introduction to kinematic analysis software packages	1
3	Gears and Gear Trains	
3.1	Gear tooth profiles	1
3.2	Gear tooth action	2
3.3	Interference and undercutting	2
3.4	Requirement of minimum number of teeth in gears	2
3.5	Gear trains	1
3.6	Simple and compound gear trains	2
3.7	Determination of speed and torque in epicyclic gear trains	2
4	Turning Moments and Flywheels	
4.1	Introduction	1
4.2	Turning moment diagram for a single cylinder double acting steam engine	1
4.3	Turning moment diagram for a four stroke internal combustion engine	2
4.4	Fluctuation of energy- determination of maximum fluctuation energy	1
4.5	Co-efficient of fluctuation of energy-	1
4.6	Flywheel: co-efficient of fluctuation of speed	2
4.7	Energy stored in a flywheel- Dimensions of the flywheel rim	2
4.8	Introduction to governors and gyroscope	2
5	Vibration and Balancing	
5.1	Free, forced and damped vibrations of single degree of freedom systems	2
5.2	Critical speed of shaft	1
5.3	Logarithmic decrement Force transmitted to supports	1
5.4	Static and dynamic balancing	2
5.5	Balancing of revolving masses masses	2
5.6	single and multi-cylinder engines.	2
5.7	Reciprocating masses - single cylinder engines	2
	Total	60

NPTEL Course Material

S.No.	Link
1.	https://www.youtube.com/watch?v=l8L6JQ GKQc&list=PL5KGb23FFL8eDGFRT7wK4cm6uwYwA7d04
2.	https://www.youtube.com/watch?v=TPlqvCg5xJ4&list=PLf-VAO7xqD8f1PdfkWG2tL56rAdBn2- 1

Course Designer

Dr.P.Mohanram - mohanram@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 HS 003	TOTAL QUALITY MANAGEMENT

Category	L	T	P	Credit
HS	3	0	0	3

Objective

- To facilitate the understanding of total quality management principles, tools and techniques.
- To equip the students to apply the TQM principles, tools and techniques in manufacturing sectors.
- To equip the students to apply the TQM principles, tools and techniques in service sectors
- To impart knowledge on quality management principles, tools, techniques and quality standards for real life applications
- To make the students understand the importance of standards in the quality assurance process and their impact on the final product

Course Outcomes

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

CO1	Recognize the need for quality concepts and its application in organizations	Remember
CO2	Apply the TQM principles for survival and growth in world class competition	Understand
CO3	Apply the traditional tools and new tools for quality improvement.	Understand
CO4	Apply the tools and techniques like quality circle, QFD, TPM and FMEA for qualityimprovement.	Apply
CO5	Apply QMS and EMS in organizations	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2			2	3	3	3	3	3		3		
CO2	3	2			2	3	3	3	3	3		3		
CO3		3				2	2			3				
CO4		3			3	2	2	3	2			3		
CO5	3				3	3		3	2	2				
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)		End Sem Examination(Marks)
	1	2	
Remember (Re)	10	10	20
Understand (Un)	20	20	40
Apply (Ap)	30	30	40
Create (Cr)	0	0	0

K.S.Rangasamy College of Technology – Autonomous								R2022
60 HS 003- Total Quality Management								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction to Fundamentals of Total Quality Management Introduction, definitions of quality, need for quality, evolution of quality, dimensions of quality, product quality and service quality; Basic concepts of TQM, TQM framework, contributions of Deming, Juran and Crosby. Barriers to TQM; Quality statements, customer focus, customer satisfaction, customer complaints, customer retention; costs to quality.	**[09]**
Total Quality Management Principles TQM principles; leadership, strategic quality planning; Quality councils- employee involvement, motivation; Empowerment; Team and Teamwork; Quality circles, recognition and reward, performance appraisal; continuous process improvement; PDSA cycle, Kaizen, 5S & 7S ; Supplier partnership, Partnering, Supplier rating and selection.	**[09]**
TQM Management Tools and Techniques The seven traditional tools of quality; New management tools - applications to manufacturing, service sector, Statistical Fundamentals, Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, control charts, process capability, concepts of six sigma, Bench marking - Reasons to benchmark, Benchmarking process.	**[09]**
TQM Process based Tools and Techniques Quality circles, Quality Function Development (QFD), Taguchi quality loss function; TPM- concepts, improvement needs, performance, measures. FMEA- stages, types-Design FMEA and Process FMEA.	**[09]**
Quality Management System Introduction-Benefits of ISO Registration-ISO 9000 Series of Standards-Sector-Specific Standards - AS 9100, TS16949 and TL 9000 - ISO 9001, ISO 9001:2008 Requirements-Implementation-Documentation-Internal Audits-Registration-Environmental Management System: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001-Benefits of EMS	**[09]**
Total Hours	**45**

Text Book(s):

1.	Dale H.Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc.2003. (Indian reprint 2020). ISBN 81- 297-0260-6.
2	Janakiraman, B and Gopal, R.K, “Total Quality Management – Text and Cases”, Prentice Hall (India) Pvt. Ltd. 2016.

Reference(s):

1.	James R. Evans, James Robert Evans, William M. Lindsay , “The Management and Control of Quality”, 8th Edition, South-Western, 2019.
2.	Joel.E. Ross, “Total Quality Management – Text and Cases”, 3rd Edition, Routledge, 2021.
3.	International 1996. 5. Zeiri. “Total Quality Management for Engineers”, Wood Head Publishers, 2019
4.	Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”,New Age 3rd Edition-2018

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Introduction to Fundamentals of Total Quality Management**	
1.1	Introduction and Definition of Quality	1
1.2	Need and evolution of quality	1
1.3	Different Dimensions of Quality	1
1.4	Basic concepts of TQM and TQM framework	1
1.5	Deming, Juran and Crosby Philosophy of quality Management	1
1.6	Barriers to TQM Implementation	1
1.7	Quality Statements, Strategic Planning	1
1.8	Customer focus, customer satisfaction customer retention Techniques	1
1.9	Techniques for Quality Costs	1
2	**Total Quality Management Principles**	
2.1	Total Quality Management Principles	1
2.2	Strategic of quality planning and Quality councils	1
2.3	Motivation, Empowerment, Teams, Recognition and Reward	1
2.4	Performance Appraisal, Benefits, Continuous Process Improvement	1
2.5	Juran Trilogy, PDSA Cycle Continuous Process Improvement	1
2.6	5S, Kaizen, Continuous Process and Supplier Partnership	1
2.7	Partnering, sourcing, Supplier Selection	1
2.8	Supplier Rating, Relationship Development,	1
2.9	Basic Concepts, Strategy, Performance Measure.	1
3	**TQM Management Tools and Techniques**	
3.1	The seven traditional management tools of quality	1
3.2	The New management tools	1
3.3	Management tools applications to manufacturing	1
3.4	Management tools applications to service sector	1
3.5	Statistical Fundamentals in management tools	1
3.6	Normal Curve, Control Charts for variables and attributes	1
3.7	Concepts of six sigma principles	1
3.8	Benchmarking tools and Reasons to benchmark	1
3.9	Benchmarking process tools	1
4	**TQM Process based Tools and Techniques**	
4.1	Quality circles	1
4.2	Quality Function Deployment (QFD	1
4.3	house of Quality, QFD Process	1
4.4	Benefits, Taguchi Quality Loss Function	1
4.5	Total Productive Maintenance (TPM	1
4.6	Concept, Improvement Needs	1
4.7	Performance measuring tools	1
4.8	stages, types of FMEA	1
4.9	Process implementation of FMEA	1

5	**Quality Management System (QMS)**	
5.1	Need for ISO 9000 and Other Quality Systems	1
5.2	Benefits of ISO Registration	1
5.3	Sector-Specific Standards in ISO 9001	1
5.4	AS 9100, TS16949 and TL 9000 - ISO 9001	1
5.5	Documentation and Internal Audits Requirements	1
5.6	Environmental Management System	1
5.7	ISO 14000 Series Standards	1
5.8	Concepts of ISO 14001Requirements	1
5.9	ISO 14001-Benefits of EMS	1
	Total	45

Course Designers

1. Dr.G.Mylsami - mylsamig@ksrct.ac.in

60 MY 003	STARTUPS AND ENTREPRENEURSHIP

Category	L	T	P	Credit
MY	2	0	0	-

Objective

- To provides practical proven tools for transforming an idea into a product or service that creates value for others.
- To build a winning strategy, how to shape a unique value proposition, prepare a business plan
- To impart practical knowledge on business opportunities
- To inculcate the habit of becoming entrepreneur
- To know the financing, growth and new venture & its problems

Prerequisite

Basic knowledge of reading and writing in English.

Course Outcomes

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

CO1	Listen and comprehend Meaning and concept of Entrepreneurship	Understand
CO2	Identify the business opportunities and able prepare business plan	Analyze
CO3	Comprehend the process of innovation, incubation, prototyping and marketing	Understand
CO4	Executing a new venture through various financial resources	Apply
CO5	Grasp the managing growth and rewards in new venture	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	1	3	1	2	1		2	2		
CO2	2	3	3	2	2		2	2	2		2	2		
CO3	3	2	3	1	2				1	3	1	3		
CO4	3	3	3	3	3	2	2	1		1	3	3		
CO5	3	2	3	3	3			2			3	2		
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests(Marks)		Case Study Report
	1 (25 Marks)	2 (25 Marks)	
Remember (Re)	10	10	50 Marks
Apply (Ap)	20	20	
Analyse (An)	30	30	
Create (Cr)	0	0	

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MY 003 – Startups and Entrepreneurship								
Common to all Branches								
Semester	Hours / Week			Total Hrs.	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	2	0	0	30	-	100	--	100

Introduction to Entrepreneurship & Entrepreneur* Meaning and concept of Entrepreneurship, the history of Entrepreneurship development, Myths of Entrepreneurship, role of Entrepreneurship in Economic Development, Agencies in Entrepreneurship Management and Future of Entrepreneurship. The Entrepreneur: Meaning, the skills required to be an entrepreneur, the entrepreneurial decision process, Role models, Mentors and Support system.	**[06]**
Business Opportunity Identification and Preparing a Business Plan* Business ideas, methods of generating ideas, and opportunity recognition, Idea Generation Process, Feasibility study, preparing a Business Plan: Meaning and significance of a business plan, components of a business plan.	**[06]**
Innovations** Innovation and Creativity - Introduction, Innovation in Current. Environment, Types of Innovation, School of Innovation, Analysing the Current Business Scenario, Challenges of Innovation, Steps of Innovation Management, Experimentation in Innovation Management, Participation for Innovation, Co-creation for Innovation, Proto typing to Incubation. Blue Ocean Strategy-I, Blue Ocean Strategy-II. Marketing of Innovation, Technology Innovation Process.	**[06]**
Financing and Launching the New Venture* Importance of new venture financing, types of ownership, venture capital, types of debt securities, determining ideal debt-equity mix, and financial institutions and banks. Launching the New Venture: Choosing the legal form of new venture, protection of intellectual property, and formation of the new venture.	**[06]**
Managing Growth and Rewards in New Venture* Characteristics of high growth new ventures, strategies for growth, and building the new ventures. Managing Rewards: Exit strategies for Entrepreneurs, Mergers and Acquisition, Succession and exit strategy, managing failures– bankruptcy.	**[06]**
Total Hours	**30**

Text Book(s):

1.	Stephen Key, "One Simple Idea for Startups and Entrepreneurs: Live Your Dreams and Create Your Own Profitable Company" 1st Edition, Tata Mc Grawhill Company, New Delhi, 2013.
2	Charles Bamford and Garry Bruton, "Entrepreneurship: The Art, Science, and Process for Success", 2nd Edition, Tata Mc Grawhill Company, New Delhi, 2016.

Reference(s):

1.	Philip Auerswald, "The Coming Prosperity: How Entrepreneurs Are Transforming the Global Economy", Oxford University Press, 2012.
2.	Janet Kiholm Smith; Richard L. Smith; Richard T. Bliss, "Entrepreneurial Finance: Strategy, Valuation and Deal Structure, Stanford Economics and Finance", 2011
3.	Edward D. Hess, "Growing an Entrepreneurial Business: Concepts and Cases", Stanford Business Books, 2011
4.	Howard Love, "The Start-Up J Curve: The Six Steps to Entrepreneurial Success", Book Group Press, 2011.

***SDG 8 – Decent Work and Economic Growth**
***SDG 12 – Responsible Consumption and Production**
SDG 9 – Industry, Innovation and Infrastructure

Course Contents and Lecture Schedule

S.No	Topic	No. of Periods
1	**Introduction to Entrepreneurship & Entrepreneur**	
1.1	Meaning and concept of Entrepreneurship, the history of Entrepreneurship development,	1
1.2	Myths of Entrepreneurship, role of Entrepreneurship in Economic Development,	1
1.3	Agencies in Entrepreneurship Management and Future of Entrepreneurship.	1
1.4	The Entrepreneur: Meaning, the skills required to be an entrepreneur,	1
1.5	The entrepreneurial decision process	1
1.6	Role models	1
1.7	Mentors and Support system.	1
2	**Business Opportunity Identification and Preparing a Business Plan**	
2.1	Business ideas, methods of generating ideas	1
2.2	Opportunity recognition	1
2.3	Idea Generation Process	1
2.4	Feasibility study	1
2.5	Preparing a Business Plan	1
2.6	Meaning and significance of a business plan	1
2.7	Components of a business plan	1
3	**Innovations**	
3.1	Innovation and Creativity - Introduction, Innovation in Current. Environment	1
3.2	Types of Innovation, School of Innovation,Analyzing the Current Business Scenario	1
3.3	Challenges of Innovation, Steps of Innovation Management	1
3.4	Experimentationin Innovation Management, Participation for Innovation,	1
3.5	Co-creation for Innovation, Proto typing to Incubation.	1
3.6	Blue Ocean Strategy-I, Blue Ocean Strategy-II.	1
3.7	Marketing of Innovation, Technology Innovation Process	1
4	**Financing and Launching the New Venture**	
4.1	Importance of new venture financing, types of ownership,	1
4.2	Venture capital, types of debt securities	1
4.3	Determining idealdebt-equity mix, and financial institutions and banks.	1
4.4	Launching the New Venture	1
4.5	Choosing the legal form of new venture,	1
4.6	Protection of intellectual property	1
4.7	Formationof the new venture	1
5	**Managing Growth and Rewards in New Venture**	
5.1	Characteristics of high growth new ventures	1
5.2	Strategies for growth	1
5.3	Building the new ventures	1
5.4	Managing Rewards	1
5.5	Exit strategies for Entrepreneurs,	1
5.6	Mergers and Acquisition, Succession and exit strategy	1
5.7	Managing failures– bankruptcy.	1
	Total Hours	**30**

Course Designers

1. Dr.N.Tiruvenkadam - tiruvenkadam@ksrct.ac.in

60 MC 5P1	Microprocessors and Microcontrollers Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To familiarize the architecture of 8085, 8086 Microprocessor and 8051 microcontrollers.
- To explore a basic knowledge of microprocessors and microcontrollers.
- To learn programming of microprocessors and microcontrollers.
- To design and develop interfacing concepts of microprocessors and microcontrollers.
- Ability to develop microprocessor and microcontroller based small applications.

Prerequisite

Theory of Machines

Course Outcomes

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

CO1	Perform the basic arithmetic operations using 8085 microprocessors by developing assembly language programs...	Remember, Understand
CO2	Develop an assembly language program to convert hexadecimal to decimal and decimal to hexadecimal and also perform sorting using 8085.	Understand
CO3	Perform the basic programming operations using 8086 microprocessors.	Analyse
CO4	Perform the basic arithmetic operations using 8051 microcontrollers by developing assembly language programs	Apply
CO5	Demonstrate the interfacing of stepper motor and traffic light controller using 8051.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3		3			3		2	3	2	2
CO2	3			3		3			3		2	3	2	2
CO3	3			3		3			3		2	3	2	2
CO4	3			3		3			3		2	3	3	2
CO5	3			3		3			3		2	3	3	2
3- Strong;2-Medium;1-Some														

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 5P1 – Microprocessors and Microcontrollers Laboratory								
MCT								
	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	
V	0	0	4	60	2	60	40	100

List of Experiments

Programming with 8085 Microprocessors

1. Arithmetic operations (addition, subtraction, multiplication, division) using 8085
2. Logical operations programs using 8085
3. Sorting numbers in ascending and descending order of 8085
4. 8-bit decimal to hexadecimal conversion of 8085
5. Hexadecimal number to decimal number conversion of 8085

Programming with 8086 Microprocessors

6. Basic Programming with 8086 Assembler

Programming with 8051 Microcontrollers

7. Arithmetic operations (addition, subtraction, multiplication, division) using 8051
8. Stepper motor interface using 8051
9. Interface Traffic light controller using 8051
10. ADC and DAC Interface

Total Hours	60

SDG No. 8, 9

60 MC 5P2	Metrology and Dynamics laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- To be familiar with different measurement equipment's and quality inspection for industrial applications.
- Identify and use reference materials to ensure good quality, accurate, traceable measurement results.
- To study the principles of gyroscope, Cam and measurement of surface finish.
- To calculate the moment of inertia of connecting rod.
- To analyze the natural frequency of different types of vibrations.

Prerequisite

Theory of Machines

Course Outcomes

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

CO1	Describe the basic concepts of Metrology and Understand the measuring concepts of microscope.	Remember, Understand
CO2	Discriminate between various screws by measuring their taper angle and pitch.	Understand
CO3	Measure the surface finish by using autocollimeter	Analyse
CO4	Verify the laws of gyroscope and plot the profile of cam.	Apply
CO5	Evaluate the natural frequency of spring mass system and moment of inertia connectingrod.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			3		3			3		2	3	2	2
CO2	3			3		3			3		2	3	2	2
CO3	3			3		3			3		2	3	2	2
CO4	3			3		3			3		2	3	3	2
CO5	3			3		3			3		2	3	3	2
3- Strong;2-Medium;1-Some														

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 5P2- Metrology and Dynamics laboratory								
MCT								
	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	0	0	4	60	2	60	40	100

Introduction to metrology and measurement.

1. Calibration of micrometer using slip gauges.
2. a) Study of Tool Makers Microscope.
   b) Measurement of taper angle and pitch by using tool maker's microscope.
3. a) Study of Gear Terminology.
   b) Measurement of various dimensions of the given component using profile projector.
4. Measurement of taper angle using sine bar.
5. a) Study of Screw thread terminology.
   b) Measurement of major and effective diameter of screw thread using 2 wire methods.
6. a) Study of various surface finish measurement techniques.
   b) Measurement of surface flatness by using autocollimator.
7. Determination of gyroscopic couple using Motorized Gyroscope.
8. Plot the profile of cam and study of jump phenomenon.
9. Determination of natural frequency and critical speed of given shaft.
10. Determination of natural frequency of given spring mass system.
11. Determination of torsional frequency of a single rotor system.
12. Calculate the moment of inertia of connecting rod by oscillation method.

Total Hours	60

SDG No. 9

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

(An Autonomous Institution affiliated to Anna University)
B.E. / B.Tech. Degree Programme
SCHEME OF EXAMINATIONS
(For the candidates admitted from 2022 –2023 onwards)
SIXTH SEMESTER

S. No.	Course Code	Name of the Course	Duration of Internal Exam	Weightage of Marks			Minimum Marks for Pass in End Semester Exam	
				Continuous Assessment*	End Semester Exam **	Max. Marks	End Semester Exam	Total
THEORY								
1	60 MC 601	Industrial Automation Controllers	2	40	60	100	45	100
2	60 MC 602	Machine Design	2	40	60	100	45	100
3	60 MC 603	Computer Aided Design and Manufacturing	2	40	60	100	45	100
4	60 MC E2*	Elective-II	2	40	60	100	45	100
5	60 MC E3*	Elective-III	2	40	60	100	45	100
6	60 MC L0*	Open Elective-III	2	40	60	100	45	100
PRACTICAL								
8	60 MC 6P1	Computer Aided Manufacturing Laboratory	3	60	40	100	45	100
9	60 MC 6P2	Design Thinking and Industrial Automation Laboratory	3	60	40	100	45	100
10	60 MC 6P3	Mini Project	3	100	-	100	-	-
11	60 CG 0P5	Comprehension Test						
	60 CG 0P6	Internship	-	-	-	-	-	-

* CA evaluation pattern will differ from course to course and for different tests.This will have to be declared in advance to students. The department will put a process in place to ensure that the actual test paper follow the declared pattern.

** End Semester Examination will be conducted for maximum marks of 100 and subsequently be reduced to 60marks for the award of terminal examination marks

60 MC 601	Industrial Automation Controllers

Category	L	T	P	Credit
PC	3	1	0	4

Objective

- To gain the knowledge of various skills necessary for industrial applications of PLC.
- To provide the basic programming concepts and various logical instructions used in PLC.
- To familiarize the learners in data handling of PLC.
- To impart the knowledge of Supervisory Control and Data Acquisition (SCADA) System.
- To enable the students to troubleshoot and maintain the controller operation in industries.

Prerequisite

Sensors and Instrumentation, Industrial Drives and Control, Digital electronics and Microprocessors

Course Outcomes

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

CO1	Describe the main functional units in a PLC and its elements.	Remember, Understand an Apply
CO2	Develop ladder logic programming for industrial applications.	Analyze
CO3	Apply PLC data handling instructions for industrial automation	Understand, Apply
CO4	Implement the Supervisory Control and Data Acquisition systems for particular applications.	Analyze
CO5	Outline different industrial automation applications and troubleshooti procedure.	Remember, Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	2				3	3	2	2	3	3
CO2	3	3	3	2	3								3	3
CO3	3	3	3	2	3	2					3	3	3	3
CO4	3	3	2	2	2			3					2	2
CO5	3	2	2	2	2		3				2	2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyze	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 601- Industrial Automation Controllers								
MCT								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	40	60	100

Fundamentals of PLC Introduction – Requirement, Architecture of Industrial Automation system – History & Architecture of PLC – Principle operation – PLC Input & Output modules –Selection criteria – PLCs versus computers – Programming devices – PLC programming: Ladder diagram, STL, Functional block diagram, Sequential flow chart, Instruction List.	**[09]**
PLC Programming PLC Programming Symbols in ladder diagram – Boolean logic & relay logic– input and output field devices – Bit logic instructions – ladder diagram examples, interlocking, latching, inter dependency and logical functions – PLC Timer & Counter functions: ON-delay timer, OFF-delay timers, retentive timers, pulse timers, up-counter, down-counter and up down counter, industrial process examples using timer & counters	**[09]**
Data Handling Functions Data move instructions– FIFO & LIFO, FAL, ONS, CLR, SWEEP functions – Math instructions – Data manipulation &conversion functions – Program control and interrupts: SKIP and MCR functions, jumps, subroutine, and sequence control relay – Simple programs-.	**[09]**
Supervisory Control and Data Acquisition System Elements of SCADA-Functionalities of SCADA-Architecture: Hardware, Software: Development, Runtime mode Functions-Tools: Tag Database-Recipe database- Alarm Logging-Trends- Distributed Control System (DCS) - Introduction, Flow sheet symbols, Architecture- HMI, DCS programming- Different Network protocols - ASI, CAN, Device net, Industrial Ethernet, Profibus – PA -DP -FMS, Fieldbus, HART	**[09]**
PLC Maintenance and Case Studies PLC maintenance – internal & external PLC faults – programmed error – watch dogs – hardware safety circuits – Diagnostic Circuits- troubleshooting. Case Studies: Robot controller – FMS – Factory automation – Process control –Materials handling applications – Automatic control of power plant using SCADA.	**[09]**
	Total Hours:45+15(Tutorial) = 60 Hrs

Text book(s):

1.	Frank D.Petruzella “Programmable Logic Controller”, Tata McGraw-Hill Publication, 6th Edition, 2023.
2	M. P. Groover, Automation, Production Systems and Computer Integrated Manufacturing, Fourth Edition, Pearson Education, UK, 2016.

Reference(s):

1.	Robert Radvanovsky, Jacob Brodsky, “Handbook of SCADA/Control Systems Security”, 2nd Edition, CRC Press, 2016.
2.	E.A. Parr “Programmable Controllers An Engineer’s Guide”, Elsevier Publication, 3rd Edition, 2017.
3.	Stuart A Boyer, “SCADA Supervisory Control and Data Acquisition”, ISA, 4th Revised Edition, 2018.
4.	Krishnakant, “Computer based Industrial Control”, PHI, New Delhi,5th Edition, 2017.

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Fundamentals of PLC**	
1.1	Introduction	1
1.2	Requirement	1
1.3	Architecture of Industrial Automation system	1
1.4	History & Architecture of PLC	1
1.5	Principle operation	1
1.6	PLC Input & Output modules	1
1.7	Selection criteria	1
1.8	PLCs versus computers, Programming devices	1
1.9	PLC programming: Ladder diagram, STL, Functional block diagram, Sequential flow chart, Instruction List	1
2	**PLC Programming**	
2.1	PLC Programming Symbols in ladder diagram	1
2.2	Boolean logic & relay logic	1
2.3	Input and output field devices	1
2.4	Bit logic instructions, ladder diagram examples	1
2.5	Interlocking, latching, inter dependency and logical functions	1
2.6	PLC Timer & Counter functions	1
2.7	ON-delay timer, OFF-delay timers, retentive timers, pulse timers, up-counter	1
2.8	Down-counter and up/down counter,	1
2.9	Sequential flow chart, Instruction List	1
3	**Data Handling Functions**	
3.1	Data move instructions	1
3.2	FIFO & LIFO, FAL, ONS	2
3.3	CLR, SWEEP functions, Math instructions	1
3.4	Data manipulation &conversion functions	1
3.5	Program control and interrupts, SKIP and MCR functions	2
3.6	Jumps, subroutine, and sequence control relay	1
3.7	Simple programs	1
4	**Supervisory Control and Data Acquisition System**	
4.1	Elements of SCADA	1
4.2	Functionalities of SCADA, Architecture	1
4.3	Hardware, Software, Development, Runtime mode Functions,	1
4.4	Tools, Tag Database	1
4.5	Recipe database, Alarm Logging, Trends	2
4.6	Distributed Control System (DCS) - Introduction	1
4.7	Flow sheet symbols, Architecture, HMI, DCS programming, Different Network protocols	1
4.8	ASI, CAN, Device net, Industrial Ethernet, Profibus – PA -DP -FMS, Fieldbus, HART	1
5	**PLC Maintenance and Case Studies**	
5.1	PLC maintenance	1
5.2	Internal & external PLC faults, programmed error	1
5.3	Watch dogs, Hardware safety circuits	1
5.4	Troubleshooting. Case Studies	1
5.5	Robot controller, FMS, Factory automation	1
5.6	Process control, Materials handling applications	2
5.7	Automatic control of power plant using SCADA	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	**https://onlinecourses.nptel.ac.in/noc24_ee56/preview**

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 602	Machine Design

Category	L	T	P	Credit
PC	3	1	0	4

Objective

- To familiarize the various steps involved in the Design Process.
- To understand the principles involved in evaluating the shape and dimensions of a component to satisfy functional and strength requirements.
- To learn to use standard practices and standard data.
- To learn to use catalogues and standard machine components.
- To design the various machine components as per standards.

Pre-requisite

Strength of Materials

Course Outcomes

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

CO1	Analyze stresses and dimensions in machine elements at various loa	Remember, Understand, Understand and Apply
CO2	Understand the design of shaft, couplings, keys and knuckle joint for different applications.	Analyze, Understand and Apply
CO3	Design and analyze the springs and gears	Remember, Understand, Analyze and Apply
CO4	Exhibit the design of bearings and connecting rod	Analyze, Understand and Apply
CO5	Understand the threaded fasteners and ability to design of welded joints.	Remember, Understand, Analyze and Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	3	1	1	1	2		2		2	3	2	2	3
CO2	2	2	2	3	3		2		3		2		2	2
CO3	2	3	1	3	2	1		1		1		3	2	2
CO4	1	3	3	2	1		2	3		2	1	2	2	2
CO5	2	1	1	1	2	2	3				1	2	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 602 – Machine Design								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	1	0	60	4	40	60	100

VARIABLE STRESSES IN MACHINE MEMBERS Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – eccentric loading – Design of curved beams – crane hook and 'C' frame - Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations.	**[09]**
SHAFTS AND COUPLINGS Design of shaft based on strength, rigidity and critical speed – Design of keys – Types - keyways - Design of rigid and flexible couplings - design of knuckle joints.	**[09]**
SPRINGS AND GEARS Springs –Types of Springs, Design of helical, leaf under constant loads and varying loads – Concentric torsion springs – Gears, types, terminologies-Design of spur and helical gears	**[09]**
BEARINGS AND CONNECTING ROD Study of bearings, Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions – Design of connecting rod.	**[09]**
FASTENERS AND WELDED JOINTS Threaded fasteners - Design of bolted joints including eccentric loading – Design of welded joints - theory of bonded joints**.**	**[09]**
Total Hours:45+15(Tutorial) = 60	

Text Book(s):

1.	Juvinall R.C, and Marshek K.M, "Fundamentals of Machine Component Design", John Wiley & Sons, Seventh Edition,2020.
2.	J. K Gupta and R.S..Khurmi, "A Textbook of Machine Design",Eurasia Publishing House, 2019.

Reference(s):

1.	Bhandari V.B, "Design of Machine Elements", Tata McGraw-Hill Book Co, 2008
2.	Norton R.L, "Design of Machinery", Tata McGraw-Hill Book Co, 2004.
3.	Orthwein W, "Machine Component Design", Jaico Publishing Co, 2003.
4.	Spotts M.F., Shoup T.E, "Design and Machine Elements" Pearson Education, 2004
5.	Design Data Book Of Engineers By "PSG College Kalaikathir Achchagam", 2020.

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**VARIABLE STRESSES IN MACHINE MEMBERS**	
1.1	Introduction to the design process - factors influencing machine design, selection of materials based on mechanical properties.	1
1.2	mechanical properties – Direct, Bending and torsional stress equations.	2
1.3	eccentric loading	1
1.4	Tutorial 1	2
1.5	Design of curved beams – crane hook and 'C' frame	1
1.6	Factor of safety - theories of failure	1
1.7	stress concentration, design for variable loading – Soderberg	1
1.8	Design for variable loading – Goodman relations.	2
1.9	Design for variable loading – Gerber relations.	1
1.10	Tutorial 2	2
2	**SHAFTS AND COUPLINGS**	
2.1	Design of solid shaft based on strength	1
2.2	Design of solid shaft based on rigidity	2
2.3	Design of solid shaft based on critical speed	1
2.4	Tutorial 3	2
2.5	Design of keys – Types - keyways	1
2.6	Design of rigid and flexible couplings	2
2.7	Design of knuckle joints.	2
2.8	Design of knuckle joints.	1
2.10	Tutorial 4	2
3	**ELECTRICAL INSTALLATIONS**	
3.1	Springs –Types of Springs, Design of helical	1
3.2	Design of helical spring	2
3.3	Design of leaf spring	1
3.4	Design of leaf spring	2
3.5	Tutorial 5	2
3.7	Concentric torsion springs	1
3.8	Gears, types, terminologies-Design of spur and helical gears	1
3.9	Gears, types, terminologies-Design of spur and helical gears	2
4	**BEARINGS AND CONNECTING ROD**	
4.1	Study of bearings, Design of bearings – sliding contact	2
4.2	Study of bearings, Design of bearings – sliding contact	1
4.3	Tutorial 6	2
4.4	Design of rolling contact types	1
4.5	Design of rolling contact types. Cubic mean load	2
4.6	Design of journal bearings, Mckees equation	1
4.7	Design of journal bearings, Mckees equation	2
4.8	Lubrication in journal bearings – calculation of bearing dimensions	1
4.9	Design of connecting rod	2
4.10	Tutorial 7	
5	**FASTENERS AND WELDED JOINTS**	
5.1	Threaded fasteners	1
5.2	Design of bolted joints including eccentric loading	2
5.3	Design of welded joints for pressure vessels and structures	1
5.4	theory of bonded joints	1
5.5	Tutorial 8	2
	Total	60

NPTEL Course Material

Sl.No	Link
1.	https://www.nptelvideos.com/lecture.php?id=15521
2.	https://www.nptelvideos.com/lecture.php?id=15552
3.	https://www.nptelvideos.com/lecture.php?id=15545
4.	https://nptel.ac.in/courses/112105125
5.	https://www.nptelvideos.com/lecture.php?id=15541

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 603	Computer Aided Design and Manufacturing	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To offer a sight into the utilization of computers in component design.
- To gain insight into the role of computer-aided design and analysis in the design process.
- To comprehend the fundamentals of pioneering manufacturing methodologies.
- To know the impressions of Part programming with computer assistance.
- To understand the Group Technology and Flexible Manufacturing System concepts.

Pre -requisites

Manufacturing Technology

Course Outcomes

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

CO1	Obtain an understanding of the stages within the product life cycle, as well as the principles of 2D and 3D transformations and the basics of CAD/CAM	Remember, Understand , Apply
CO2	Acquire knowledge regarding I/O devices, Boolean operations, and the concepts of Finite Element Analysis (FEA).	Remember, Understand, Apply
CO3	Comprehend and elucidate the principles governing the latest advancements in manufacturing machinery.	Remember, Understand, Apply
CO4	Utilize NC programming concepts to create part programs for both Lathe and Milling Machines	Remember, Understand, Apply
CO5	Enumerate the functions of computers in the context of Group Technology (GT) and Flexible Manufacturing Systems (FMS).	Remember, Understand, Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2				2		3	3	2
CO2	2	3	3	2	2	2				3		3	2	2
CO3	2	2	2	2	3	2				2		2	3	2
CO4	2	3	2	3	3	2				3		3	2	2
CO5	2	3	3	2	3	2				2		2	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	30	30	50
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0
Total	60	60	100

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 603 - Computer Aided Design and Manufacturing								
Semester	Hours / Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Computer Aided Drawing Historical development of CAD technology - Product cycle, Design process (Shigley model) - CAD and its applications in various industries - Transformations: 2D & 3D transformations - translation, scaling, rotation and concatenation. Geometric modelling: Wire frame modelling. Surface modelling - types of surfaces - applications - Solid modelling - entities - advantages and disadvantages	**[09]**
Computer Graphics Introduction to Computer Graphics - Input and Output devices. Graphical input techniques - Boolean operations - Boundary representation - Constructive Solid Geometry- Comparison. Graphics standard: Definition - Need - GKS - OpenGL - IGES - DXF. Finite Element Analysis: Introduction - development - basic steps - advantages	**[09]**
Computer Aided Manufacturing Definition of automation, types of automation, Definition of NC, basic components of NC system, applications of numerical control. Process Planning: Introduction - Computer Assisted Process Planning (CAPP) - Types of CAPP - Variant type, Generative type - advantages of CAPP. AGV: Introduction - AGV - working principle - types - benefits. Concurrent Engineering: Definition - Sequential Vs Concurrent engineering - need of CE - benefits of CE	**[09]**
CNC Part Programming Manual part programming - coordinate system - Datum points: machine zero, work zero, tool zero - reference points - NC dimensioning - G codes and M codes - linear interpolation and circular interpolation - CNC program procedure - sub-program - canned cycles - stock removal - thread cutting - mirroring - drilling cycle - pocketing	**[09]**
Group Technology and Flexible Manufacturing Systems Group Technology: Part families - Parts classification and coding - Coding structure - Optiz Coding System, MICLASS System and CODE System. Flexible Manufacturing System - FMS Components and its types - Flexibility in FMS - FMS Control - FMS layout configuration - FMS Application and Benefits - Role of CAD/CAM in Industry 4.0	**[09]**
Total Hours	**45**

Text Book(s):

1.	P. N. Rao - 'CAD/CAM, Principles and Applications' - Tata McGraw Hill Publishers - 2017
2	Mikell P. Groover and Emory W. Zimmers - 'CAD/CAM' - PHI Publishers - 2014
3.	Yoram Koren - 'Computer Control of Manufacturing Systems' - McGraw Hill Publishers - 2007.

Reference(s):

1.	R. Radhakrishnan, S. Subramanian 'CAD/CAM/CIM', New Age International Pvt. Ltd., 3rd Edition
2.	Ibrahim Zeid and R Sivasubramanian, "CAD/CAM: Theory and Practice", Tata McGraw Hill Company, 2009.
3.	Sadhu Singh, "Computer Aided Design and Manufacturing", Khanna Publishers, New Delhi, 2011.
4.	H.M.T. Production Technology: Hand book` - Tata McGraw-Hill Publishing Company Limited, 1990

SDG No. 9

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

Course Contents and Lecture Schedule

S. No	Topic	No. of Hours
1	**Computer Aided Drawing**	1
1.1	Historical development of CAD technology	1
1.2	Product cycle, Design process (Shigley model)	1
1.3	CAD and its applications in various industries	1
1.4	Transformations: 2D & 3D transformations – translation and scaling	1
1.5	Transformations: 2D & 3D transformations - rotation and concatenation	1
1.6	Geometric modelling: Wire frame modelling	1
1.7	Surface modelling - types of surfaces - applications	1
1.8	Solid modelling - Entities	1
1.9	Solid modelling - advantages and disadvantages	1
2	**Computer Graphics**	1
2.1	Introduction to Computer Graphics	1
2.2	Input and Output devices	1
2.3	Graphical input techniques	1
2.4	Boolean operations - Boundary representation	1
2.5	Constructive Solid Geometry	1
2.6	Graphics standard: Definition - Need - GKS	1
2.7	OpenGL - IGES - DXF	1
2.8	Finite Element Analysis: Introduction	1
2.9	Finite Element Analysis: Development - basic steps - advantages	1
3	**Computer Aided Manufacturing**	1
3.1	Definition of automation, types of automation	1
3.2	Definition of NC, basic components of NC system, applications of numerical control	1
3.3	Process Planning : Introduction - Computer Assisted Process Planning (CAPP)	1
3.4	Types of CAPP - Variant type,	1
3.5	Generative type - advantages of CAPP	1
3.6	AGV : Introduction - AGV - working principle - types - benefits	1
3.7	Concurrent Engineering : Definition	1
3.8	Sequential vs Concurrent engineering	1
3.9	Need of CE - benefits of CE	1
4	**CNC Part Programming**	1
4.1	Manual part programming - coordinate system	1
4.2	Datum points: machine zero, work zero, tool zero - reference points	1
4.3	NC dimensioning - G codes and M codes	1
4.4	Linear interpolation and circular interpolation	1
4.5	CNC program procedure - sub-program - canned cycles - stock removal	1
4.6	Thread Cutting	1
4.7	Mirroring	1
4.8	Drilling Cycle	1
4.9	Pocketing	1
5	**Group Technology and Flexible Manufacturing Systems**	1
5.1	Group Technology: Part families - Parts classification and coding	1
5.2	Coding structure - Optiz Coding System	1
5.3	MICLASS System and CODE System	1
5.4	Flexible Manufacturing System	1
5.5	FMS Components and its types	1
5.6	Flexibility in FMS - FMS Control	1
5.7	FMS layout configuration	1
5.8	FMS Application and Benefits	1
5.9	Role of CAD/CAM in Industry 4.0	1
	Total Hours	**45**

NPTEL Course Link

S. No	Link
1	https://archive.nptel.ac.in/courses/112/102/112102101/
2	https://archive.nptel.ac.in/courses/112/102/112102102/
3	https://archive.nptel.ac.in/courses/112/102/112102103/
4	https://www.nptelvideos.com/course.php?id=782

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC 6P1	Computer Aided Manufacturing Laboratory	Category	L	T	P	Credit
		PC	0	0	4	2

Objective

- Imparting an understanding of the construction and operation of Computer Numerical Control (CNC) Machines.
- Familiarizing individuals with the interfacing, communication, and control of CNC machine tools.
- Providing foundational knowledge in CNC manual part programming.
- Equipping individuals with the skills needed to program CNC turning centers and CNC machining centers
- Facilitating hands-on experience in computer-assisted part programming.

Prerequisite

Manufacturing Technology Laboratory

Course Outcomes

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

CO1	Elaborate on the structure and functionality of CNC machine tools	Remember / Understand / Apply
CO2	Comprehend diverse aspects of CNC programming.	Remember / Understand / Apply
CO3	Create programs for producing components on CNC turning centers.	Remember / Understand / Apply
CO4	Develop programs for fabricating geometric components with CNC machining centers.	Remember / Understand / Apply
CO5	Grasp the generation of NC code from CAD models within CAM software.	Remember / Understand / Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2						2		2	2	3	2
CO2	3	2	2						2		2	2	2	2
CO3	3	2	2						2		2	2	3	2
CO4	3	2	2						2		2	2	2	2
CO5	3	2	2						2		2	2	2	2

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	20
Understand	20	20	30
Apply	30	30	50
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0
Total	60	60	100

List of Experiments

Exploration of CNC Machinery and Programming

1. Study on CNC Lathe, CNC Milling operations and G-Codes and M-Codes

CNC Turning Operations

2. Implementing Linear and Circular interpolation for step turning
3. Applying Contour Turning cycles to achieve taper turning
4. Utilizing Stock removal cycles for drilling and boring processes
5. Crafting a part program for grooving and thread cutting using canned cycles

CNC Milling Techniques

6. Developing a part program for drilling, tapping, and counter sinking with canned cycles
7. Generating a part program for contour milling using canned cycles
8. Creating part programs for drilling and peck drilling with the aid of canned cycles
9. Employing subprograms to achieve mirror imaging

Computer-Aided Part Programming

10. Generating CL Data for a given component using CAM Software

SDG No. 9

Virtual Lab Links

S. No	Link
1	http://vlabs.iitkgp.ac.in/cim/
2	http://vlabs.iitkgp.ernet.in/vlabs/rtvlab1/cadprg.html

Course Designers

Dr. A.Ramesh Kumar - rameshkumar@ksrct.ac.in

60 MC 6P2	Design Thinking and Industrial Automation Laboratory

Category	L	T	P	Credit
PC	0	0	4	2

Objective

- To train the students to be familiar with the software and hardware of PLC using ladder logic codes.
- To familiarize the student to develop PLC programs for different applications.
- To facilitate knowledge on PLC Control Principles and Applications with Field Devices.
- To train the students to create ladder diagrams for process control descriptions.
- To impart knowledge on Configure communication between the PLC and PC.

Pre-requisite

Sensors and Instrumentation, Industrial Drives and Control, Digital Electronics and Microprocessors

Course Outcomes

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

CO1	Write a PLC program for various industrial applications.	Remember, Understand and Apply
CO2	Control the speed of AC motors using VFD.	Analyze
CO3	Interface the sensors for flow, pressure and level monitoring and control in process industries	Understand, Apply
CO4	Design the of closed loop temperature controller	Analyze
CO5	Explore the concept of real-time monitoring and control using HMI	Remember, Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	3	3				3	3	2	2	3	2
CO2	3	3	3	2	3								3	3
CO3	3	3	3	2	3	2	3				3	3	3	2
CO4	3	3	2	2	3			3					3	2
CO5	3	2	2	2	3						2	2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Model lab (Marks)		End Sem Practical Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyze	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC 6P2- Design Thinking and Industrial Automation Laboratory								
MCT								
	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	0	0	4	60	2	60	40	100

1. PLC Programming for simple control applications using logic Gates.
2. Demonstration of delay on timers and delay off timers using PLC.
3. Demonstration of count up and count down counter using PLC.
4. Demonstration of Master and Jump control in PLC ladder logic network.
5. Simulation of Automating car parking system using PLC.
6. PLC control of electro-pneumatic and electro-hydraulic systems.
7. Simulation of Lift Elevator system using PLC.
8. Controlling of a conveyor belt control using PLC.
9. Controlling and speed control of AC motors using PLC
10. Implementation of water level control system using HMI.
11. Demonstration of batch process reactor control system through PLC.
12. Measurement by multi touch position tracking using HMI
13. A PLC based experiment on Pressure Monitoring and Control in Industrial process.

Total Hours	60

Text book(s):

1.	Frank D.Petruzella “Programmable Logic Controller”, Tata McGraw-Hill Publication, 6 th Edition, 2023.
2	Mrs.V.Indumathi, “ Design Thinking and Industrial Automation Laboratory**” ,** KSRCT Lab manual ,2023

Reference(s):

1.	Robert Radvanovsky, Jacob Brodsky, “Handbook of SCADA/Control Systems Security”, 2nd Edition, CRC press, 2016.
2.	E.A.Parr “Programmable Controllers An Engineer’s Guide”, Elsevier Publication, 3 rd Edition, 2017.
3.	Stuart A Boyer, “SCADA Supervisory Control and Data Acquisition”, ISA, 4 th Revised Edition, 2018.
4.	Krishnakant, “Computer based Industrial Control”, PHI, New Delhi,5thEdition, 2017.

SDG No.9

60 MC E11	Mobile Robotics	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To broaden the importance of Robot Locomotion
- To learn the knowledge of mobile Robot kinematics and dynamics
- To broaden the importance of GPS and sensors
- To enhance the knowledge about Localization, Planning and Navigation
- To make the student design, fabricate, motion planning, and control of intelligent mobile robotic systems

Prerequisite

Robotics Engineering

Course Outcomes

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

CO1	Discuss about the Robot Locomotion.	Remember, Understand and Apply
CO2	Differentiate the Kinematics and the Dynamics of Mobile Robots	Analyze
CO3	Illustrate the Sensors and GPS.	Understand
CO4	Describe about the Localization and Planning of Robots	Understand/Analyze
CO5	Summarize the knowledge on Navigation	Remember

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	2	2	1	1	2	3
CO2	3	3	2	3	1	2	1	1	2	3	3	1	2	2
CO3	3	3	3	3	1	1	1	1	2	1	1	1	2	2
CO4	2	2	3	3	1	2	1	2	3	1	2	1	2	2
CO5	3	3	2	1	1	2	1	1	1	1	2	1	2	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyze	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S.Rangasamy College of Technology – Autonomous							R2022
60 MC E11 - Mobile Robotics							
MCT							
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**	
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Robot locomotion Types of locomotion, hopping robots, legged robots, wheeled robots, stability, maneuverability, controllability. .	**[09]**
Mobile robot kinematics and dynamics Forward and inverse kinematics, holonomic and non-holonomic constraints, kinematic models of simple car and legged robots, dynamics simulation of mobile robots.	**[09]**
Perception Proprioceptive/ Exteroceptive and passive/active sensors, performance measures of sensors, sensors for mobile robots like global positioning system (GPS), Doppler effect-based sensors, vision-based sensors, uncertainty in sensing, filtering.	**[09]**
Localization Odometric position estimation, belief representation, probabilistic mapping, Markov localization, Bayesian localization, Kalman localization, positioning beacon systems.	**[09]**
Introduction to planning and navigation path planning algorithms based on A-star, Dijkstra, Voronoi diagrams, probabilistic roadmaps (PRM), rapidly exploring random trees (RRT), Markov Decision Processes (MDP), stochastic dynamic programming (SDP).	**[09]**
Total Hours	45

Text Book(s):	
1.	R.Siegwart,I.R.Nourbakhsh,'IntroductiontoAutonomousMobileRobots',TheMITPress,2017..
2	Peter Corke, Robotics, Vision and Control: Fundamental Algorithms in MATLAB, Springer Tracts in Advanced Robotics,2018.
Reference(s):	
1.	S.M.LaValle,'PlanningAlgorithms',CambridgeUniversityPress,2016.(Availableonline http://planning.cs.uiuc.edu/)
2.	Thrun,S.,Burgard,W.,andFox,D.,ProbabilisticRobotics.MITPress,Cambridge,MA,2017..
3.	Melgar,E.R.,Diez,C.C., ArduinoandKinectProjects:Design,Build,BlowTheirMinds,2016.
4.	H.Choset,K.M.Lynch,S.Hutchinson,G.Kantor,W.Burgard,L.E.Kavraki,andS.Thrun, Principles of Robot Motion: Theory, Algorithms and Implementations,PHILtd.,2017..

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	Types of locomotion	2
1.1	hopping robots	1
1.2	legged robots	2
1.3	wheeled robots	2
1.4	stability, maneuverability	1
1.5	controllability.	1
2	Mobile robot kinematics and dynamics	
2.1	Forward and inverse kinematics	2
2.2	holonomic and nonholonomic constraints	1
2.3	kinematic models of simple car and legged robots	2
2.4	dynamics simulation of mobile robots	1
3	Perception	
3.1	Proprioceptive/ Exteroceptive and passive/active sensors	2
3.2	performance measures of sensors	1
3.3	sensors for mobile robots like global positioning system (GPS)	2
3.4	Doppler effect-based sensors	1
3.5	Doppler effect-based sensors, vision-based sensors	2
3.6	uncertainty in sensing, filtering	1
4	Localization	
4.1	Odometric position estimation	2
4.2	belief representation	2
4.3	probabilistic mapping	1
4.4	Markov localization, Bayesian localization	2
4.5	Kalman localization, positioning beacon systems.	2
5	Introduction to planning and navigation	
5.1	path planning algorithms based on A-star	1
5.2	Dijkstra, Voronoi diagrams	2
5.3	probabilistic roadmaps (PRM)	1
5.4	rapidly exploring random trees (RRT), Markov Decision Processes (MDP)	2
5.5	stochastic dynamic programming (SDP).	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	https://archive.nptel.ac.in/courses/112/106/112106298/

Course Designers

Dr.M.Ravi - ravi@ksrct.ac.in

60 MC E12	Electric Vehicle	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To understand the concept of electric vehicles.
- To study about the motors & drives for electric vehicles.
- To understand the concept of BMS.
- To understand the concept of hybrid vehicles.
- To study about fuel cell for electric vehicles**.**

Prerequisite

Industrial Drives and Control, Sensors and Instrumentation

Course Outcomes

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

CO1	Understand about working principle of electric vehicles.	Understand
CO2	Understand the construction and working principle of various motors used in electric vehicles.	Understand
CO3	Understand about working principle of BMS	Understand
CO4	Analyze the different types and working principle of hybrid vehicles.	Analyze
CO5	Understand the various types and working principle of fuel cells.	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	2	2		2					2	1	2	
CO2	3	3	3	2				3			2	2	2	2
CO3	3	3	2	3		2				3	1	2	2	3
CO4	2	2		2	3			2			2	3		2
CO5	2	2	2	3	2						3	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E12 - Electric Vehicle								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Introduction To Electric Vehicles Electric Vehicle –Cost and Emissions – Electric Vehicle Technology – layouts, cables, components, Controls. Batteries – overview and its types. Battery plug-in and life. Ultra-capacitor, Charging – Methods and Standards. Alternate charging sources – Wireless & Solar.	**[09]**
Electric Vehicle Motors Motors (DC, Induction, BLDC) – Types, Principle, Construction, Control. Electric Drive Trains (EDT) – Series HEDT (Electrical Coupling) – Power Rating Design, Peak Power Source (PPS); Parallel HEDT (Mechanical Coupling) – Torque Coupling and Speed Coupling – Switched Reluctance Motors (SRM) Drives	**[09]**
Battery Management System (BMS) Need of BMS, BMS Topology-BMS Controller and BMS Communication system-Cell balancing-State of Charge (SoC), State of Health (SoH), Rule based control and optimization-based control, Software-based high-level supervisory control.	**[09]**
Hybrid Vehicles Hybrid Electric vehicles – Classification – Micro, Mild, Full, Plug-in, EV. Layout and Architecture – Series, Parallel and Series-Parallel Hybrid, Propulsion systems and components. Regenerative Braking, Economy, Vibration and Noise reduction. Hybrid Electric Vehicles System – Analysis and its Types, Controls.	**[09]**
Fuel Cells for Electric Vehicles Fuel cell – Introduction, Technologies & Types, Obstacles. Operation principles, Potential and I-V curve, Fuel and Oxidation Consumption, Fuel cell Characteristics – Efficiency, Durability, Specific power, Factors affecting, Power design of fuel Cell Vehicle and freeze capacity. Lifetime cost of Fuel cell Vehicle – System, Components, maintenance.	**[09]**
Total Hours	45

Text Book(s):

1.	Electric and Hybrid Vehicles, Tom Denton, Taylor & Francis, 2020.
2	Electric and Hybrid Vehicles Power Sources, Models, Sustainability, Infrastructure and the Market Gianfranco Pistoia Consultant, Rome, Italy, Elsevier Publications, 2019.

Reference(s):

1.	Hybrid Electric Vehicles – Teresa Donateo, Published by ExLi4EvA, 2017.
2.	Hybrid Electric Vehicle System Modeling and Control - Wei Liu, General Motors, USA, John Wiley & Sons, Inc., 2017.
3.	Jack Erjavec and Jeff Arias, “Alternative Fuel Technology – Electric, Hybrid and Fuel Cell Vehicles”, Cengage Learning Pvt. Ltd., New Delhi, 2017
4.	Jack Erjavec and Jeff Arias, “Hybrid, Electric and Fuel Cell Vehicles”, Cengage Learning, 2012.

SDG No.7, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**INTRODUCTION to ELECTRIC VEHICLES**	
1.1	Electric Vehicle	1
1.2	Cost and Emissions	1
1.3	Electric Vehicle Technology	1
1.4	layouts, cables, components, Controls	1
1.5	Batteries	1
1.6	overview and its types	1
1.7	Battery plug-in and life	1
1.8	Ultra-capacitor, Charging	1
1.9	Methods and Standards.	1
1.10	Alternate charging sources – Wireless & Solar.	1
2	**ELECTRIC VEHICLE MOTORS**	
2.1	Motors (DC, Induction, BLDC)	1
2.2	Types, Principle, Construction, Control	1
2.3	Electric Drive Trains (EDT)	1
2.4	Series HEDT (Electrical Coupling)	1
2.5	Power Rating Design, Peak Power Source (PPS)	1
2.6	Parallel HEDT (Mechanical Coupling)	1
2.7	Torque Coupling and Speed Coupling.	1
2.8	Switched Reluctance Motors (SRM) Drives	1
3	**Battery Management System**	
3.1	Need of BMS, BMS Topology	1
3.2	BMS Controller and BMS Communication system	2
3.3	Cell balancing	1
3.4	State of Charge (SoC), State of Health (SoH)	1
3.5	Rule based control and optimization-based control	2
3.6	Software-based high-level supervisory control.	1
4	**HYBRID VEHICLES**	
4.1	Hybrid Electric vehicles	1
4.2	Classification – Micro, Mild, Full, Plug-in, EV	1
4.3	Layout and Architecture	1
4.4	Series, Parallel and Series-Parallel Hybrid	1
4.5	Propulsion systems and components	2
4.6	Regenerative Braking, Economy, Vibration and Noise reduction	1
4.7	Hybrid Electric Vehicles System	1
4.8	Analysis and its Types, Controls.	1
5	**FUEL CELLS FOR ELECTRIC VEHICLES**	
5.1	Fuel cell	1
5.2	Introduction, Technologies & Types	1
5.3	Fuel and Oxidation Consumption, Fuel cell Characteristics	1
5.4	Efficiency, Durability, Specific power	1
5.5	Factors affecting, Power design of fuel Cell Vehicle and freeze capacity	1
5.6	Lifetime cost of Fuel cell Vehicle	1
5.7	System, Components, maintenance.	1
	Total	45

NPTEL Course Material

S.No.	Link
1.	https://onlinecourses.nptel.ac.in/noc22_ee53

Course Designers

Mr.S.Hari Prasadh -hariprasadh@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC E13	Aircraft Mechatronics

Category	L	T	P	Credit
PE	3	0	0	3

Objective

- To familiarize the basic concept on Aircraft Aerodynamics
- To facilitate the various types of aircraft propulsion and their uses
- To gain knowledge on navigation and guidance system of aircraft
- To provide exposure on the functions of various primary flight controls
- To familiarize the use of various applications of mechatronics in aviation

Prerequisite

NIL

Course Outcomes

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

CO1	Recognize the Basics in aerodynamics, aircraft propulsion, materials and controls	Remember, Understand
CO2	Understand the various concepts used in aerodynamics	Understand
CO3	Apply the techniques to develop the aero system	Apply
CO4	Design the aircraft with the use of concepts in aerodynamics, aircraft propulsion, materials and controls	Analyze
CO5	Apply this aircraft system in various applications	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		2	2						2	1	3	2
CO2	3	3	3		3						2	2	2	2
CO3	3	3	2	3	2	2					1	2	3	2
CO4	2	2			3						2	3	2	2
CO5	2	2	2	3	2						3	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E13 - Aircraft Mechatronics								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

AIRCRAFT AERODYNAMICS Types of wing plan forms, Aerodynamic features Aerofoil pressure distribution- Aerodynamic forces and moments Lift and Drag- Drag polar, L/D ratio, high lift devices, Airplane performance, Thrust/Power available, climb and glide – maximum range and endurance, take off and landings.	**[09]**
AIRCRAFT PROPULSION Requirement of power- various means of producing power – Brief description of thermo dynamics of engines – Piston engines, Jet engines – Airplane Structure, Materials and Production – Structural arrangement of earlier airplane- developments leading to all metal aircraft – Strength to weight ratio choice of aircraft materials for different parts.	**[09]**
NAVIGATION AND GUIDANCE SYSTEM OF AIRCRAFT Flight Control System –Path planning- Way point Navigation system - Obstacle's avoidance Techniques – functional block of lateral and longitudinal guidance- GPS – GCS-Telemetry –Transmitter & Receiver.	**[09]**
PRIMARY FLIGHT CONTROLS Ailerons – Aileron Control System of a Commercial Aircraft – Elevators – Elevator control system of a commercial aircraft – Rudders- Rudder Control System.	**[09]**
APPLICATIONS OF MECHATRONICS IN AVIATION Flaps and Actuator drive unit-Pilot Static system-Fly by wire control system-Yaw damper-Primary flight control system-Internal navigation system-Under carriage-Measurement of motor rpm-Measurement of air flow velocity-Altitude measurement sensor.	**[09]**
Total Hours	45

Text Book(s):

1.	Middleton, D.H., Ed., "Avionics systems, Longman Scientific and Technical", Longman Group UK Ltd., England, 2021
2	Pallet. E.H.J., "Aircraft Instruments and Integrated Systems", Pearsons, Indian edition 2020.

Reference(s):

1.	Spitzer, C.R. "Digital Avionics Systems", Prentice-Hall, Englewood Cliffs, N.J.,U.S.A. 2019.
2.	Spitzer. C.R. "The Avionics Hand Book", CRC Press, 2019
3.	Mirosaw Adamski, "Power units and power supply systems in UAV", New Edition, Taylor and Francis Group publishers, 2019.
4.	Droneprep, "Unmanned Aircraft Systems Logbook for Drone Pilots & Operators", Create Space Independent Publishing Platform, Latest Edition, 2019.

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**AIRCRAFT AERODYNAMICS**	
1.1	Nomenclature used in Aerodynamics	1
1.2	different parts of airplane	1
1.3	Wing as lifting surface	1
1.4	Aerodynamic features	1
1.5	Aerofoil pressure distribution	1
1.6	Aerodynamic forces and moments Lift and Drag	1
1.7	Drag polar, L/D ratio, high lift devices	1
1.8	Airplane performance, Thrust/Power available	1
1.9	climb and glide	1
1.10	maximum range and endurance, take off and landings	2
2	**AIRCRAFT PROPULSION**	
2.1	Requirement of power	1
2.2	various means of producing power	1
2.3	Brief description of thermo dynamics of engines	1
2.4	Piston engines, Jet engines	1
2.5	Airplane Structure, Materials and Production	1
2.6	Structural arrangement of earlier airplane	1
2.7	developments leading to all metal aircraft	1
2.8	Strength to weight ratio choice of aircraft materials for different parts.	2
3	**NAVIGATION AND GUIDANCE SYSTEM OF AIRCRAFT**	
3.1	Flight Control System	1
3.2	Path planning- Way point Navigation system	2
3.3	Obstacle's avoidance Techniques	1
3.4	functional block of lateral and longitudinal guidance	1
3.5	GPS,GCS	2
3.6	Telementry	1
3.7	Transmitter & Receiver	1
4	**PRIMARY FLIGHT CONTROLS**	
4.1	Ailerons	1
4.2	Aileron Control System of a Commercial Aircraft	1
4.3	Elevators	1
4.4	Elevator control system of a commercial aircraft	1
4.5	Rudders- Rudder Control System	2
5	**APPLICATIONS OF MECHATRONICS IN AVIATION**	
5.1	Flaps and Actuator drive unit	1
5.2	Pilot Static system	1
5.3	Fly by wire control system	1
5.4	Yaw damper	1
5.5	Primary flight control system	1
5.6	Internal navigation system	1
5.7	Under carriage-Measurement of motor rpm	1
5.9	Measurement of air flow velocity	1
5.10	Altitude measurement sensor-Air speed	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	**https://onlinecourses.nptel.ac.in/noc22_ae14/preview**

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC E14	Applied Materials Technology

Category	L	T	P	Credit
PE	3	0	0	3

Objective

- To impart knowledge on the structure and properties of alloys.
- To understand heat treatment processes and hardening techniques.
- To acquire knowledge in ferrous and non-ferrous materials.
- To impart knowledge on Powder metallurgy processes and applications.
- To identity and select suitable characterization techniques for material testing.

Pre-requisite

NIL

Course Outcomes

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

CO1	Understand the various types of alloy structures using iron carbide equilibrium diagram andphase changes of various structures.	Remember
CO2	Identify heat treatment process for engineering applications and case hardening process -carburizing, nitriding and cyaniding.	Apply
CO3	Predict the effect of alloying additions on ferrous and non- ferrous metals.	Apply
CO4	Comply the properties of ceramic materials and powder metallurgy for engineeringapplications and production of different metal powders.	Apply
CO5	Utilize the mechanism of plastic deformation process, testing of mechanical properti andmetallographic procedures.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3			2		2						3	2	2
CO2	3			2		2						3	2	3
CO3	3			2		2						3	2	2
CO4	3			2		2						3	2	3
CO5	3			2		2						3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E14- Applied Materials Technology								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Constitution of Alloys and Phase Diagrams Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, types and construction ofphase diagrams, Iron – Iron carbide equilibrium diagram, eutectic, peritectic, eutectoid and peritectoid reactions.	**[09]**
Heat Treatment Definition – full annealing, stress relief and recrystallization – normalizing, hardening and tempering of steel, austempering, martempering - TTT diagrams -hardenability, jiminy end quench test – case hardening, carburising, nitriding, cyaniding, flame and induction hardening.	**[09]**
Ferrous and Non Ferrous Metals Classification of steel and cast iron- effect of alloying additions on steel (Mn, Si, Cr, Mo, V, Ti & W) - stainless and tool steels – HSLA - gray, white, malleable - alloy cast irons - copper and copper alloys – aluminum and aluminum alloys – bearing alloys, Ni-based super alloys and titanium alloys.	**[09]**
Non-Metallic Materials and Powder Metallurgy Engineering ceramics – properties and applications of Al2O3, SiC - powder metallurgy process - steps involved- characteristics of metal powders - advantages and limitations, major applications: aerospace, nuclear, metal cutting and automobile industries.	**[09]**
Mechanical Properties and Testing Mechanism of plastic deformation - slip and twinning - types of fracture - Destructive testing: testing of materials under tension, compression and shear loads - hardness tests: Brinell, Vickers and Rockwell - impact test: Izod and Charpy - fatigue and creep test – metallography - preparation of specimen, metallurgical microscope and Scanning Electron Microscope.	**[09]**
Total Hours	45

Text Book(s):

1.	Khanna O.P, "A Text Book of Material Science and Metallurgy", Dhanpat Rai Publishers, 2016.
2	Sidney H.Avner "Introduction to Physical Metallurgy" Tata McGraw-Hill Companies Inc., New Delhi, 2012

Reference(s):

1.	William D. Callister, "Material Science and Engineering: An Introduction", Wiley India Pvt Ltd, New Delhi,2012.
2.	Raghavan.V., "Materials Science and Engineering: A First Course",5th Edition, Prentice Hall of India Pvt. Ltd., New Delhi, 2009
3.	George E. Dieter, "Mechanical Metallurgy", Tata McGraw-Hill Companies Inc., New Delhi, 2013
4.	R Balasubramaniam, " Callister's Materials Science and Engineering", Second edition, Wiley,2014.

SDG No.9

NPTEL Course Material

S.No.	Link
1.	https://archive.nptel.ac.in/courses/113/106/113106032/
2.	https://nptel.ac.in/courses/113105024

Course Designers

Dr.M.Baskaran -baskaranm@ksrct.ac.in

60 MC E15	DESIGN OF EXPERIMENTS	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To impart knowledge on various types of experimental designs conduct of experiments
- To understand the different data analysis techniques
- To Understand the importance of Design of Experiments
- Be able to allocate observations using Single Factor Experiments
- To Learn the factorial design of experiments

Prerequisite

Operations Research

Course Outcomes

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

CO1	Apply experimental techniques to practical problems to improve quality of processes	Understand
CO2	Analyze the variance and apply the single factor variance	Analyze
CO3	Learn the factorial design of experiments	Apply
CO4	Design and learn Special Experimental Design	Analyze
CO5	Focuses on design efficient, reliable products using Taguchi method.	Analyze

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3								2	3	3
CO2	3	3	3	3	3							2	3	3
CO3	3	3	3	3								2	3	3
CO4	3	3	3	3								2	3	3
CO5	3	3	3	3								2	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E15-Design of Experiments								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Fundamentals of Experimental Designs Hypothesis testing – single mean, two means, dependant/ correlated samples – confidence intervals, Experimentation – need, Conventional test strategies, Analysis of variance, F-test, terminology, basic principles of design, steps in experimentation. market-standard design analysis – choice of sample size – Normal and half normal probability plot – simple linear and multiple linear regression testing using Analysis of variance.	**(09)**
Single Factor Experiments Completely Randomized Design- effect of coding the observations- model adequacy checking- estimation of model parameters, residuals analysis- treatment comparison methods-Duncan's multiple range test, Newman-Keuel's test, Fisher's LSD test, Tukey's test-testing using contrasts- Randomized Block Design – Latin Square Design- Graeco Latin Square Design – Applications.	**(09)**
Factorial Designs Main and Interaction effects - Two and three factor full factorial designs- Fixed effects and random effects model - Rule for sum of squares and Expected Mean Squares- 2K Design with two and three factors- Yate's Algorithm- fitting regression model- Randomized Block Factorial Design - Practical applications	**(09)**
Special Experimental Design Blocking and Confounding in 2K Designs- blocking in replicated design- 2K Factorial Design in two blocks- Complete and partial confounding- Confounding 2K Design in four blocks- Two level Fractional Factorial Designs- one-half fraction of 2K Design, design resolution, Construction of one-half fraction with highest design resolution, one-quarter fraction of 2K Design	**(09)**
Taguchi Methods Design of experiments using Orthogonal Arrays, Data analysis from Orthogonal experiments-Response Graph Method, ANOVA- attribute data analysis- Robust design- noise factors, Signal to noise ratios, Inner/outer OA design	**(09)**
Total Hours	45

Text Book (s):

1.	Krishnaiah K, and Shahabudeen P, "Applied Design of Experiments and Taguchi Methods", PHI, India, 2011.
2	Douglas C. Montgomery, Design and Analysis of Experiments, John Wiley and sons, 2012.

Reference(s):

1	Box, G. E., Hunter,W.G., Hunter, J.S., Hunter,W.G., Statistics for Experimenters: Design, Innovation, and Discovery, 2nd Edition, Wiley, 2005.
2.	Phillip J. Ross, Taguchi Techniques for Quality Engineering, Tata McGraw-Hill, India, 2005.
3	George E. P. Box, J. Stuart Hunter and William G. Hunter "Statistics for Experimenters: Design, Innovation and Discovery"' Wiley-Interscience, 2nd edition, 2005
4	Jiju Antony **"**Design of Experiments for Engineers and Scientists" Elsevier; 3rd edition, 2003

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**FUNDAMENTALS OF EXPERIMENTAL DESIGNS**	
1.1	Hypothesis testing – single mean, two means, dependant/ correlated samples	1
1.2	Confidence Intervals	1
1.3	Experimentation – need, Conventional test strategies	1
1.4	Analysis of variance, F-test, terminology	1
1.5	Basic principles of design, steps in experimentation	1
1.6	Market-standard design analysis	**1**
1.7	Coice of sample size	1
1.8	Normal and half normal probability	1
1.9	Simple linear and multiple linear regression testing using Analysis of variance	1
2	**SINGLE FACTOR EXPERIMENTS**	
2.1	Completely Randomized Design- effect of coding the observations-	1
2.2	model adequacy checking- estimation of model parameters	1
2.3	Residuals analysis- treatment comparison methods	1
2.4	Duncan's multiple range test,	1
2.5	Newman-Keuel's test	1
2.6	Fisher's LSD test, Tukey's test-testing using contrasts-	1
2.7	Randomized Block Design	1
2.8	Latin Square Design	1
2.9	Graeco Latin Square Design – Applications.	1
3	**FACTORIAL DESIGNS**	
3.1	Main and Interaction effects	1
3.2	Two and three factor full factorial designs	1
3.3	Fixed effects and random effects model	1
3.4	Rule for sum of squares and Expected Mean Squares	1
3.5	2K Design with two and three factors	1
3.6	Yate's Algorithm	1
3.7	Fitting regression model	1
3.8	Randomized Block Factorial Design - Practical applications	2
4	**SPECIAL EXPERIMENTAL DESIGN**	
4.1	Blocking and Confounding in 2K Designs	1
4.2	Blocking in replicated design- 2K Factorial Design in two blocks	1
4.3	Complete and partial confounding	1
4.4	Confounding 2K Design in four blocks	1
4.5	Two level Fractional Factorial Designs	1
4.6	One-half fraction of 2K Design	1
4.7	Design resolution,	1
4.8	Construction of one-half fraction with highest design resolution	1
4.9	One-quarter fraction of 2K Design	1
5	**TAGUCHI METHODS**	
5.1	Design of experiments using Orthogonal Arrays	2
5.2	Data analysis from Orthogonal experiments-Response Graph Method	2
5.3	ANOVA- attribute data analysis	1
5.4	Robust design	1
5.5	noise factors, Signal to noise ratios,	1
5.6	Inner/outer OA design	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	https://www.youtube.com/watch?v=KhjM8YI3agk
2.	https://www.youtube.com/watch?v=p0iUVADJwHk

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC E16	Automation in Process Industries	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- **To intro**duce the importance of automation techniques manufacturing and process industries.
- To impart the role of PLC in industry automation.
- To expose to various sensors employed in process automation.
- To develop safety and control strategies in automation system.
- To expose to various control techniques employed in process automation using PLC

Prerequisite

NIL

Course Outcomes

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

CO1	Understand automation techniques manufacturing and process industries.	Remember, Understar and Apply
CO2	Understand the automated material handling equipment	Analyze
CO3	Apply various control sensors employed in process automation.	Understand
CO4	Develop the safety and control strategies in industrial standard	Understand/Analyze
CO5	Understand various control techniques employed in process automati using IOT.	Understand/Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	2	2	1	1	3	2
CO2	3	3	2	3	1	2	1	1	2	3	3	1	2	2
CO3	3	3	3	3	1	1	1	1	2	1	1	1	3	2
CO4	2	2	3	3	1	2	1	2	3	1	2	1	2	2
CO5	3	3	2	1	1	2	1	1	1	1	2	1	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E16 – Automation in Process Industries								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
V	3	0	0	45	3	40	60	100

Automation in Manufacturing Industries Introduction-Automation in production system, Principles and strategies of automation, Basic elements an automated system, Advanced automation functions, Levels of automations, Automated flow lines a transfer mechanisms, Analysis of transfer lines without storage, Automated flow lines with stora buffers**.**	**[09]**
Material handling Material handling and identification technologies -Overview of material handling systems, Types of material handling equipment, Design of the system, Conveyor system, Automated guided vehicle system, Automated storage and retrievel systems, Interfacing handling and storage with manufacturing.	**[09]**
Sensors and Actuators in Process Automation Types of Sensors -Temperature, Pressure, Flow, Level- Selection and Calibration of Sensors- Actuators: Motors, Valves, and Drives- Integration of Sensors and Actuators in Control Systems	**[09]**
Safety and control Strategies in Automation Safety Instrumented Systems (SIS)- Risk Assessment and Safety Standards-Cybersecurity in Industr Automation-Best Practices for Securing Industrial Control Systems (ICS)- Advanced Control Strategi (PID, Model Predictive Control)- Cascade and Feedforward Control-Batch Processing and Sequent Control-Optimization Techniques in Industrial Processes.	**[09]**
Industrial Automation In IoT Press and Fork lift control using IoT - Fluid powered Assembling, Feeding, Metalworking, materials handling and plastics working application with IoT.	**[09]**
Total Hours	45

Text Book(s):	
1.	M.P.Groover,"Automation, Production Systems and Computer Integrated Manufacturing", 5 th Edition, Pearson Education, 2009.
2	John W. Webb and Ronald A. Reis, "Programmable Logic Controllers: Principles and Applications", 5th Edition, Prentice Hall Inc., New Jersey, 2003.
Reference(s):	
1.	Curtis D. Johnson, "Process Control Instrumentation Technology", 8th Edition, Pearson New International, 2013.
2.	N. Viswanandham, Y. Narahari, "Performance Modeling of Automated Manufacturing Systems", 1st Edition, 2009.
3.	Alasdair Gilchrist, "Industry 4.0: The Industrial Internet of Things", Apress 1st Edition, 2017.
4.	Lucas M.P, Distributed Control Systems, Van Nostrand Reinhold Company, Newyork, 2007.

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	Automation in production system	2
1.1	Principles and strategies of automation	1
1.2	Basic elements of an automated system	2
1.3	Advanced automation functions, Levels of automations	2
1.4	Automated flow lines and transfer mechanisms	1
1.5	**Analysis of transfer lines without storage, Automated flow lines with storage buffers.**	1
	Material handling	
2.1	Material handling and identification technologies	2
2.2	Overview of material handling systems	1
2.3	Types of material handling equipment, Design of the system	2
2.4	Conveyor system, Automated guided vehicle system, Automated storage systems	2
2.5	Interfacing handling and storage with manufacturing ,Overview of Automatic Identification Methods	2
	Sensors and Actuators in Process Automation	
3.1	Types of Sensors	1
3.2	Temperature, Pressure, Flow, Level sensors	2
3.3	Selection and Calibration of Sensors	2
3.4	Actuators: Motors, Valves, and Drives	2
3.5	Integration of Sensors	1
3.6	Actuators in Control Systems	1
	Safety and control Strategies in Automation	
4.1	Safety Instrumented Systems (SIS)	2
4.2	Risk Assessment and Safety Standards, Cybersecurity in Industrial Automation	2
4.3	Best Practices for Securing Industrial Control Systems (ICS).	1
4.4	Advanced Control Strategies (PID, Model Predictive Control),Cascade and Feedforward Control	2
4.5	Batch Processing and Sequential Control, Optimization Techniques in Industrial Processes	2
	Industrial Automation in IoT	
5.1	Press and Fork lift control using IoT	1
5.2	Fluid powered Assembling	2
5.3	Feeding, Metalworking	2
5.4	materials handling	2
5.5	Plastics working application with IoT	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	https://nptel.ac.in/courses/108105063

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC E21	AGRICULTURAL ROBOTICS AND AUTOMATION

Category	L	T	P	Credit
PE	3	0	0	3

Objective

- Recognize the areas in agricultural process where robotics can be applied.
- Integrate sensor and system for a required specific process in agricultural applications.
- Apply Mechanics to the design various robot parameters
- Convert various mechanisms into robot by providing actuation at specific links and joints of the mechanism.
- Develop suitable robotic system for specific agricultural tasks.

Course Outcomes

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

CO1	Know the basics of automation in agriculture. .	Remember, Understand
CO2	Recognize the concepts of Precision agricultural systems and trends	Understand
CO3	understand importance of automation in Irrigation systems	Understand
CO4	Realize the various Automation Practices in agriculture through case studies	Understand
CO5	Apply concepts in material handling and packaging industries	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	2	2	1	1	3	2
CO2	3	3	2	3	1	2	1	1	2	3	3	1	2	2
CO3	3	3	3	3	1	1	1	1	2	1	1	1	3	2
CO4	2	2	3	3	1	2	1	2	3	1	2	1	2	3
CO5	3	3	2	1	1	2	1	1	1	1	2	1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	20	50
Apply	0	20	20
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K.S.Rangasamy College of Technology – Autonomous							R2022
60 MC E21 - Agricultural Robotics and Automation							
MCT							
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**	
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Introduction History of Mechanized Agriculture – Farming Operations and Related Machines – Tillage- Planting Cultivation and Harvesting-Agricultural Automation – Agricultural Vehicle Robot.	**[09]**
Precision Agriculture Sensors – types and agricultural applications- Global Positioning System (GPS) – GPS for civilian use-Differential GPS- Carrier-phase GPS- Real-time kinematic GPS- Military GPS- Geographic Information System- Variable Rate Applications and Controller Area Networks.	**[09]**
Traction and Testing Hitching- Principles of hitching- Types of hitches- Hitching and weight transfer- Control of hitches- Tires and Traction models-Traction predictor spread sheet- Soil Compaction- Traction Aids- Tractor Testing.	**[09]**
Soil Tillage and Weed Management Tillage Methods and Equipment – Mechanics of Tillage Tools – Performance of Tillage Implements-Hitching of Tillage Implements-Weed Management – Conventional Cropping Systems- Tools- Crop Rotation- Mechanical Cultivation.	**[09]**
Robotics and Greenhouse Automation Robotic applications in tasks such as pruning, sorting, and packing-Climate control systems-Automation of irrigation and nutrient delivery-Monitoring and control of greenhouse environments-Sustainable practices in controlled environments.	**[09]**
Total Hours	45

Text Book(s):

1. Ajit K. Srivastava, Carroll E. Goering, Roger P. Rohrbach, Dennis R. Buckmaster, “Engineering Principles of Agricultural Machines”, ASABE Publication, 2019.
2. Qin Zhang, Francis J. Pierce, "Agricultural Automation Fundamentals and Practices", CRC Press, 2016.

Reference(s):

1. Prof Pål Johan,Prof John Billingsley, Robotics and Automation for Improving Agriculture, Burleigh Dodds Series in Agricultural Science, 2019
2. Stephen L Young, Francis J. Pierce, "Automation: The Future of Weed Control in Cropping Systems", Springer, Dordrecht Heidelberg New York London, 2014.
3. R.A. Kepner, Roy Bainer, E.L. Barger, "Principles of Farm Machinery", 3rd Edition, CBS Publishers, New Delhi, 2015.

SDG No. 9 & 12

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	History of Mechanized Agriculture	2
1.1	Farming Operations and Related Machines	1
1.2	Tillage	2
1.3	Planting Cultivation and Harvesting	2
1.4	Agricultural Automation	1
1.5	Agricultural Vehicle Robot.	
	Precision Agriculture	
2.1	Sensors ,types and agricultural applications	2
2.2	Global Positioning System (GPS)	1
2.3	GPS for civilian use- Differential GPS, Carrier, phase GPS, Real-time kinematic GPS, Military GPS	2
2.4	Geographic Information System	1
2.5	Variable Rate Applications and Controller Area Networks	
	Traction and Testing	
3.1	Hitching, Principles of hitching,Types of hitches	2
3.2	Hitching and weight transfer	1
3.3	Control of hitches, Tires and Traction models	2
3.4	Traction predictor spread sheet	1
3.5	Soil Compaction, Traction Aids	2
3.6	Tractor Testing	1
	Soil Tillage and Weed Management	
4.1	Tillage Methods and Equipment	2
4.2	Mechanics of Tillage Tools ,Performance of Tillage Implements ,Hitching of Tillage Implements	2
4.3	Weed Management	1
4.4	Conventional Cropping Systems, Tools	2
4.5	Crop Rotation ,Mechanical Cultivation.	2
	Robotics and Greenhouse Automation	
5.1	Robotic applications in tasks such as pruning, sorting, and packing	2
5.2	Climate control systems	1
5.3	Automation of irrigation and nutrient delivery.	1
5.4	Monitoring and control of greenhouse environments	2
5.5	Sustainable practices in controlled environments	2
	Total	45

NPTEL Course Material

S.No	Link
1.	https://www.youtube.com/watch?v=-NINgz6KQTA&list=PLOSWwFV98rfLAVnU2DJq8xO1LuFw6SXEa

Course Designers

Dr.M.Ravi – ravi@ksrct.ac.in

60 MC E22	DESIGN OF TRANSMISSION SYSTEMS

Category	L	T	P	Credit
PE	3	0	0	3

Objective

- To learn about the and design process for mechanical power transmission components.
- To understand the standard procedure available for Design of Transmission of Mechanical elements
- To learn to use standard data and catalogues.
- To select and design drive systems for a wide variety of driven loads to a
- given performance specification.
- To design a power transmission component with quality assurance.

Prerequisite

NIL

Course Outcomes

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

CO1	Understand and apply the concepts of design to belts, chains and rope drives.	Understand and apply
CO2	Understand and apply the concepts of design to spur, helical gears.	Understand and apply
CO3	Understand and apply the concepts of design to worm and bevel gears.	Understand and apply
CO4	Understand and apply the concepts of design to gear boxes.	Understand and apply
CO5	Understand and apply the concepts of design to cams, brakes and clutch	Understand and apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3										3	3
CO2	2	2	3										3	3
CO3	2	2	3			2							3	3
CO4	2	2	3										3	3
CO5	2	2	3										3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

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

K.S. Rangasamy College of Technology – Autonomous								R2022
60 MC E22 - Design of Transmission Systems								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
III	3	0	0	45	3	40	60	100

DESIGN OF FLEXIBLE ELEMENTS Design of Flat belts and pulleys - Selection of V belts and pulleys – Selection of hoisting wire ropes and pulleys – Design of Transmission chains and Sprockets.	**[09]**
SPUR GEARS AND PARALLEL AXIS HELICAL GEARS Speed ratios and number of teeth-Force analysis -Tooth stresses - Dynamic effects – Fatigue strength - Factor of safety - Gear materials – Design of straight tooth spur & helical gears based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces for helical gears.	**[09]**
BEVEL, WORM AND CROSS HELICAL GEARS Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears. Herringbone gears and Hypoid gears. Worm Gear: Merits and demerits terminology. Thermal capacity, materials-forces and stresses, efficiency, estimating the size of the worm gear pair. Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears. ball & screw mechanisms	**[09]**
GEAR BOXES Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box - Design of multi speed gear box for machine tool applications - Constant mesh gear box - Speed reducer unit. – Variable speed gear box, Fluid Couplings, Torque Converters for automotive applications - gearboxes in vehicles	**[09]**
CAMS, CLUTCHES AND BRAKES Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses. Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-Electromagnetic clutches. Braking methods - advantages & disadvantages- Band and Block brakes - external shoe brakes – Internal expanding shoe	**[09]**
Total Hours	**45**

Text Book(s):

1.	Bhandari V, “Design of Machine Elements”, 4th Edition, Tata McGraw-Hill Book Co, 2016.
2	Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8th Edition, Tata McGraw-Hill, 2008

Reference(s):

1.	Robert C. Juvinall and Kurt M. Marshek, “Fundamentals of Machine Design”, 4 th Edition, Wiley, 2005
2.	Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8th Edition, Printice Hall, 2003
3.	Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003
4.	Sundararajamoorthy T. V, Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2003.

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**DESIGN OF FLEXIBLE ELEMENTS**	
1.1	Design of Flat belts	1
1.2	Design of pulleys	1
1.3	Selection of V belts and pulleys	1
1.4	Selection of pulleys	1
1.5	Selection of hoisting wire ropes	2
1.6	Design of Transmission chains	2
1.7	Design of Sprockets.	1
2	**SPUR GEARS AND PARALLEL AXIS HELICAL GEARS**	
2.1	Speed ratios and number of teeth-Force analysis	2
2.2	Tooth stresses - Dynamic effects	1
2.3	Fatigue strength - Factor of safety	1
2.4	Design of straight tooth spur & helical gears based on strength and wear considerations	2
2.5	Pressure angle in the normal and transverse plane	1
2.6	Equivalent number of teeth-forces for helical gears.	2
3	**BEVEL, WORM AND CROSS HELICAL GEARS**	
3.1	Straight bevel gear: Tooth terminology, tooth forces and stresses	2
3.2	Estimating the dimensions of pair of straight bevel gears.	1
3.3	Herringbone gears and Hypoid gears	1
3.4	Worm Gear: Merits and demerits terminology, materials-forces and stresses	2
3.5	Cross helical: Terminology-helix angles	1
3.6	Estimating the size of the pair of cross helical gears	1
3.7	ball & screw mechanisms	1
4	**GEAR BOXES**	
4.1	Geometric progression - Standard step ratio	1
4.2	Ray diagram, kinematics layout	1
4.3	Design of sliding mesh gear box	1
4.4	Design of multi speed gear box for machine tool applications	2
4.5	Constant mesh gear box - Speed reducer unit.	1
4.6	Variable speed gear box, Fluid Couplings	1
4.7	Torque Converters for automotive applications	1
4.8	gearboxes in vehicles	1
5	**CAMS, CLUTCHES AND BRAKES**	
5.1	Cam Design: Types-pressure angle and under cutting base circle determination	2
5.2	forces and surface stresses	1
5.3	Design of plate clutches –axial clutches-cone clutches	1
5.4	Internal expanding rim clutches- Electromagnetic clutches.	2
5.5	Braking methods - advantages & disadvantages	1
5.6	Band and Block brakes	1
5.7	external shoe brakes – Internal expanding shoe brake	1
	Total	45

NPTEL Course Material

S.No.	Link
1.	**onlinecourses.nptel.ac.in/noc24_me71/preview**

Course Designers

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60 MC E23	Navigation and Communication System	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To familiarize the basic concept on inertial navigation systems
- To facilitate the various types of radio navigation & satellite navigation and their uses
- To gain knowledge on navigation system and guidance system of aircraft
- To provide exposure on the functions of various aircraft communication systems
- To familiarize the use of various principles of weather radar system and DME

Prerequisite

NIL

Course Outcomes

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

CO1	Understand the advanced concepts of Aircraft Navigation	Understand
CO2	Understand the necessary mathematical knowledge those are needed in modeling the navigation process and methods.	Understand
CO3	Apply exposure on various Navigation systems such as Inertial Measurement systems, Radio Navigation Systems, Satellite Navigation and GPS	Apply
CO4	Design Landing aids and will be able to deploy these skills effectively in the analysis and understanding of navigation systems in an aircraft.	Analyze
CO5	Apply the principles of Radar and its related components.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		2			2				2	1	2	3
CO2	3	3					3				2	2	2	2
CO3	3	3	2	3		2					1	2	2	2
CO4	2	2									2	3	2	3
CO5	2	2	2	3							3	3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E23 - Navigation and Communication System								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

INERTIAL NAVIGATION SYSTEMS Introduction to navigation – Types INS components- transfer function and errors – Earth in inertial space – Coriolis Effect – INS Mechanization. Platform and Strap down – Navigation algorithms	**[09]**
RADIO NAVIATION & SATELLITE NAVIGATION Different types of radio navigation- ADF, VOR, DME – Doppler – Hyperbolic Navigations -LORAN, DECCA and Omega – TACAN. Introduction to GPS -system description -basic principles	**[09]**
NAVIGATION CONCEPTS Fundamentals of navigation systems and Position Fixing – Categories of navigation – Geometric concepts of Navigation – The Earth in inertial space – Different Coordinate Systems – Coordinate Transformation – Euler angle formulations – direction cosine matrices formulation – quaternion	**[09]**
AIRCRAFT COMMUNICATION SYSTEMS Basics of aircraft communication system-types Very High Frequency Communication system-Description, Principle, Operation of VHF Communication system - layout on aircraft, High Frequency communication system.	**[09]**
WEATHER RADAR SYSTEM AND DME TCAS, ATC transponders, Weather Radar System, Radio Altimeter, Arinc Communication & reporting.	**[09]**
Total Hours	45

Text Book(s):

1.	Navigation and Communication system “Aircraft Communications and Navigation systems”,Longman Group UK Ltd., England, 2022.
2	Paul. D. Groves. Principles of GNSS, Inertial, and Multi sensor Integrated Navigation Systems, Artech House, 2020.

Reference(s):

1.	Maxwell Noton, Spacecraft navigation and guidance, Springer (London, New York), 2015
2.	Albert D. Helfrick, Modern Aviation Electronics, Second Edition, Prentice Hall Career & Technology, 2016
3.	Albert Helfrick, Practical Aircraft Electronic Systems, Prentice Hall Education, Career & Technology, 2013
4.	George M Siouris, Aerospace Avionics System; A Modern Synthesis, Academic Press Inc., 2010

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**AIRCRAFT AERODYNAMICS**	
1.1	Introduction to navigation	1
1.2	Types INS components	1
1.3	transfer function and errors	1
1.4	Earth in inertial space	2
1.5	Coriolis Effect	1
1.6	INS Mechanization. Platform and Strap down	2
1.7	Navigation algorithms	1
2	**AIRCRAFT PROPULSION**	
2.1	Different types of radio navigation	1
2.2	ADF, VOR, DME& Doppler	1
2.3	Hyperbolic Navigations	2
2.4	LORAN, DECCA and Omega	1
2.5	Introduction to GPS ,system description	2
2.6	,Basic principles	1
3	**NAVIGATION AND GUIDANCE SYSTEM OF AIRCRAFT**	
3.1	Fundamentals of navigation systems and Position Fixing	1
3.2	Categories of navigation	2
3.3	Geometric concepts of Navigation	1
3.4	The Earth in inertial space	2
3.5	Different Coordinate Systems	2
3.6	Telementry Coordinate Transformation & Euler angle formulations	1
3.7	direction cosine matrices formulation & quaternion formulation	2
4	**AIRCRAFT COMMUNICATION SYSTEMS**	
4.1	Basics of aircraft communication system	2
4.2	Types Very High Frequency Communication system	1
4.3	Description, Principle, Operation of VHF Communication system	2
4.4	layout on aircraft.	1
4.5	High Frequency communication system	2
5	**WEATHER RADAR SYSTEM AND DME**	
5.1	TCAS	1
5.2	ATC transponders	1
5.3	Weather Radar System	2
5.4	Radio Altimeter	1
5.5	Arinc Communication & reporting,	2
	Total	45

Course Designers

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NPTEL Course Material

S.No.	Link
1.	https://nptel.ac.in/courses/101104330
2.	https://archive.nptel.ac.in/courses/117/105/117105131/

60 MC E24	Non-Destructive Testing	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To learn the fundamentals of NDT Techniques
- To understand the basic principles of various NDT methods
- To be aware of applications and limitations of the NDT techniques
- To know the different type of service and process defects.
- To learn the NDT method(s) best suited to evaluate the manufactured products.

Pre-requisite

NIL

Course Outcomes

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

CO1	Understand the fundamentals of NDT techniques and testing equipment.	Remember
CO2	Understand the eddy current testing procedures for non-destructive testing	Apply
CO3	Apply principles of magnetism to investigate the service and processing defects	Apply
CO4	Select appropriate radiographic techniques and X-Rays for evaluation	Apply
CO5	Utilize ultrasonic testing as an NDT technique to investigate defects.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3					2	2	2				3	2	2
CO2	3					2	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	2				3	2	2

- Strong;2-Medium;1-Some

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E24- Non Destructive Testing								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Visual Inspection and Liquid Penetrant Testing Introduction to Non Destructive Testing (NDT), scope and advantages of NDT, Comparison of NDT and Destructive testing (DT), classifications of NDT. Equipment used for visual inspection -Magnifying Glass, Magnifying Mirror, Microscope, Borescope and Endoscope. Liquid Penetration Testing: Introduction, Principle, Procedures, Hazards Precautions, Advantages, Limitations and Applications..	**[09]**
Eddy Current Testing Principle of Eddy Current Testing, Advantages, Disadvantages, Factors affecting Eddy Current Response-Material Conductivity, Permeability, Frequency, Geometry and Proximity (Lift off)-Faraday's Law - Lenz's law - Types of Probes.	**[09]**
Magnetic Particle Testing Principle of Magnetic Particle Testing-Different methods to generate magnetic fields -Magnetic Particle Testing Equipment and Testing Procedures - Methods of De-Magnetization- Magnetic Particle Medium-Evaluation of test indications and Acceptance Standards.	**[09]**
Radiographic Testing Radiography Principle-Electromagnetic Radiation Sources- X-ray films, exposure- Penetrometer radiographic imaging-inspection standards and techniques – Neutron radiography – Radiography applications, limitations and safety.	**[09]**
Ultrasonic Testing Principle of operation, Types of Ultrasonic Propagation- Ultrasonic probes - Ultrasonic Transducers - Ultrasonic Testing Techniques. Method for Evaluating Discontinuities - Applications in inspection of castings, forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements.	**[09]**
Total Hours	45

Text Book(s):	
1.	J Prasad, C G K Nair, “Non-Destructive Testing and Evaluation of Materials”, Tata McGraw Hill Education Private Limited, 2017.
2	Prakash Ravi, ”Nondestructive Testing Techniques”, New Age International publishers, 1st Revised Edition,2010.
Reference(s):	
1.	Baldev Raj, Jayakumar.T, Thavasimuthu.M, “Practical Non Destructive Testing”, Narosa Publishing House, New Delhi,3rd Edition, 2009.
2.	American Society for Metals, “Non-Destructive Evaluation and Quality Control” : Metals Hand Book, Vol. 17, 9thEdition, Metals Park, 1992.
3.	Paul E Mix, Wiley, “Introduction to Nondestructive Testing: A Training Guide”, 2nd Edition New Jersey, 2005.
4.	Y. Kong, C.J. Bennett, C.J. Hyde, “A Review of Non-Destructive Testing Techniques for the in-situ investigation of fretting fatigue cracks “, Materials and Design, Vol. 196, Elsevier, 2020.

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Visual Inspection and Liquid Penetrant Testing**	
1.1	Introduction to Non Destructive Testing (NDT), scope and advantages of NDT	1
1.2	Comparison of NDT and Destructive testing (DT)	1
1.3	Classifications of NDT, Equipment used for visual inspection	2
1.4	Magnifying Glass, Magnifying Mirror,	1
1.5	Microscope, Borescope and Endoscope.	1
1.6	Liquid Penetration Testing:	1
1.7	Introduction, Principle, Procedures, Hazards Precautions, Advantages, Limitations and Applications.	2
2	**Eddy Current Testing**	
2.1	Principle of Eddy Current Testing	1
2.2	Advantages, Disadvantages	1
2.3	Factors affecting Eddy Current Response	2
2.4	Material Conductivity, Permeability	1
2.5	Frequency, Geometry and Proximity (Lift off)	2
2.6	Faraday's Law - Lenz's law	1
2.7	Types of Probes	1
3	**Magnetic Particle Testing**	
3.1	Principle of Magnetic Particle Testing	1
3.2	Different methods to generate magnetic fields	1
3.3	Magnetic Particle Testing Equipment and Testing Procedures	2
3.4	Methods of De-Magnetization	1
3.5	Magnetic Particle Medium	1
3.6	Evaluation of test indications and Acceptance Standards.	2
4	**Radiographic Testing**	
4.1	Radiography Principle	1
4.2	Electromagnetic Radiation Sources	1
4.3	X-ray films, exposure	1
4.4	Penetrometer radiographic imaging	2
4.5	inspection standards and techniques	1
4.6	Neutron radiography	1
4.7	Radiography applications	1
4.8	limitations and safety.	1
5	**Ultrasonic Testing**	
5.1	Principle of operation	1
5.2	Types of Ultrasonic Propagation	1
5.3	Ultrasonic probes - Ultrasonic Transducers	1
5.4	Ultrasonic Testing Techniques	2
5.5	Method for Evaluating Discontinuities	1
5.6	Applications in inspection of castings, forgings, Extruded steel parts	2
5.7	Bars, pipes, rails and dimensions measurements	1
	Total	45

Course Designers

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R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC E25	Optimization Techniques	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To impart knowledge about Operations Research techniques and enable students to take effective engineering and managerial decisions
- To equip students to find the optimum solution for transportation problems and assignment problems
- To train students to apply simulation techniques to solve Inventory and queuing problems
- To train students to apply Operations Research techniques for the effective utilization of available resources in engineering and business
- To impart knowledge about network models and train students to apply these concepts to solve the real world problems

Pre-requisite

Statistics and Numerical method

Course Outcomes

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

CO1	Form the Linear Programming models and solve them.	Remember, Understan and Apply
CO2	Apply transportation models and Assignment models to solve real world problems.	Apply
CO3	Apply Inventory models to solve inventory problems	Understand
CO4	Apply Queuing models to solve problems and analyze them using simulation techniques	Apply
CO5	Construct Networks and find optimum solution	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3		2							3	2	3	
CO2	3	2	3	2							3	2	2	
CO3	3	3	3	3							2	3		3
CO4	2	3	3	3								3		2
CO5	2	2		2							3	2	3	
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	45
Apply	20	10	30
Analyse	10	5	15
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
50 MC E25 - Optimization Techniques								
MCT								
Semester	Hours/Week			Total Hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Formulation of Linear Programming Optimization techniques- definition, Phases & Models, Mathematical formulation of linear programming – Graphical solution - Simplex method - Big M method - Introduction to duality theory.	**[09]**
Transportation Model Transportation problems- Balanced and Unbalanced TP- Basic feasible solution, Degeneracy, Production problems. Assignment problems - Hungarian method – Balanced assignment problems-, Travelling salesman problem.	**[09]**
Inventory Models Types of inventory models - Inventory cost - Deterministic Inventory models - Economic Order Quantity (EOQ) - Purchase and Production models without shortages - Determination of buffer stock and re-order levels - ABC, VED & SDE analysis in inventory - Introduction to Stochastic inventory.	**[09]**
Queuing Theory and Simulation Queuing system - terminologies of queuing problem - applications of queuing model - Poisson distribution and exponential distribution –Single server queuing models – Simulation - Need for simulation – Advantages, disadvantages and applications of simulation - Random number generation –	**[09]**
Network Models and Project Management Shortest route model- Minimal spanning tree model - Maximum flow model – Project network construction – Network logic - Fulkerson's rule - Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT) – Probability of completing a project in a scheduled date	**[09]**
Total Hours	45

Text Book(s):

1.	Hamdy A. Taha, "Operation Research - An Introduction", 9th Edition, Pearson India Education Services Pvt. Ltd., New Delhi, 2019.
2	Panneerselvam, R., "Operations Research" 2nd Edition, Prentice Hall of India Private Ltd, New Delhi, 2016.

Reference(s):

1.	Wayne L. Winston, "Operations Research – Applications and Algorithms", 4th Edition, Cengage Learning, 2003 India Private Limited, New Delhi, 2011.
2.	Perm Kumar Gupta, D.S. Hira, "Operations Research", S. Chand and Company Ltd., 2008.
3.	Srinivasan G, "Operations Research Principles and Applications", 3rd Edition EEE PHI, 2017.
4.	Sharma J K, "Operations Research Theory and Applications", 5th Edition, Macmillan India, 2013.

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	Formulation of Linear Programming	
1.1	Optimization techniques- definition, Phases & Models	1
1.2	Mathematical formulation of linear programming	1
1.3	Graphical solution	2
1.4	Simplex method	2
1.5	Big M method	2
1.7	Introduction to duality theory	1
2	Transportation Model	
2.1	Transportation	1
2.2	Balanced and Unbalanced TP	2
2.3	Basic feasible solution	1
2.4	Degeneracy, Production problems	2
2.5	Assignment problems - Hungarian method - Balanced assignment problems	2
2.6	Travelling salesman problem	1
3	Inventory Models	
3.1	Types of inventory models - Inventory cost	1
3.2	Deterministic Inventory models	2
3.3	Economic Order Quantity (EOQ)	1
3.4	Purchase and Production models without shortages	2
3.5	Determination of buffer stock and re-order levels	1
3.6	ABC, VED & SDE analysis in inventory - Introduction to Stochastic inventory	2
4	Queuing Theory and Simulation	
4.1	Queuing system - terminologies of queuing problem	1
4.2	applications of queuing model	1
4.3	Poisson distribution and exponential distribution	2
4.4	Single server queuing models	1
4.5	Simulation - Need for simulation, Advantages, disadvantages and applications of simulation	2
4.6	Random number generation – Monte Carlo technique	2
5	Network Models and Project Management	
5.1	Shortest route model	1
5.2	Minimal spanning tree model	1
5.3	Maximum flow model	1
5.4	Project network construction – Network logic	2
5.5	Fulkerson's rule	1
5.6	Critical Path Method (CPM)	2
5.7	Project Evaluation and Review Technique (PERT)	1
	Total	45

Course Designer

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NPTEL Course Material

S.No.	Link
1.	https://www.youtube.com/watch?v=WwMz2fJwUCg
2.	https://www.youtube.com/watch?v=66aKgySf9vo&list=PLLy_2iUCG87Bq8RGMTdeFZiB-87V4i9p1

60 MC E26	SUPPLY CHAIN MANAGEMENT	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To provide an insight on the fundamentals of supply chain networks, tools and techniques.
- To describe the increasing significance of logistics and its impact on both costs and service in business and commerce.
- To incorporate and learn the critical elements of logistics and supply-chain management processes based on the most relevant application in forward-thinking companies.
- To develop a sound understanding of the important role of supply chain management in today's business environment
- To incorporate a meaningful focus on the rate of change occurring in business today, and more specifically, in business logistics.

Pre-requisite

NIL

Course Outcomes

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

CO1	Understand fundamental supply chain management concepts.	Understand
CO2	Understand the foundational role of logistics in transportation system.	Understand
CO3	Integrating and optimizing the total logistics and supply-chain design.	Understand and apply
CO4	Co-ordinate the efficient handling and movement of goods, services, materials and related information within and between supply chains	Understand and apply
CO5	Learn and apply computer-based supply chain management	Understand and apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2		3								2		2	1
CO2	2		3								2		2	1
CO3	2		3								2		3	1
CO4	2		3								2		3	1
CO5	2		3								2		2	1
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	10	10
Understand	50	30	60
Apply	0	20	30
Analyse	-	-	
Evaluate	-	-	-
Create	-	-	-

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E26 - Supply Chain Management								
MCT								
Semester	Hours/Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

INTRODUCTION Role of Logistics and Supply chain Management: 5 basic steps of supply chain management -Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.	**[09]**
LOGISTICS IN SUPPLY CHAIN Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation- third-party logistics - Logistics Intelligence	**[09]**
COORDINATED PRODUCT AND SUPPLY CHAIN DESIGN General framework - design for logistics – Reverse logistics- supplier integration into the new product development - mass customization - value-added services-differential pricing- dynamic pricing	**[09]**
SOURCING AND COORDINATION IN SUPPLY CHAIN Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - Planning Demand and Supply- Planning and Managing Inventories - Production Planning & Control-supply chain co-ordination - Bull whip effect –Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.	**[09]**
SUPPLY CHAIN AND INFORMATION TECHNOLOGY The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management.	**[09]**
Total Hours	**45**

Text Book(s):

1.	Sunil Chopra, Peter Meindl and Kalra, “Supply Chain Management, Strategy, Planning, and Operation”, Pearson Education, 2010.
2	David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies and Case Studies", McGraw Hill, India, Fourth edition, 2022.

Reference(s):

1.	Srinivasan G.S, “Quantitative models in Operations and Supply Chain Management, PHI, 2010.
2.	David J.Bloomberg , Stephen Lemay and Joe B.Hanna, “Logistics”, PHI 2002
3.	Jeremy F.Shapiro, “Modeling the Supply Chain”, Thomson Duxbury, 2002.
4.	James B.Ayers, “Handbook of Supply Chain Management”, St.Lucle press, 2000.

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**INTRODUCTION**	
1.1	Role of Logistics and Supply chain Management:	1
1.2	5 basic steps of supply chain management	1
1.3	Scope and Importance of supply chain management	1
1.4	Evolution of Supply Chain	1
1.5	Decision Phases in Supply Chain	1
1.6	Competitive and Supply chain Strategies	2
1.7	Drivers of Supply Chain Performance and Obstacles	2
2	**LOGISTICS IN SUPPLY CHAIN**	
2.1	Role of transportation in supply chain	1
2.2	factors affecting transportations decision	1
2.3	Design option for transportation network	1
2.4	Tailored transportation	2
2.5	third-party logistics	2
2.6	Logistics Intelligence	2
3	**COORDINATED PRODUCT AND SUPPLY CHAIN DESIGN**	
3.1	General framework - design for logistics	2
3.2	Reverse logistics	1
3.3	Supplier integration into the new product development	2
3.4	mass customization	1
3.5	value-added services	1
3.6	differential pricing- dynamic pricing	2
4	**SOURCING AND COORDINATION IN SUPPLY CHAIN**	
4.1	Role of sourcing supply chain supplier selection assessment and contracts	2
4.2	Design collaboration - sourcing planning and analysis	1
4.3	Planning Demand and Supply- Planning and Managing Inventories	2
4.4	Production Planning & Control - supply chain co-ordination	1
4.5	Bull whip effect –Effect of lack of co-ordination in supply chain and obstacles	1
4.6	Building strategic partnerships and trust within a supply chain.	2
5	**SUPPLY CHAIN AND INFORMATION TECHNOLOGY**	
5.1	The role IT in supply chain	1
5.2	The supply chain IT frame work	2
5.3	Customer Relationship Management	2
5.4	Internal supply chain management	2
5.5	supplier relationship management.	2
	Total	45

		Category	L	T	P	Credit
60 MC E31	**Robots and Systems in Smart Manufacturing**	PE	3	0	0	3

Objective

- To acquire the basic concepts of Industrial Robot.
- To selection of robots based on various applications.
- To familiar with a material handling system
- To impart the knowledge on robotic welding
- To obtain the knowledge on various type of robot welding operation

Course Outcomes

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

CO1	Recognize various concepts of Industrial Robot.	Remember, Understand
CO2	Select the appropriate manufacturing procedure for Robots	Understand
CO3	Apply various manufacturing process in Robot manufacturing.	Understand
CO4	Learn about the Welding operation and also related to Programming	Understand
CO5	Produce a manufacturing plan for developing a robot	Apply

Mapping with Programme Outcomes

COs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2	2	2	1	1	1	2	2	1	2	3	3
CO2	3	3	2	3	1	2	1	1	2	3	3	2	3	3
CO3	3	3	3	3	1	1	1	1	2	1	1	2	3	3
CO4	2	2	3	3	1	2	1	2	3	1	2	2	3	3
CO5	3	3	2	1	1	2	1	1	1	1	2	2	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	**Continuous Assessment Tests (Marks)**		**End Sem Examination (Marks)**
	1	**2**	
Remember	30	20	30
Understand	30	40	40
Apply	0	0	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous							R2022
60 MCE31 - Robots and Systems in Smart Manufacturing							
MCT							
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**	
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Introduction Types of industrial robots – Load handling capacity – general considerations in Robotic material handling-material transfer – machine loading and unloading – CNC machine tool loading – Robot centered cell	**[09]**
SELECTION OF ROBOTS AND OTHER APPLICATIONS Factors influencing the choice of a robot – robot performance testing – economics of robotisation – Impact of robot on industry and society. Application of Robots in continuous arc welding – Spot welding – Spray painting -assembly operation – cleaning – robot for underwater applications.	**[09]**
Traction and Testing Hitching- Principles of hitching- Types of hitches- Hitching and weight transfer- Control of hitches- Tires and Traction models-Traction predictor spread sheet- Soil Compaction- Traction Aids- Tractor Testing.	**[09]**
MATERIAL HANDLING concepts of material handling - principles and considerations in material handling systems design - conventional material handling systems - industrial trucks - monorails - rail guided vehicles - conveyor systems -cranes and hoists - advanced material handling systems - automated guided vehicle systems - automated storage and retrieval systems(ASRS) - bar code technology - radio frequency identification technology -Introduction to Automation Plant design software.	**[09]**
APPLICATIONS OF ROBOTS IN WELDING AND ALLIED PROCESSES Application of robot in manufacturing: Exploration of practical application of robots in welding: Robots for car body's welding, robots for box fabrication, robots for microelectronic welding and soldering – Applications in nuclear, aerospace and ship building, case studies for simple and complex applications	**[09]**
Total Hours	45

Text Book(s):	
1.	Ajit K. Srivastava, Carroll E. Goering, Roger P. Rohrbach, Dennis R. Buckmaster, "Engineering Principles of Agricultural Machines", ASABE Publication, 2012.
2.	Pires J N, Loureiro A, Bolmsjo G, "Welding Robots: Technology, System Issues and Application", Springer, London, 2010.
Reference(s):	
1.	Parmar R S , "Welding Processes and Technology", Khanna Publishers, New Delhi, 2nd Edition, 2013.
2.	John A. piotrowski, William T. Randolph , "Robotic welding: A Guide to Selection and Application, Welding Division, Robotics International of SME", Publications Development Dept., Marketing Division, 1987.
3.	Mikell P Groover, Mitchel Weiss, Roger N Nagel, N.G.Odrey, AshishDutta , "Industrial Robotics (SIE): Technology, Programming and Applications", 2nd Edition, McGraw Hill Education India Pvt Ltd, 2012.
4.	YoramKoren , "Robotics for Engineers", McGraw-Hill, 1987.

SDG No.4, 9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	Introduction	
1.1	Types of industrial robots	2
1.2	Load handling capacity	1
1.3	General considerations in Robotic material handling	2
1.4	Material transfer, machine loading and unloading	2
1.5	CNC machine tool loading , Robot centered cell	2
2	Selection of Robots and other Applications	
2.1	Factors influencing the choice of a robot	2
2.2	Robot performance testing	1
2.3	Economics of robotisation, Impact of robot on industry and society	2
2.4	Application of Robots in continuous arc welding ,Spot welding, Spray painting	2
2.5	Assembly operation , cleaning, robot for underwater applications.	2
3	Traction and Testing	
3.1	Hitching, Principles of hitching, Types of hitches	2
3.2	Hitching and weight transfer	1
3.3	Control of hitches, Tires and Traction models	2
3.4	Traction predictor spread sheet	1
3.5	Soil Compaction, Traction Aids	2
3.6	Tractor Testing	1
4	Material Handling	
4.1	Concepts of material handling ,principles and considerations in material handling systems design	2
4.2	Conventional material handling systems ,industrial trucks	2
4.3	Monorails, rail guided vehicles ,conveyor systems	1
4.4	Cranes and hoists, advanced material handling systems, automated guided vehicle systems, automated storage and retrieval systems(ASRS)	2
4.5	Bar code technology, radio frequency identification technology, Introduction to Automation Plant design software	2
5	Applications of Robots in Welding and Allied Processes	
5.1	Application of robot in manufacturing: Exploration of practical application of robots in welding	2
5.2	Robots for car body's welding, robots for box fabrication	1
5.3	Robots for microelectronic welding and soldering	2
5.4	Applications in nuclear, aerospace and ship building	2
5.5	Case studies for simple and complex applications	2
	Total	45

NPTEL Course Material

S.No.	Link
1.	**https://archive.nptel.ac.in/courses/110/105/110105155/**

Course Designers

Dr.M.Ravi – ravi@ksrct.ac.in

60 MCE32	Automotive Electronics	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To study the basics of electronics and Various Vehicle Sensors.
- To study the Ignition and Injection system in Automobiles
- To expose students about the automotive engine management and its construction details.
- To understand the principles of comfort, safety systems
- To understand the concept of advanced vehicle technologies of automobiles

Course Outcomes

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

CO1	Know the working of Various Vehicle Sensors	Remember, Understand
CO2	Understand the electronic fuel injection/ignition components and their function.	Remember, Understand
CO3	Study the construction details of new developments in engine management	Remember, Understand
CO4	Exposure of different automotive safety systems	Understand
CO5	Acquire knowledge about advanced vehicle technology and navigation systems	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1	1	1	2	2	1	1	3	3
CO2	3	3	2	3	1	2	1	1	2	3	3	1	3	3
CO3	3	3	3	3	1	1	1	1	2	1	1	1	3	3
CO4	2	2	3	3	1	2	1	2	3	1	2	1	3	3
CO5	3	3	2	1	1	2	1	1	1	1	2	1	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	40	40
Apply	0	0	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E32 - Automotive Electronics								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Vehicle Sensors Working principle of sensors-speed and pressure sensors, vehicle speed sensors(VSS), manifold absolute pressure sensor(MAP), knock sensor, mass air flow sensor (MAF)-Temperature sensors, coolant and exhaust gas temperature sensor, exhaust oxygen level sensor-position sensors, throttle position sensor, accelerator pedal position sensor and crank shaft position sensor-Air mass flow sensor**.**	**[09]**
Ignition and Injection Ignition Systems: Ignition fundamental, types of electronic ignition Systems. Programmed ignition, Distribution less ignition, Direct ignition, IGBTs automotive ignition- Spark plugs – Injection Systems – Throttle body injection – Multipoint fuel injection – Sequential fuel injection – GDI –CRDI- Supercharger.	**[09]**
Engine Management Introduction: Input, output and control strategies, Combined electronic Ignition and Fuel Management Systems – Exhaust Emission Control – Advanced vehicle control systems – New developments in engine management system, fuel injection timing control.	**[09]**
Safety and Comfort Antilock Braking System (ABS) – Traction Control System (TCS) —Electric Seats-Power steering, mirrors and sun-roofs – Central locking and electric windows - Cruise Control System (CCS) - Electric power steering - electronic clutch – Electronic suspension system – airbags, seat belt tensioners, collision avoidance Radar warning system and low tire pressure warning system	**[09]**
Advanced Vehicle Technology Gasoline Direct Injection.- Electronic Control of Automatic Transmission (ECAT) – Keyless entry – Noise control – Reverse sensing / parking aid – Car navigation system – Telematics - Global Positioning System, e- mobility	**[09]**
Total Hours	**45**

Text Book(s):	
1.	Tom Denton, “Automobile Electrical and Electronics Systems”, Edward Arnold Publishers, 2000.
2.	Ribbens, "Understanding Automotive Electronics", 8th Edition, Elsevier, Indian Reprint, 2017.
Reference(s):	
1.	Allan Bonnick, Automotive computer controlled systems, Kindle Edition, 2012.
2.	William B. Ribbens, “Understanding Automotive Electronics”, Butterworth-Heinemann, Burlington, 2003.
3	Richard K. Dupuy “Fuel System and Emission controls”, Check Chart Publication,4th edition, 2000.
4.	Bosch Automotive Hand Book, 8 th Edition, 2011.

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Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	Vehicle Sensors	
1.1	Working principle of sensors-speed and pressure sensors	1
1.2	Vehicle speed sensors(VSS), manifold absolute pressure sensor(MAP),	1
1.3	Knock sensor, mass air flow sensor (MAF)	1
1.4	Temperature sensors, Coolant and exhaust gas temperature sensor, exhaust oxygen level sensor	1
1.5	Position sensors, throttle position sensor	1
1.6	Accelerator pedal position sensor and crank shaft position sensor	2
1.7	Air mass flow sensor.	2
2	**Ignition and Injection**	
2.1	Ignition Systems: Ignition fundamental, types of electronic ignition Systems.	1
2.2	Programmed ignition, Distribution less ignition,	1
2.3	Direct ignition, IGBTs automotive ignition	1
2.4	Spark plugs – Injection Systems	2
2.5	Throttle body injection – Multipoint fuel injection	2
2.6	Sequential fuel injection – GDI –CRDI- Supercharger	2
3	**Engine Management**	
3.1	Introduction: Input, output and control strategies,	2
3.2	Combined electronic Ignition and Fuel Management Systems	1
3.3	Exhaust Emission Control	2
3.4	Advanced vehicle control systems	1
3.5	New developments in engine management system,	1
3.6	Fuel injection timing control.	2
4	Safety and Comfort	
4.1	Antilock Braking System (ABS)	2
4.2	Traction Control System (TCS)	1
4.3	Electric Seats-Power steering, mirrors and sun-roofs – Central locking and electric windows - Cruise Control System (CCS)	2
4.4	Electric power steering - electronic clutch	1
4.5	Electronic suspension system	1
4.6	Airbags, seat belt tensioners, collision avoidance Radar warning system and low tire pressure warning system	2
5	**Advanced Vehicle Technology**	
5.1	Gasoline Direct Injection.	1
5.2	Electronic Control of Automatic Transmission (ECAT) – Keyless entry	2
5.3	Noise control – Reverse sensing / parking aid	2
5.4	Car navigation system – Telematics	2
5.5	Global Positioning System, e- mobility	2
	Total	45

Course Designers

Dr.C.Vijayakumar – vijayakumarc@ksrct.ac.in

NPTEL Course Material

S.No.	Link
1.	https://onlinecourses.nptel.ac.in/noc24_de03/preview

60 MC E33	DESIGN OF UAV SYSTEMS	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To expose students to concepts needed in modelling and analysing an unmanned system.
- To expose students to the design and development of UAV.
- To expose students to the type of payloads used in UAV.
- To study path planning communication and payload control
- To understand the avionics hardware used in the UAV

Course Outcomes

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

CO1	Understand the concept of UAV system	Remember, Understand
CO2	Prepare preliminary design requirements for an unmanned aerial vehicle.	Remember, Understand
CO3	Identify different hardware for UAV	Remember, Understand
CO4	Perform system testing for unmanned aerial vehicles	Understand
CO5	Design micro aerial vehicle systems by considering practical limitations.	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2	2	1	2	2	1	1	2	3
CO2	3	3	2	3	2	2	2	1	2	3	3	1	3	2
CO3	3	3	3	3	2	1	2	1	2	1	1	2	2	3
CO4	2	2	3	3	2	2	2	2	3	1	2	2	3	2
CO5	3	3	2	1	2	2	2	1	1	1	2	2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	40	40
Apply	0	0	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MCE33 - DESIGN OF UAV SYSTEMS								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

INTRODUCTION TO UAV History of UAV –classification – Introduction to Unmanned Aircraft Systems--models and prototypes – System Composition-applications	**[09]**
THE DESIGN OF UAV SYSTEMS Introduction to Design and Selection of the System- Aerodynamics and Airframe Configurations Characteristics of Aircraft Types- Design Standards and Regulatory Aspects-UK,USA and Europe Design for Stealth--control surfaces-specifications.	**[09]**
AVIONICS HARDWARE Autopilot – AGL-pressure sensors-servos-accelerometer –gyros-actuators- power supply processor, integration, installation, configuration, and testing	**[09]**
COMMUNICATION PAYLOADS AND CONTROLS Payloads-Telemetry-tracking-Aerial photography-controls-PID feedback-radio control frequency range –modems-memory system-simulation-ground test-analysis-trouble shooting	**[09]**
THE DEVELOPMENT OF UAV SYSTEMS Waypoints navigation-ground control software- System Ground Testing- System In-flight Testing Future Prospects and Challenges-Case Studies – Mini and Micro UAVs.	**[09]**
Total Hours	45

Text Book(s):

1.	Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems, Inc, 1998
2.	Reg Austin “Unmanned Aircraft Systems UAV design, development and deployment”, Wiley, 2010.

Reference(s):

1.	Dr. Armand J. Chaput, “Design of Unmanned Air Vehicle Systems”, Lockheed Martin Aeronautics Company, 2001
2.	Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007
3.	Robert C. Nelson, Flight Stability and Automatic Control, McGraw-Hill, Inc, 1998.

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	INTRODUCTION TO UAV	
1.1	History of UAV	1
1.2	Classification	1
1.3	Introduction to Unmanned Aircraft Systems	1
1.4	Models and prototypes	1
1.5	System Composition	1
1.6	Applications	1
2	**THE DESIGN OF UAV SYSTEMS**	
2.1	Introduction to Design and Selection of the System	1
2.2	Aerodynamics and Airframe Configurations	1
2.3	Characteristics of Aircraft Types	1
2.4	UK,USA and Europe Design for Stealth	1
2.5	Control surfaces	1
2.6	Specifications	1
3	**AVIONICS HARDWARE**	
3.1	Autopilot	1
3.2	AGL-pressure sensors	2
3.3	Servos-accelerometer	1
3.4	Power supply processor	1
3.5	Integration, installation	2
3.6	Configuration, and testing	1
4	**COMMUNICATION PAYLOADS AND CONTROLS**	
4.1	Payloads	1
4.2	Telemetry-tracking	1
4.3	Aerial photography	1
4.4	Controls-PID feedback.	1
4.5	Radio control frequency range	2
4.6	Modems-memory system	1
4.7	Simulation-ground test-analysis	2
4.8	Trouble shooting	1
5	**THE DEVELOPMENT OF UAV SYSTEMS**	
5.1	Waypoints navigation	1
5.2	Ground control software	1
5.3	System Ground Testing	1
5.4	System In-flight Testing	1
5.5	Future Prospects and Challenges	1
5.6	Case Studies – Mini and Micro UAVs	1
	Total	45

NPTEL Course Link

S. No	Link
1	https://archive.nptel.ac.in/courses/101/104/101104073/

Course Designers

Mr.S.Hari Prasadh -hariprasadh@ksrct.ac.in

60 MCE34	Non-Conventional Machining Processes	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- Give an exposure about various unconventional machining processes.
- Recognize the role of mechanical energy in unconventional machining processes.
- Gain the knowledge on machining the electrically conductive material through electrical energy in unconventional machining processes
- Impart specifies the concept of machining the hard material using chemical energy and electrochemical energy.
- Familiarity with various thermal energy based unconventional machining processes.

Course Outcomes

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

CO1	Describe the classification of non-traditional machining methods and process selection.	Remember, Understand
CO2	Understand the Mechanical energy based unconventional machining processes.	Remember, Understand
CO3	Understand the Electrical energy based unconventional machining processes.	Remember, Understand
CO4	Recognize the Chemical and Electrochemical energy based unconventional machining processes.	Remember, Understand
CO5	Understand the Thermal energy based unconventional machining processes	Remember, Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1		2	2	2	1	3	3	3
CO2	3	3	2	3	1	2		2	2	3	3	3	3	3
CO3	3	3	3	3	1	1		2	2	1	1	3	3	3
CO4	2	2	3	3	1	2		2	3	1	2	3	3	3
CO5	3	3	2	1	1	2		2	1	1	2	3	3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	40	40
Apply	0	0	0
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MCE34 - Non-Conventional Machining Processes								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Introduction Introduction - Need of non-traditional machining Methods - Classification of modern machining processes, Process selection, Materials Applications. Ultrasonic machining: Elements of the process, mechanics of metal removal process, parameters, economic considerations, applications and limitations, recent development.	**[09]**
Mechanical Energy Based Processes Abrasive Jet Machining, Water Jet Machining and Abrasive Water Jet Machining: Basic principles, equipment, process variable, and mechanics of material removal (MRR)-application and limitations	**[09]**
Electrical Energy Based Processes Electric Discharge Machining (EDM): Basic principle, equipment, Process Parameters, Surface Finish and MRR, electrode/Tool, Power and control Circuits, Tool Wear, Dielectric, Flushing. Wire cut EDM, Applications.	**[09]**
Chemical and Electro-Chemical Energy Based Processes Chemical machining: Etchants, Maskant, techniques of applying mask ants, Process Parameters, Surface finish and MRR, Applications. Electro-Chemical machining: Basic principle, equipment, Surface Roughness and MRR Electrical Circuit, Process Parameters, Electrochemical grinding and Electrochemical Honing Applications.	**[09]**
Thermal Energy Based Processes Laser Beam machining and drilling (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles – Equipment –Types - Beam control techniques – Applications.	**[09]**
Total Hours	45

Text Book(s):	
1.	K K Singh, “Unconventional Manufacturing Process”, Dhanpat Rai & Company, New Delhi, 2012.
2.	P C Pandey and H S Shan, “Modern Machining Processes” Tata McGraw-Hill, New Delhi, 2017.
Reference(s):	
1.	Paul De Garmo, J.T. Black, and Ronald.A. Kohser, Material and Processes in Manufacturing, Prentice Hall of India Pvt. Ltd., New Delhi, 2011.
2.	Serope Kalpakjian and Steven Schmid, “Manufacturing Engineering and Technology”, 7th Edition, Pearson education India Ltd, New Delhi, 2013.
3.	P. K. Mishra, Non-Conventional Machining, Narosa Publishing House, New Delhi, 2010.
4.	Gary F Benedict, ‘Nontraditional Manufacturing processes”, CRC press, 2011

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Course Contents and Lecture Schedule

S. No	Topic	No. of Hours
1	**Introduction and Mechanical Energy Based Processes**	
1.1	Comparison between traditional and non- conventional machining process	1
1.2	Need for Non - conventional machining process	1
1.3	Classification based on nature of energy employed in machining	1
1.4	Selection of non-conventional machining processes	1
1.5	Specific advantages, limitations and applications	1
1.6	Abrasive Jet Machining - Working Principles – equipment used – Process parameters – MRR - Applications.	1
1.7	Water Jet Machining - Working Principles – equipment used – Process parameters – MRR - Applications.	1
1.8	Abrasive Water Jet Machining - Working Principles – equipment used – Process parameters – MRR - Applications.	1
1.9	Ultrasonic Machining - Working Principles – equipment used – Process parameters – MRR - Applications.	1
2	**Thermal and Electrical Energy Based Processes**	
2.1	Electric Discharge Machining – Working Principle – equipments - Process Parameters - Surface Finish and MRR - Electrode/Tool – Power and Control Circuits - Tool Wear	1
2.2	Wire cut EDM - Working Principle – equipments - Process Parameters - Surface Finish and MRR - Electrode/Tool – Power and Control Circuits - Tool Wear	1
2.3	Electrical Discharge Grinding Working Principle – equipments - Process Parameters - Surface Finish and MRR - Electrode/Tool – Power and Control Circuits - Tool Wear	1
2.4	Flushing types - Pressure Flushing, Suction Flushing, Side Flushing, Pulsed Flushing.	1
2.5	EDM Process Parameters: Spark Frequency, Current & Spark Gap, Surface Finish, Heat Affected Zone	1
2.6	Laser Beam Machining - Principles – Equipment – Types – Beam control techniques – Applications	1
2.7	Laser Beam Drilling - Principles – Equipment – Types – Beam control techniques – Applications	1
2.8	Plasma Arc Machining - Principles – Equipment – Types – Beam control techniques – Applications	1
2.9	Electron Beam Machining - Principles – Equipment – Types – Beam control techniques – Applications	1
3	**Chemical and Electro-Chemical Energy Based Processes**	
3.1	Chemical Machining - Process Parameters	1
3.2	Surface Finish and MRR - Applications	1
3.3	Electro-Chemical Machining - Process Parameters	1
3.4	Surface Finish and MRR - Applications	1
3.5	Etchants – Maskant techniques of applying maskants	1
3.6	Principles of ECM - Equipment - Surface Roughness	1
3.7	ECM - MRR - Electrical Circuit	1
3.8	Electro-Chemical Grinding - Process Parameters - Applications	1
3.9	Electro-Chemical Honing - Process Parameters - Applications	1
4	**Advanced Nano Finishing Processes**	
4.1	Abrasive Flow Machining - working principles, equipments	1
4.2	Effect of process parameters, applications, advantages and limitations	1
4.3	Chemo Mechanical Polishing - working principles, equipments	1
4.4	Effect of process parameters, applications, advantages and limitations	1

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

4.5	Magnetic Abrasive Finishing - working principles, equipments	1
4.6	Effect of process parameters, applications, advantages and limitations	1
4.7	Magnetorheological Abrasive Flow Finishing - working principles, equipments	2
4.8	Effect of process parameters, applications, advantages and limitations	1
5	**Recent Trends in Non-conventional Machining Processes**	
5.1	Recent developments in non-conventional machining processes	2
5.2	Electric Discharge Diamond Grinding - working principles, equipments	1
5.3	Effect of process parameters, applications, advantages and limitations	1
5.4	Wire Electro Discharge Grinding - working principles, equipments	1
5.5	Effect of process parameters, applications, advantages and limitations	1
5.6	Electro Chemical Spark Machining - working principles, equipments	1
5.7	Effect of process parameters, applications, advantages and limitations	1
5.8	Comparison of non-conventional machining processes	1
	Total Hours	**45**

SDG No.9

NPTEL Course Link

S. No	Link
1	https://nptel.ac.in/courses/112103202
2	https://archive.nptel.ac.in/courses/112/105/112105212/

Course Designers

Dr. A.Ramesh Kumar - rameshkumar@ksrct.ac.in

60 MCE 35	Product Design and Costing	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To enable the student to understand the various aspects of the product design and development.
- To educate the concept of customer need and product architecture.
- To train the student in the concept of product development economics in product design.
- To impart knowledge on various types of costs associated with production of components
- To educate the concept of work study and ergonomics and its influence in production.

Course Outcomes

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

CO1	Understand the fundamentals of product design, planning, development and product life cycle.	Remember, Understand
CO2	Understand the significance of customer satisfaction and issues associated with it	Remember, Understand
CO3	Learn the economic analysis process, factors affecting it and trade-offs.	Remember, Understand
CO4	Estimate various types of costs for producing components by turning, drilling, shaping, planning, milling, grinding, welding and forging.	Remember, Understand
CO5	Learn the process of work study, method study, tools and techniques used for it and able to calculate the standard time	Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	1		2	2	2	2		3	3
CO2	3	3	2	3	2	2		2	2	3	3		3	3
CO3	3	3	3	3	2	1		2	2	1	1		3	3
CO4	2	2	3	3	2	2		2	3	1	2		3	3
CO5	3	3	2	1	1	2		2	1	1	2		3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	40	40
Apply	0	0	30
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MCE35 - Product Design and Costing								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Product Design and Development Principles of creativity in design - Product development planning - Planning process - Product analysis – Criteria for product design - Market research - Design for customer and design for manufacture - Product life cycle.	**[09]**
Customer Needs and Product Architecture Customer satisfaction - Voice of customer, Types of customer needs, customer need model - Organizing and prioritizing customer needs. Product architecture - Architecture types - Implication - Establishing product modularity – types.	**[09]**
Product Development Economics Elements of economic analysis - Quantitative analysis- Qualitative analysis. Economic Analysis Process - build a base- Case financial model - Sensitivity analysis - Understand the project trade-offs - Influence of the qualitative factors on project success.	**[09]**
Cost Estimation of Manufactured Jobs Cost estimation to find out labor and total costs for simple machining works such as Turning, Drilling, Shaping Planning, Milling, Grinding, Cast, Welded and forged components.	**[09]**
Work Study and Ergonomics Method study - definition - objectives - Motion economy principles - Tools and techniques – applications. Work and Measurement - purpose - use - procedure techniques - Standard time. Ergonomics - tools - principles - applications.	**[09]**
Total Hours	**45**

Text Book(s):	
1.	Karl T. Ulrich, Steven D. Eppinger, “Product Design and Development”, Tata Mc Graw-Hill edition, 4th Edition, 2012.
2.	Kevin Otto, Kristin Wood, “Product Design: Techniques in Reverse Engineering and New Product Development”, Pearson education, 2012.
Reference(s):	
1.	George E Dieter, “ Engineering Design: A Materials and Processing Approach”, McGraw Hill Publishing Company, London, 2000.
2.	Stanley Walker Jones, “Product Design and Process Selection”, Butterworth Publications, 1973.
3	Sameul Eilon, “Elements of Production Planning and Control”, McMillan and Company, 1962.
4.	R Kesavan, C Elanchezhian and B Vijaya Ramnath, “Process Planning and Cost Estimation”, New Age International (P) Ltd., Publishers, 2015.

SDG No.9

NPTEL Course Material

S.No.	Link
1.	https://onlinecourses.nptel.ac.in/noc24_me58/preview

Course Designers

Dr.C.Vijayakumar – vijayakumarc@ksrct.ac.in

60 MC E36	Ware House Management	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To develop competencies and knowledge of students to become Warehouse professionals
- To orient students in the field of Logistics
- To understand Warehousing and distribution centre operations.
- To study Warehouse Safety Rules and Procedures
- To understand complete the analysis and to select the most appropriate solution for ware-house automation

Course Outcomes

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

CO1	Understand the Basic concept of Warehouse	Remember, Understand
CO2	Plan the activity in the field of Logistics	Remember, Understand
CO3	Identify Warehousing and distribution centre operations	Remember, Understand
CO4	Know the Warehouse Safety Rules and Procedures	Remember, Understand
CO5	Understand the basic concept of the most common automations from light to heavy	Remember, Understand

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	2	2	2		2	2	2	2		3	3
CO2	3	3	2	3	2	2		2	2	3	3		3	3
CO3	3	3	3	3	2	1		2	2	2	2		3	3
CO4	2	2	3	3	2	2		2	3	2	2		3	3
CO5	3	3	2	2	2	2		1	1	1	2		3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	30	20	30
Understand	30	40	70
Apply	0	0	0
Analyse	0	0	0
Evaluate	0	0	0
Create	0	0	0

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC E36- Ware House Management								
MCT								
Semester	**Hours / Week**			**Total hrs**	**Credit**	**Maximum Marks**		
	L	T	P		C	CA	ES	Total
VI	3	0	0	45	3	40	60	100

Introduction to Warehouse **(**Storage and Packaging) Background – Need for Warehouse – Importance of warehouse -Types of Warehouses -Broad functions in a warehouse -warehouse layouts and layout related to functions. Associate warehouse -Its functions -equipment available in associate ware house -Video on warehouse – Visits to ware houses - Warehouse Organization Structure -Benefits of Warehousing.	**[09]**
Receiving and Dispatch of Goods in warehouse Various stages involved in receiving goods – Stages involved receipt of goods-Advanced shipment notice (ASN) or invoice items list-Procedure for Arranging of goods on dock for counting and Visual inspection of goods unloaded-Formats for recording of goods unloaded from carriers-Generation of goods receipt note using computer-Put away of Goods-Put away list and its need-Put away of goods into storage locations -storage location codes and its application-Process of put away activity-Procedure to Prepare Warehouse dispatches	**[09]**
Warehouse Activities Explain receiving, sorting, loading, unloading, Picking Packing and dispatch, activities and their importance in a warehouse -quality parameters -Quality check-need for quality check-importance of quality check. Procedure to develop Packing list / Dispatch note-Cross docking method -Situations suited for application of cross docking -Information required for coordinating cross docking-Importance of proper packing-Packing materials -Packing machines -Reading labels	**[09]**
Warehouse Safety Rules and Procedures The safety rules and 'Procedures to be observed in a Warehouse -Hazardous cargo – Procedure for Identification of Hazardous Cargo -safety data sheet-Instructions to handle hazardous cargo - Familiarization with the industry. Health, Safety & Environment -safety Equipment's and their uses -5S Concept on shop floor. Personal protective Equipment's (PPE) and their uses.	**[09]**
Warehouse Automation Vehicles Material Flow Automation -Conveyors -Lifts -Automated Guided Vehicles –Monorail- Picking/Outbound Automation : Pick / Put To Light -A Frame -Automated Order Selection – Pick-N-Go - Outbound Sorters - Automatic Truck Loading	**[09]**
Total Hours	45

Text Book(s):	
1.	JP Saxena, Warehouse Management and Inventory Control-Vikas Publication House Pvt Ltd, First Edition, 2003.
2.	Warehouse Management: Automation and Organisation of Warehouse and Order Picking Systems, Michael Ten Hompel, Thorsten Schmidt, Springer-verlag, First Edition, 2006.
Reference(s):	
1.	Keller, S., & Keller, B. C. The definitive guide to warehousing: managing the storage and handling of materials and products in the supply chain. Pearson Education,2014
2.	.Kimon P. Valavanis, "Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy", Springer, 2007
3.	Advanced Industrial Automation and its Application: Ravindra Sharma Industrial Control Electronics Devices, Systems, & Applications 3D Edition Author: Terry Bartler Publisher: Delmar
4.	Richards, G. . Warehouse management: a complete guide to improving efficiency and minimizing costs in the modern warehouse. Kogan Page Publishers,2017

SDG No.9

Course Contents and Lecture Schedule

S.No	Topic	No. of Hours
1	**Introduction to Warehouse**	
1.1	Introduction to Warehouse	1
1.2	(Storage and Packaging) Background	1
1.3	Need for Warehouse – Importance of warehouse	1
1.4	Types of Warehouses -Broad functions in a warehouse	1
1.5	warehouse layouts and layout related to functions.	1
1.6	Associate warehouse -Its functions	1
1.7	equipment available in associate ware house	1
1.8	Video on warehouse – Visits to ware houses	1
1.9	Warehouse Organization Structure -Benefits of Warehousing.	1
2	**Receiving and Dispatch of Goods in warehouse**	
2.1	Receiving and Dispatch of Goods in warehouse	1
2.2	Various stages involved in receiving goods	1
2.3	Stages involved receipt of goods-Advanced shipment notice (ASN) or invoice items list	1
2.4	Procedure for Arranging of goods on dock for counting and Visual inspection of goods unloaded	1
2.5	Formats for recording of goods unloaded from carriers-Generation of goods receipt note using computer	1
2.6	Put away of Goods-Put away list and its need-Put away of goods into storage locations	1
2.7	storage location codes and its application	1
2.8	Process of put away activity	1
2.9	Procedure to Prepare Warehouse dispatches	1
3	**Warehouse Activities**	
3.1	Warehouse Activities	1
3.2	Elucidate receiving, sorting, loading, unloading, Picking Packing and dispatch, activities and their importance in a warehouse	
3.3	quality parameters -Quality check-need for quality check-importance of quality check.	1
3.4	Procedure to develop Packing list / Dispatch note	1
3.5	Cross docking method -Situations suited for application of cross docking	1
3.7	Information required for coordinating cross docking	1
3.8	Importance of proper packing	1
3.9	Packing materials	1
4	**Warehouse Safety Rules and Procedures**	
4.1	Warehouse Safety Rules and Procedures	1
4.2	The safety rules and 'Procedures to be observed in a Warehouse	1
4.3	Hazardous cargo – Procedure for Identification of Hazardous Cargo	1
4.4	safety data sheet-Instructions to handle hazardous cargo	1
4.5	Familiarization with the industry.	1
4.6	Health, Safety & Environment	1
4.7	safety Equipment's and their uses	1
4.8	5S Concept on shop floor.	1
4.9	Personal protective Equipment's (PPE) and their uses.	1
5	**Supply Chain and Warehousing**	
5.1	Supply Chain and Warehousing	1
5.2	Introduction, Objectives	1
5.3	Supply Chain Impact on Stores and Warehousing	1
5.4	Retail Logistics	1
5.5	Retail transportation	1
5.6	Issues in retail logistics.	1
5.7	Retailing and Warehousing	
5.8	Challenges in retail warehousing	1
5.9	Setting up a warehouse	
	Total	45

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

NPTEL Course Material

Sl.No	Nptel Link
1.	http://www.digimat.in/nptel/courses/video/106106093/L31.html
2.	https://archive.nptel.ac.in/courses/110/106/110106045/
3.	https://www.youtube.com/watch?v=m-aKj5ovDfg
4.	http://www.digimat.in/nptel/courses/video/110105094/L01.html
5.	https://archive.nptel.ac.in/courses/110/105/110105141/

Course Designers

Mr.R.Vivek – vivekr@ksrct.ac.in

Open Elective

60 MC L005	Introduction to Occupational Health	Category	L	T	P	Credit
		PE	3	0	0	3

Objective

- To Identify the various fields of safety and risk management
- To Identify and describe the organization of regulatory agencies that deal with issues of occupational safety and health, environmental health, and risk management.
- To Define and understand basic terminology used in the field of occupational safety and health and apply it appropriately.
- To Describe and demonstrate how to access safety information and resources.
- To Describe the history and evolution of occupational safety and health.

Prerequisite

NIL

Course Outcomes

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

CO1	Need for EHS in industries and related Indian regulations	Understand
CO2	Various types of Health hazards, effect, assessment and control methods	Understand
CO3	Various safety systems in working environments	Apply
CO4	The methodology for preparation of Emergency Plans and Accident investigation	Analyze
CO5	EHS Management System and its elements	Apply

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	3	3					2	3	2	3	3
CO2	3	3	2		3					3			2	2
CO3	2		2	2						3	2		3	3
CO4		3	2	3	3					2		3	2	3
CO5	3			3	2						3		3	3
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination(Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K. S. Rangasamy College of Technology – Autonomous								R2022
60 MC L005– Introduction to Occupational Health								
Open to All Branches								
Semester	Hours/Week			Total Hours	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Basics of Occupational Health

History of Occupational Health- Triangle of occupational health, Occupational health, hygiene and wellbeing – need for Occupational history- Industrial process and hazards. [09]

Physical Health

Hazards, Types of hazards ,Physical, Chemical, Biological and Ergonomical hazards- effect of hazard, Notifiable diseases- Hazard control measures –Occupational exposure limits – Permissible Exposure Limit(PEL),Recommended Exposure Limit(REL),Threshold Limit Value-Time Weighted Average, TLV-TWA, Short Term Exposure Limit (STEL) ,Long Term Exposure Limit, Immediate Danger to Life and Health (IDLH)-Occupational health surveillance [09]

Mental Health

Psychosocial factors and hazards in occupation- Shift work –fitting job to man –effects of psychosocial factors fatigue, anxiety and stress- Job rotation - welfare activities. [09]

Statutory norms

National policy on Safety, health and environment at work place - Provisions pertaining to occupational health under the Factories Act,1948 and Tamil Nadu Factories Rules,1950 – Overview about Occupational Safety, health and Working Conditions Code 2020- Introduction to American Conference for Governmental Industrial Hygienist (ACGIH) & National Institute of Occupational Safety and Health (NIOSH),overview about OSHA Standards. [09]

Safety practices

Safety protocols to minimize hazards, hazard control hierarchy, and risk matrix –work design, automation - overview on Behavior based safety and safety culture. [09]

Total Hours 45

Text Book(s):

1. Haldar S K, " Industrial and Occupational Health, CBS Publishers & Distributors Private Limited, New Delhi,2017
2. Charles D Reese, "Occupational Health and Safety Management: A Practical Approach", CRC Press, 3rd Edition, 2018.

Reference(s):

1. "The Factories Act 1948", Madras Book Agency,Chennai,2017
2. Jayaraj G, "Occupational Health Practice in Indian Industries", Occupational health foundation,Chennai,2012
3. Danuta Koradecka, "Hand book of Occupational Safety and Health", CRC Press, 2010

SDG No. 4,9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1	**Basics of Occupational Health**	
1.1	History of Occupational Health	1
1.2	Triangle of occupational health	1
1.3	Occupational health	1
1.4	Occupational hygiene	2
1.5	Occupational wellbeing	1
1.6	Need for Occupational history	2
1.7	Industrial process and hazards	1
2	**Physical Health**	
2.1	Hazards, Types of hazards ,Physical, Chemical, Biological and Ergonomical hazards	1
2.2	Effect of hazard, Notifiable diseases	1
2.3	Hazard control measures –Occupational exposure limits	2
2.4	Permissible Exposure Limit(PEL),Recommended Exposure Limit(REL),Threshold Limit Value-Time Weighted Average, TLV	1
2.5	TWA, Short Term Exposure Limit (STEL) ,Long Term Exposure Limit,	2
2.6	Immediate Danger to Life and Health (IDLH)- Occupational health surveillance	1
3	**Mental Health**	
3.1	Psychosocial factors and hazards in occupation	1
3.2	Shift work	2
3.3	Fitting job to man	1
3.4	Effects of psychosocial factors fatigue	2
3.5	Anxiety and stress	2
3.6	Job rotation	1
3.7	Welfare activities	2
4	**Statutory norms**	
4.1	National policy on Safety, health and environment at work place	2
4.2	Provisions pertaining to occupational health under the Factories Act,1948 and Tamil Nadu Factories Rules,1950	1
4.3	Overview about Occupational Safety, health and Working Conditions Code 2020	2
4.4	Introduction to American Conference for Governmental Industrial Hygienist (ACGIH)	1
4.5	National Institute of Occupational Safety and Health (NIOSH),overview about OSHA Standards.	2
5	**Safety practices**	
5.1	Safety protocols to minimize hazards	1
5.2	Hazard control hierarchy	1
5.3	Risk matrix	2
5.4	Work design	1
5.5	Overview on Behavior based safety and safety culture.	2
		45

Course Designers

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Mr.Sanjay – sanjaym@ksrct.ac.in

K. S. Rangasamy College of Technology

(Autonomous Institution affiliated to Anna University, Chennai)

CURRICULUM AND SYLLABI

of

B.E. Mechatronics Engineering

Honours Degree - Robotics and Automation

R 2022

Accredited by NAAC with 'A++' Grade,

Approved by AICTE, Affiliated to Anna University, Chennai.

KSR Kalvi Nagar, Tiruchengode – 637 215.

Namakkal District, Tamil Nadu, India.

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

K. S. RANGASAMY COLLEGE OF TECHNOLOGY, TIRUCHENGODE – 637 215

DEPARTMENT OF MECHATRONICS ENGINEERING

Honours Degree – Robotics and Automation

S.No	Course Code	Course Name	L	T	P	Credits
1.	60 MC H01	Medical Robotics	03	0	0	03
2.	60 MC H02	AI for Robotics	03	0	0	03
3.	60 MC H03	Robot Kinematics and Dynamics	03	0	0	03
4.	60 MC H04	Applied and Industrial Robotics	03	0	0	03
5.	60 MC H05	Robotic Programming	03	0	0	03
6.	60 MC H06	Sensors and Machine Vision Systems	03	0	0	03
		Total	**18**	**0**	**0**	**18**

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC H01	Medical Robotics	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Identify and describe different types of medical robots and their potential applications
- Know basic concepts in kinematics, dynamics, and control relevant to surgical manipulators
- Develop the analytical and experimental skills necessary to design and implement Motion control and force control in medical robotics
- Be familiar with the state of the art in applied medical robotics and Haptic Tele manipulation.
- Understand the various roles that robotics can play in Minimally Invasive Surgery

Pre-requisite

Robotics Engineering

Course Outcomes

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

CO1	Classify the different types design of control architectures	Remember, Understand, Apply
CO2	Identify the function of -assisted minimally invasive surgery.	Remember, Understand, Apply, Analyse
CO3	Design of control architectures for robotic-assisted tele-medicine. Evaluation of medical robots	Remember, Understand, Apply
CO4	Describe the haptic tele manipulation and control strategies	Remember, Understand, Apply
CO5	Discuss the different techniques minimal invasive surgery	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2	3			2		3	3	3
CO2	3	3	3	2	2	2	2			3		3	3	2
CO3	2	3	2	2	3	2			3	2		2	1	2
CO4	2	3	2	3	3	2	1			3		3	2	2
CO5	2	3	3	2	3	2	2			2		2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC H01 – Medical Robotics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
IV	3	0	0	45	3	40	60	100

Introduction to Medical Robots Introduction to medical robotics-Assistive technologies - rehabilitation robotics - surgical robotics-robotics for diagnosis - Historical perspective.	**[09]**
Design of Surgical Manipulators Security issues-Manipulators with serial and parallel configurations-European directives-Minimally invasive surgery-Passive and active joints-Remote rotation center-Master-slave mechatronic system - Da Vinci system.	**[09]**
Motion control and force control in medical robotics Motion Control: Joint space control and task space control - Force Control: Indirect force control (compliant control, impedance control) - direct force control (hybrid position/force control, external force control) - Kalman Active Observers - Design of null space / task space controllers for minimally invasive surgery.	**[09]**
Haptic Tele manipulation. Haptic control architectures- Tele presence - stability and robustness analysis - Contact parameter estimation.	**[09]**
Minimally Invasive Surgery Human-machine interfaces - Teleoperation - Cooperative manipulation - Port placement for MIS - Robot design concepts - Video images in MIS - Augmented reality	**[09]**
Total Hours	45

Text Book(s):	
1.	Khalil, W, Dombre E, Modeling, Identification and Control of Robots, HPS 2022
2	Ciavicco and Siciliano, Modeling and Control of Robot Manipulators, Springer.2020
Reference(s):	
1.	Cortesão, R., Medical Robotics Course, DEEC-FCTUC.(2018)
2.	Anandanatarajan.R., “Biomedical robots”, PHI Learning Private Limited, New Delhi ,2011.
3.	Cromwell, Leslie, Weibell. Fred J. and Pfeiffer. Erich A., “Bio-Medical and electronics ”, Second Edition, Pearson Education, New Delhi, 2012.
4	Khandpur R.S., “Handbook of Bio-Medical instrumentation”, Tata McGraw-Hill Publishing Co Ltd., New Delhi, 2014.

SDG No.8, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
	Introduction to medical robotics	
1.1	Assistive technologies	2
1.2	rehabilitation robotics	1
1.3	surgical robotics	2
1.4	surgical robotics	2
1.5	Robotics for diagnosis -	1
1.6	Historical perspective	1
	Design of Surgical Manipulators	
2.1	Security issues-Manipulators with serial and parallel configurations	1
2.2	European directives	1
2.3	Minimally invasive surgery	1
2.4	Passive and active joints-Remote rotation center	2
2.5	Master-slave mechatronic system	1
2.6	Deviance system.	2
	Motion control and force control in medical robotics	
3.1	Motion Control	1
3.2	Joint space control and task space control	1
3.3	Force Control: Indirect force control (compliant control, impedance control)	1
3.4	direct force control (hybrid position/force control, external force control)	1
3.6	Kalman Active Observers	1
3.7	Design of null space / task space controllers for minimally invasive surgery.	1
	Haptic Tele manipulation	
4.1	Haptic control architectures	1
4.2	Tele presence	1
4.3	stability and robustness analysis	1
4.5	Contact parameter estimation	1
	Minimally Invasive Surgery	1
5.1	Human-machine interfaces	1
5.2	Teleoperation	1
5.3	Cooperative manipulation	2
5.4	Port placement for MIS	1
5.5	Robot design concepts	1
5.6	Video images in MIS	1
5.7	Augmented reality	1
	Total	45

Course Designer

1. Dr.M.Ravi - ravi@ksrct.ac.in

60 MC H02	AI for Robotics	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To impart artificial intelligence principles, techniques and its history.
- To assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving engineering
- To develop intelligent systems by assembling solutions to concrete computational problems
- To artificial intelligence principles related to Logic and Reasoning
- To develop intelligent systems in the aspect of communication related to robotics.

Pre-requisite

Robotics Engineering

Course Outcomes

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

CO1	Evaluate Artificial Intelligence (AI) methods and describe their foundations.	Remember, Understand, Apply
CO2	Apply basic principles of AI in solutions that require problem-solving, inference, perception, knowledge representation and learning.	Remember, Understand, Apply, Analyse
CO3	Demonstrate knowledge of reasoning, uncertainty, and knowledge representation for solving real-world problems	Remember, Understand, Apply
CO4	Analyse and illustrate how search algorithms play a vital role in problem-solving	Remember, Understand, Apply
CO5	Understand the Communication of Robotics	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	2	3	2	3			2		3	3	3
CO2	3	2	2	3	2	2	3		2	3		3	2	3
CO3	2	2	2	2	3	2			3	2		2	2	2
CO4	2	3	2	3	3	2	1			3		3	2	2
CO5	2	3	3	2	2	2	2			2		2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC H02 - AI for Robotics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V\VI/VII	3	0	0	45	3	40	60	100

Introduction Introduction- Evolution of AI, State of Art -Different Types of Artificial Intelligence Applications of AI-Subfields of AI-Intelligent Agents- Structure of Intelligent Agents Environments	**[09]**
Problem Solving based on Searching Introduction to Problem Solving by searching Methods-State Space search, Uninformed Search Methods – Uniform Cost Search, Breadth First Search- Depth First Search-Depth limited search, Iterative deepening depth-first, Informed Search Methods- Best First Search, A* Search	**[09]**
Logic and Reasoning Introduction to Logic and Reasoning -Propositional Logic-First Order Logic-Inference in First Order Logic- Unification, Forward Chaining, Backward Chaining, Resolution.	**[09]**
Planning Classical planning, Planning as State-space search, Forward search, backward search, Planning graphs, Hierarchical Planning, Planning and acting in Nondeterministic domains – Sensor-less Planning, Multiagent planning	**[09]**
Communicating, Perceiving and Acting Communication-Fundamentals of Language -Probabilistic Language Processing -Information Retrieval- Information Extraction-Perception-Image Formation- Object Recognition.	**[09]**
Total Hours	45

Text Book(s):	
1.	Russell, S. and Norvig, P.," Artificial Intelligence - A Modern Approach", 3rd Edition, Prentice Hall,2015.
2	Robin R Murphy, "Artificial Intelligence for Robotics", 2nd Edition, Bradford books,2019.
Reference(s):	
1.	K. R. Chowdhary, "Fundamentals of Artificial Intelligence", Springer, 2020.
2.	Alpaydin, E, " Introduction to Machine Learning", 2nd Edition, MIT Press,2010
3.	Francis X. Govers," Artificial Intelligence for Robotics", Packt Publishing ltd,2018

SDG No.8, 9

Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1.1	**Introduction**	2
1.2	Evolution of AI, State of Art	1
1.3	Different Types of Artificial Intelligence Applications of AI	2
1.4	Subfields of AI	2
1.5	Intelligent Agents	1
1.6	Structure of Intelligent Agents Environments	1
	Problem Solving based on Searching	
2.1	Introduction to Problem Solving by searching Methods	1
2.2	State Space search, Uninformed Search Methods	1
2.3	Uniform Cost Search, Breadth First Search	1
2.4	Depth First Search-Depth limited search, Iterative deepening depth	2
2.5	first, Informed Search Methods	1
2.6	Best First Search, A* Search	2
	Logic and Reasoning	
3.1	Introduction to Logic and Reasoning	1
3.2	Propositional Logic	1
3.3	First Order Logic	1
3.4	Inference in First Order Logic	1
3.6	Unification, Forward Chaining, Backward Chaining, Resolution	1
	Planning	
4.1	Classical planning, Planning as State	1
4.2	space search, Forward search, backward search, Planning graphs, Hierarchical Planning, Planning and acting in Nondeterministic domains	1
4.3	Sensor-less Planning,Multiagent planning	1
	Communicating, Perceiving and Acting	1
5.1	Communication-Fundamentals of Language	1
5.2	Probabilistic Language Processing	1
5.3	Information Retrieval	2
5.4	Information Extraction	1
5.5	Perception-Image Formation	1
5.6	Object Recognition.	1
	Total	45

Course Designer

1. Mr.R.Vivek - vivekr@ksrct.ac.in

60 MC H03	Robot Kinematics and Dynamics	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Provide a mathematical and geometrical description of robotic manipulators
- To retain the best traditions of traditional calculus.
- Derive from first principles robot dynamics and know how to simulate them
- Understand basic robot control architectures
- Articulate scientific results to your peers

Pre-requisite

Robotics Engineering

Course Outcomes

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

CO1	To impart knowledge about kinematic and dynamic analysis of robot manipulators.	Remember, Understand, Apply
CO2	To control both the position and orientation of the tool in the three dimensional space.	Remember, Understand, Apply, Analyse
CO3	The relationship between the joint variables and the position and the orientation of the tool.	Remember, Understand, Apply
CO4	Planning trajectories for the tool to follow on order to perform meaningful tasks.	Remember, Understand, Apply
CO5	To precisely control the high speed motion of the system	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	2	3	2	3			2		3	3	3
CO2	3	2	2	3	2	2	3			2		3	2	3
CO3	3	3	2	2	3	2				2		3	3	3
CO4	2	3	2	3	3	2	2			3		3	3	3
CO5	3	3	3	2	2	2	2			2		2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC H03 - Robot Kinematics and Dynamics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V\VI/VII	3	0	0	45	3	40	60	100

Introduction Introduction, position and orientation of objects, objects coordinate frame Rotation matrix, Euler angles Roll, pitch and yaw angles coordinate Transformations, Joint variables and position of end effector, Dot and cross products, coordinate frames, Rotations, Homogeneous coordinates.	**[09]**
Direct Kinematics Link coordinates D-H Representation, The ARM equation. Direct kinematic analysis for Four axis, SCARA Robot and three, five and six axis Articulated Robots.	**[09]**
Inverse Kinematics The inverse kinematics problem, General properties of solutions. Tool configuration, Inverse kinematics of four axis SCARA robot and three and five axis, Articulated robot.	**[09]**
Workspace Analysis and Trajectory Planning Workspace Analysis, work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures, the pick and place operations, Joint space technique - continuous path motion, Interpolated motion, straight line motion and Cartesian space technique in trajectory planning.	**[09]**
Manipulator Dynamics Introduction, Lagrange's equation kinetic and potential energy. Link inertia Tensor, link Jacobian Manipulator inertia tensor. Gravity, Generalized forces, Lagrange-Euler Dynamic model, Dynamic model of a Two-axis planar robot, Newton Euler formulation, Lagrange Euler formulation, problems.	**[09]**
Total Hours	45

Text Book(s):	
1.	Robert J. Schilling, Fundamentals of Robotics Analysis and Control, PHI Learning, 2009.
2	Richard D. Klafter, Thomas .A, Chri Elewski, Michael Negin, Robotics Engineering an Integrated Approach, Phi Learning., 2009.
Reference(s):	
1.	John J. Craig, Introduction to Robotics Mechanics and Control, Third Edition, Pearson, 2008.
2.	Tsuneo Yohikwa, Foundations ofRobotics Analysis and Control, MIT Press., 2003.
3.	Bijay K. Ghosh, Ning Xi, T.J. Tam, Control in Robtics and Automation Sensor - Based integration, Academic Press, 1999.
4	Bernard Hodges, Industrial Robotics, Second Edition, Jaico Publishing house, 1993.

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Course Contents and Lecture Schedule

S.No	Topic	No.of Hours
1.1	Introduction, position and orientation of objects	2
1.2	objects coordinate frame Rotation matrix	1
1.3	Euler angles Roll	2
1.4	pitch and yaw angles coordinate Transformations	2
1.5	Joint variables and position of end effector	1
1.6	Dot and cross products, coordinate frames,	1
1.7	Rotations, Homogeneous coordinates	
	Direct Kinematics	
2.1	Link coordinates D-H Representation	1
2.2	The ARM equation. Direct kinematic analysis for Four axis	1
2.3	SCARA Robot and three	1
2.4	five and six axis Articulated Robots	2
	Inverse Kinematics	
3.1	The inverse kinematics problem	1
3.2	General properties of solutions	1
3.3	Tool configuration	1
3.4	Inverse kinematics of four axis SCARA robot and three and five axis	1
3.6	Articulated robot	1
	Workspace Analysis and Trajectory Planning	
4.1	Workspace Analysis	1
4.2	work envelope of a Four axis SCARA robot and five axis articulated robot workspace fixtures	1
4.3	the pick and place operations, Joint space technique	1
4.5	continuous path motion, Interpolated motion	1
4.6	straight line motion and Cartesian space technique in trajectory planning	
	Manipulator Dynamics	1
5.1	Introduction, Lagrange's equation kinetic and potential energy	1
5.2	Link inertia Tensor	1
5.3	Link Jacobian Manipulator inertia tensor. Gravity,	2
5.4	Generalized forces, Lagrange	1
5.5	Euler Dynamic model	1
5.6	Dynamic model of a Two-axis planar robot	1
5.7	Newton Euler formulation	1
5.8	Lagrange Euler formulation, problems	
	Total	45

Course Designer

1. Dr.M.Ravi - ravi@ksrct.ac.in

R1/ w.e.f.27/12/2023
Passed in the BoS Meeting Held on 24/11/2023
Approved in Academic Council Meeting held on 23/12/2023

BoS Chairman

60 MC H04	Applied and Industrial Robotics	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- To familiarize robot structures, classification and Types, levels, need of Automation.
- To develop knowledge in Grippers and Sensors for Robotics.
- To develop skills in performing Drives, Transmission and Control for Robotics.
- To develop knowledge in the Artificial Intelligence for Robotics.
- To design and develop a robotic system for a given industrial application.

Pre-requisite

Robotics Engineering

Course Outcomes

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

CO1	Identify and understand the automation concepts for Industries.	Remember, Understand, Apply
CO2	Understand various grippers and sensors for robotics	Remember, Understand, Apply, Analyse
CO3	Interpret terminologies related to drives, actuators and controllers.	Remember, Understand, Apply
CO4	Analyze the principles of AI in robot system integration	Remember, Understand, Apply
CO5	Integrate the applications of robots and digital technology.	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	3	2	2	3	3		2	2		3	3	3
CO2	3	2	2	3	2	2	3			2		3	2	3
CO3	3	3	2	2	3	3		2		2		2	2	2
CO4	3	3	3	3	3	2	2			3		3	3	3
CO5	3	3	3	2	3	3	2			2		2	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC H04 - Applied and Industrial Robotics								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V\VI/VII	3	0	0	45	3	40	60	100

Introduction to Robotics Elements of Robotic Systems, Robot anatomy, DOF, Classification of Robotic systems -work volume, type of drive, Associated parameter - resolution, accuracy, repeatability, dexterity, compliance, Remote Center of Compliance. Introduction to Principles & Strategies of Automation, Types & Levels of Automations, Need of automation.	**[09]**
Grippers and Sensors for Robotics Grippers for Robotics - Types of Grippers, Guidelines for design for robotic gripper, Force analysis for various basic gripper system. Sensors for Robots - Types of Sensors used in Robotics, Classification and applications of sensors, Characteristics of sensing devices, Selections of sensors. Need for sensors and vision system in the working and control of a robot.	**[09]**
Drives and Control for Robotics Drive - Types of Drives, Types of transmission systems, Actuators and its selection while designing a robot system. Control Systems: Types of Controllers, Introduction to closed loop control.	**[09]**
AI in Robotics Socio-Economic aspect of robotisation. Economical aspects for robot design, Safety for robot and standards, Introduction to Artificial Intelligence, AI techniques, Need and application of AI, mobile robotics, New trends & recent updates in robotics. Mobile Robot locomotion: Types of locomotion, hopping robots, legged robots, wheeled robots, stability, manoeuvrability, controllability.	**[09]**
Applications and Digital Manufacturing Robots Manufacturing, Construction, Medical, Defence, Logistics & Storage, Packing & Palletizing, Inspection & Quality Control, Harvesting, Painting & Coating, Cleaning & Hygiene, Aerospace, basics in cyber-physical production systems, data- driven production, industrial internet of things, digital twin technology and simulation methodologies.	**[09]**
Total Hours	45

Text Book(s):	
1.	S. K. Saha, Introduction to Robotics, 2nd Edition, TATA McGraw Hills Education,2014.
2	John.J.Craig, " Introduction to Robotics: Mechanics & control" , Pearson Publication, 4th Edition, 2018.
Reference(s):	
1.	Dilip Kumar Pratihar, Fundamentals of Robotics, Narosa Publishing House, 2019
2.	Jazar, "Theory of Applied Robotics: Kinematics, Dynamics and Control", Springer, 2 nd Edition, 2016.
3.	Roland Seigwart, Illah Reza Nourbakhsh, and Davide Scaramuzza, "Introduction to autonomous mobile robots", 2nd Edition, MIT Press, 2011.
4	S.R. Deb, Robotics Technology and flexible automation, 2nd Edition, Tata McGraw-Hill Education, 2017

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Course Contents and Lecture Schedule

S.No	Introduction to Robotics	No.of Hours
1.1	Elements of Robotic Systems	2
1.2	Robot anatomy, DOF, Classification of Robotic systems	1
1.3	work volume, type of drive	2
1.4	Associated parameter	2
1.5	resolution, accuracy, repeatability, dexterity, compliance	1
1.6	Remote Center of Compliance	1
1.7	Introduction to Principles & Strategies of Automation	
1.8	Types & Levels of Automations, Need of automation	
	Grippers and Sensors for Robotics	
2.1	Grippers for Robotics	1
2.2	Types of Grippers, Guidelines for design for robotic gripper	1
2.3	Force analysis for various basic gripper system.	1
2.4	Sensors for Robots	2
2.5	Types of Sensors used in Robotics, Classification and applications of sensors	
2.6	Characteristics of sensing devices, Selections of sensors	
2.7	Need for sensors and vision system in the working and control of a robot	
	Drives and Control for Robotics	
3.1	Drive	1
3.2	Types of Drives	1
3.3	Types of transmission systems	1
3.4	Actuators and its selection while designing a robot system	1
3.5	Control Systems: Types of Controllers,	1
3.6	Introduction to closed loop control	
	AI in Robotics	
4.1	Socio-Economic aspect of robotisation.	1
4.2	Economical aspects for robot design	1
4.3	Safety for robot and standards	1
4.4	Introduction to Artificial Intelligence	1
4.4	AI techniques, Need and application of AI	
4.5	Mobile robotics, New trends & recent updates in robotics.	
4.6	Mobile Robot locomotion: Types of locomotion, hopping robots	
4.7	Legged robots, wheeled robots, stability, manoeuvrability, controllability.	
	Applications and Digital Manufacturing	1
5.1	Robots Manufacturing, Construction, Medical	1
5.2	Defence, Logistics & Storage, Packing & Palletizing	1
5.3	Inspection & Quality Control, Harvesting	2
5.4	Painting & Coating, Cleaning & Hygiene	1
5.5	Aerospace, basics in cyber-physical production systems, data	1
5.6	driven production, industrial internet of things,	1
5.7	Digital twin technology and simulation methodologies.	1
	Total	45

Course Designer

1. Mr.S.Hari Prasadh - hariprasadh@ksrct.ac.in

60 MC H06	Sensors and Machine Vision System	Category	L	T	P	Credit
		PC	3	0	0	3

Objective

- Acquaint students with the various types of sensors, their principles, and their applications in diverse fields.
- Provide students with a comprehensive overview of machine vision systems, image processing techniques, and their role in automation and analysis.
- Develop practical skills in interfacing sensors, processing visual data, and designing simple vision-based systems.
- Enable students to apply sensor and machine vision knowledge to solve real-world challenges in fields like robotics, manufacturing, and healthcare.
- Foster an understanding of the ethical considerations related to data collection, privacy, and bias in machine vision applications

Pre-requisite

Robotics Engineering

Course Outcomes

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

CO1	Identify and classify various sensor types based on their principles and applications.	Remember, Understand, Apply
CO2	Assess the suitability of different sensors for specific tasks based on their characteristics.	Remember, Understand, Apply, Analyse
CO3	Describe the optical components, image formation process, and image sensor technologies in machine vision systems.	Remember, Understand, Apply
CO4	Apply image enhancement, transformation, and segmentation techniques to preprocess images for analysis.	Remember, Understand, Apply
CO5	Utilize image processing libraries and tools to extract relevant features from images.	Remember, Understand, Apply, Analyse

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	3	3	2	2			2		3	3	3
CO2	3	2	2	3	2	2	3	2	2	2		3	2	3
CO3	3	3	2	2	3	3	3			2	3	2	3	3
CO4	2	2	2	3	3	3	2			3		2	2	3
CO5	3	3	3	2	3	3	2			2		3	2	2
3- Strong;2-Medium;1-Some														

Assessment Pattern

Bloom's Category	Continuous Assessment Tests (Marks)		End Sem Examination (Marks)
	1	2	
Remember	10	20	30
Understand	20	25	30
Apply	20	10	30
Analyse	10	5	10
Evaluate	0	0	0
Create	0	0	0

K.S. Rangasamy College of Technology–Autonomous								R2022
60 MC H06 - Sensors and Machine Vision System								
MCT								
Semester	Hours / Week			Total hrs	Credit	Maximum Marks		
	L	T	P		C	CA	ES	Total
V\VI/VII	3	0	0	45	3	40	60	100

Introduction to Sensors Definition and importance of sensors-Sensor classification based on physical properties-Sensing mechanisms : electrical, mechanical, optical, thermal-Sensor characteristics: sensitivity, accuracy, precision, resolution	**[09]**
Sensor Technologies Introduction to different sensor types: temperature, pressure, proximity, motion- Resistive, capacitive, inductive, and piezoelectric sensors- Optical sensors: photodiodes, phototransistors, lasers- Sensor calibration and compensation techniques	**[09]**
Sensor Interfaces and Signal Conditioning Analog and digital sensor interfaces- Amplification and filtering of sensor signals- Analog-to-digital conversion (ADC) and digital-to-analog conversion (DAC)- Noise reduction and error handling in sensor data	**[09]**
Vision Systems Fundamentals Basics of human vision and perception- Image formation: lenses, cameras, optics- Color representation and perception- Image sensors: CCD and CMOS	**[09]**
Image Processing Techniques Image enhancement: filtering, histogram equalization, contrast adjustment- Image transformation: Fourier transform, Hough transform- Image segmentation: thresholding, edge detection- Feature extraction: corners, edges, texture	**[09]**
Total Hours	45

Text Book(s):	
1.	Orlando E. Ruiz "Introduction to Sensors" CRC Press,2018
2	Carsten Steger, Markus Ulrich, and Christian Wiedemann **"**Machine Vision Algorithms and Applications**"** Wiley,2018
Reference(s):	
1.	Ramon Pallas-Areny and John G. Webster "Sensors and Signal Conditioning" Wiley,2010
2.	Jon S. Wilson **"**Sensor Technology Handbook**",** Newnes 2010
3.	Krzysztof Iniewski **"**Smart Sensors for Industrial Applications**"** CRC Press,2013
4	E. R. Davies "Computer and Machine Vision: Theory, Algorithms, Practicalities**"** Academic Press,2015

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Course Contents and Lecture Schedule

S.No	Introduction to Robotics	No.of Hours
1.1	Elements of Robotic Systems	2
1.2	Robot anatomy, DOF, Classification of Robotic systems	1
1.3	Work volume, type of drive, Associated parameter	2
1.4	resolution, accuracy, repeatability, dexterity, compliance	2
1.5	Remote Center of Compliance	1
1.6	Introduction to Principles & Strategies of Automation	1
1.7	Types & Levels of Automations, Needof automation	
	Grippers and Sensors for Robotics	
2.1	Grippers for Robotics	1
2.2	Types of Grippers, Guidelines for design for robotic gripper	1
2.3	Force analysis for various basic gripper system. Sensors for Robots	1
2.4	Types of Sensors used in Robotics, Classification and applications of sensors	2
2.5	Characteristics of sensing devices, Selections of sensors	
2.6	Need for sensors and vision system in the working and control of a robot	
	Drives and Control for Robotics	
3.1	Drive	1
3.2	Types of Drives, Types of transmission systems	1
3.3	Actuators and its selection while designing a robot system	1
3.4	Control Systems: Types of Controllers	1
3.5	Introduction to closed loop control	1
	AI in Robotics	
4.1	Socio-Economic aspect of robotisation.	1
4.2	Economical aspects for robot design	1
4.3	Safety for robot and standards, Introduction to Artificial Intelligence	1
4.4	AI techniques, Need and application of AI, mobile robotics	1
4.4	New trends & recent updates in robotics. Mobile Robot locomotion:	
4.5	Types of locomotion, hopping robots	
4.6	legged robots, wheeled robots, stability, maneuverability, controllability	
	Applications and Digital Manufacturing	1
5.1	Robots Manufacturing, Construction, Medical	1
5.2	Defense, Logistics & Storage, Packing & Palletizing	1
5.3	Inspection & Quality Control, Harvesting	2
5.4	Painting & Coating, Cleaning & Hygiene	1
5.5	Aerospace, basics in cyber-physical production systems, data	1
5.6	driven production, industrial internet of things,	1
5.7	Digital twin technology and simulation methodologies.	1
	Total	45

Course Designer

1. Mrs.V.Indumathi - indumathi@ksrct.ac.in