

Department of Mechatronics Engineering

Minutes of Board of Studies

18.07.2020

The first Board of Studies meeting of Department of Mechatronics Engineering was held on 18th July 2020 at 9:00 A.M in the R&D Lab, Sri Manakula Vinayagar Engineering College with the Head of the Department in the Chair.

The following members were present for the BoS meeting

SI.No	Name of the Member with Designation and official Address	Responsibility in the BoS	Signature
1	Dr. G. Balamuruga Mohan Raj Professor and Head Department of Mechatronics Engineering, SMVEC	Chairman	Apr -
Extern	al Members		
2	Dr.Shankar Krishnapillai, Professor, Indian Institute of Technology, Chennai – 600 036.	Pondicherry University Nominee	Shankarth
3	Dr.D.Dinakaran, Professor, Hindustan Institute of Tech. & Science, Chennai – 103	Subject Expert	2 10.
4	Dr.R.Parameshwaran, Professor, Kongu Engineering College, Erode – 638 606	Subject Expert	Pho
5	Mr.P.Ramesh Managing Director, Switching Technologies Gunther Ltd., Tambaran, Chennai – 600045	Industry Expert	CB

1.	Dr. A.G.Ganesh Kumar, M.E., Ph.D Professor	Member	AYY
2.	Prof. P. Ramesh Kumar, M.E, Assistant Professor	Member	Am
3.	Dr. R. Kurinjimalar, M.E., Ph.D., Associate Professor	Member	Stmr.
4.	Prof. Pushaparaj, M.E. Assistant Professor	Member	b. Inshparof
op	ted Members		
1.	Prof. N. Vijayan Assistant Professor / Mathematics	Member	Un
2.	Dr. A. Rajappa Associate Professor / Chemistry	Member	g. n. for
3.	Dr. M. A. Ishrath Jahan Associate Professor / English	Member	M.A. Duff.
4.	Dr. T. Sivaranjani Associate Professor / Physics	Member	Angro

Agenda of the Meeting

- 1) Discuss about the curriculum Structure of B.Tech Mechatronics Engineering
- 2) To discuss and approve the B.Tech. Degree Regulations 2020 (R-2020), Curriculum and Syllabi from I to VIII semesters for the B.Tech Mechatronics Engineering and the students admitted in the Academic Year 2020-21. (First Year)
- To discuss and approve the B.Tech. Degree Regulation 2019, Curriculum, syllabi from I to VIII semesters under for the B.Tech – Mechatronics Engineering and the students admitted in the Academic Year 2019-20 (Second Year)
- 4) To discuss about the uniqueness of the Curriculum (R-2020)
- 5) To discuss and approve Evaluation Systems.
- 6) To discuss about the Innovative Teaching / Practices Methodology adopted to handle the emerging. / Advanced Technological concept courses.
- 7) Any other item with the permission of chair.

Minutes of the Meeting

Dr. G. Balamuruga Mohan Raj, Chairman, BoS opened the meeting by welcoming and introducing the external members, to the internal and co-opted members and thanked them for accepting to become the member of the Board of Studies and the meeting thereafter deliberated on agenda items that had been approved by the Chairman.

Item:1	The curriculum structure of Mechatronics Engineering has been discussed.
Item:2	Recommended to the Academic Council with following suggestions in the
	Curriculum and Syllabus of Regulation 2020.
	1. Thermodynamics and Heat transfer subject to be shifted from first
	semester to second semester.
	2. Design of Machine Elements is to be included instead of Operation
	Research.
	3. Operation Research may be kept as an Elective.
	4. To be modified the Engineering Drawing as Mechanical CAD and
	Electrical CAD.
	5. Metal Machining topic to be added in Manufacturing Technology.
	6. Virtual instrumentation lab may be shifted from fifth semester to third or
	fourth semester.
Item:3	Recommended to the Academic Council with following suggestions in the
	Curriculum and Syllabus of Regulation 2019.
	1. Eliminate the Brand name of software in any ware in the curriculum and
	syllabus
	2. Digital Data Acquiring systems may be included for Mechanical labs used
	by Mechatronics Department.
	ANOVA and Design of Experiments may be included in Numerical
	methods subject in Fourth semester
Item:4	Recommended to the Academic Council with minor correction of including 3D
	printing practices between third and fifth semester.
Item:5	Suggested to the Academic Council with no correction.
Item:6	Recommended to the Academic Council with following suggestions:
	1. Design and fabrication projects to be included from fourth semester
	onwards.
	2. The credit for MOOC/NPTEL/Swayam Online course to be increased.
	3. Conducting experiments using software like SciLab / VI/ MAT Lab.
Item:7	Recommended to the Academic Council with no correction.

The meeting was concluded at 11:40AM with vote of thanks by **Dr. G. Balamuruga Mohan Raj**, Head of Department, Mechatronics Engineering.

Board Chairman Dr. G. Balamuruga Mohan Raj Professor and Head Department of Mechatronics Engineering,

COLLEGE VISION AND MISSION

Vision

To be globally recognized for excellence in quality education, innovation and research for the transformation of lives to serve the society

Mission

M1- Quality Education: To provide comprehensive academic system that amalgamates the cutting edge technologies with best practices.

M2 - Research and Innovation: To foster value-based research and innovation in collaboration with industries and institutions globally for creating intellectuals with new avenues.

M3 - Employability and Entrepreneurship -: To inculcate the employability and entrepreneurial skills through value and skill based training.

M4 - Ethical Values: To instill deep sense of human values by blending societal righteousness with academic professionalism for the growth of the society.

DEPARTMENT VISION AND MISSION

Vision

To be a department with outstanding competencies in education and research in interdisciplinary field of Mechatronics Engineering for the prosperity of students and society.

Mission

M1 - Quality Integration: To uphold excellence in education by integrating the teaching learning process with hands-on trainings in updated technologies.

M2 - Research Exploration: To maintain a dynamic balance between learning and research by encompassing activities related to Research, Industrial projects and Innovation Contests.

M3 – Personality Development: To enrich the team spirit and entrepreneurship skills through training programmes on personality development for career prospects.

M4 – Social Ethics: To enhance the principle of highest ethical values by inculcating code of conduct for the betterment of the Society.

PROGRAMME 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, 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 modeling 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.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO1: Strong Knowledge

To provide comprehensive knowledge on Science, Mathematics & multiple Engineering disciplines, along-with the ability to apply the gained knowledge.

PEO2: Technical Competency

To produce graduates who can demonstrate technical competence in the field of Mechatronics Engineering and develop solutions to the complex problems.

PEO3: Task Orientation

To produce graduates who function effectively in a multi-disciplinary environment, individually and within a society towards accomplishing tasks.

PEO4: Team Work

To produce graduates who would be able to take individual responsibility and work as a part of a team towards the fulfillment of both individual and organizational goals.

PEO5: Professional Competency

To produce graduates with professional competence by life-long learning on advanced studies, professional skills and other professional activities related to Mechatronics Engineering society.

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO1: Understanding the Concepts

To comprehend the concepts of Mechatronics and their applications in the field of Automated Manufacturing Systems, Robotics, Automobile Technology, Aerial vehicles and other relevant areas.

PSO2: Application of Knowledge

To apply technical knowledge in modern hardware and software tools related to Mechatronics for solving real world problems.

PSO3: Solution Development

To develop the ability to analyze, comprehend and design mechatronics subsystems for a variety of engineering applications for the benefits of society

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM – R2019

SEMESTER – I

SI.No	Course Category	Breakdown of Credits		
1	Humanities and Social Science (HS)	9		
2	Basic Sciences(BS)	35		
3	Engineering Sciences (ES) 32			
4	Professional Core (PC)	68		
5	Professional Electives (PE)	18		
6	Open Electives (OE)	9		
7	Project Work and Internship (PW)	12		
8	Employability Enhancement Courses (EEC)			
9	Mandatory courses (MC) -			
	Total	183		

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

SI.N	AICTE		Credits per Semester							
0	Suggested Course Category	I	II	III	IV	V	VI	VII	VIII	Credits
1	1 Humanities and Social Science (HS)		-	-	-	-	3	1	1	9
2	Basic Sciences(BS)	16	12	3	4	-	-	-	-	35
3	Engineering Sciences (ES)	10	18	4	-	-	-	-	-	32
4	Professional Core (PC)	-	-	14	12	15	15	9	3	68
5	Professional Electives (PE)	-	-	-	3	3	3	3	6	18
6	Open Electives (OE)	-	-	-	3	3	-	3	-	9
7	Project Work (PW)	-	-	-	-	-	-	2	8	10
8	Internship (PW)	-	-	-	-	-	-	2	-	2
9	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-	-	-
10 Mandatory courses (MC*)		-	-	-	-	-	-	-	-	-
Total			30	21	22	21	21	20	18	183

* EEC and MC are not included for CGPA calculation

* To be completed in I and II semesters, under Pass / Fail option only and not counted for CGPA calculation

SI.	Course	Course Title	Category		ds	Cradite	Max. Marks			
No.	Code	Course The	Calegory	L	Т	Ρ	Credits	CAM	ESM	Total
Theo	Theory									
1	T101	Mathematics – I	BS	3	1	0	4	25	75	100
2	T102	Physics	BS	4	0	0	4	25	75	100
3	T103	Chemistry	BS	4	0	0	4	25	75	100
4	T110	Basic Electrical and Electronics Engineering	ES	3	1	0	4	25	75	100
5	T111	Engineering Thermodynamics	ES	3	1	0	4	25	75	100
6	T112	Computer Programming	ES	3	1	0	4	25	75	100
Prac	tical									
7	P104	Physics Lab	BS	0	0	3	2	50	50	100
8	P105	Chemistry Lab	BS	0	0	3	2	50	50	100
9	P106	Workshop Practice	ES	0	0	3	2	50	50	100
						30	300	600	900	

	SEMESTER – II										
SI.	Course	Course Title	Category	P	erio	ds	Credits	Max. Marks			
No.	Code	Course mile	Category	L	Т	Ρ	oreans	CAM	ESM	Total	
Theo	Theory						1				
1	T107	Mathematics –II	BS	3	1	0	4	25	75	100	
2	T108	Material Science	BS	4	0	0	4	25	75	100	
3	T109	Environmental Science	BS	4	0	0	4	25	75	100	
4	T104	Basic Civil and Mechanical Engineering	ES	4	0	0	4	25	75	100	
5	T105	Engineering Mechanics	ES	3	1	0	4	25	75	100	
6	T106	Communicative English	HS	4	0	0	4	25	75	100	
Prac	tical	•					•				
7	P101	Computer Programming Laboratory	ES	0	0	3	2	50	50	100	
8	P102	Engineering Graphics	ES	0	0	3	2	50	50	100	
9	P103	Basic Electrical and Electronics Laboratory	ES	0	0	3	2	50	50	100	
Mandatory Course											
10	P107	NSS / NCC *	MC	0	0	0	-	-	-	-	
							30	300	600	900	

	SEMESTER – III									
SI.	Course Code	Course Title	Category	Р	erio	ls	Credits	N	lax. Marl	s
No.	Course Coue			Cleuits	CAM	ESM	Total			
Theo	ory									
1	U19MCT31	Complex Analysis and Applications of Partial Differential Equations	BS	2	2	0	3	25	75	100
2	U19MCT32	Data Structures	ES	3	0	0	3	25	75	100
3	U19MCT33	Analog and Digital Circuits Design	PC	3	0	0	3	25	75	100
4	U19MCT34	Strength of Materials	PC	2	2	0	3	25	75	100
5	U19MCT35	Fluid Mechanics and Hydraulic Machinery	PC	2	2	0	3	25	75	100
6	U19MCT36	Sensors, Transducers and Measurement systems	PC	3	0	0	3	25	75	100
Prac	tical									
7	U19MCP31	Data Structures Lab	ES	0	0	2	1	50	50	100
8	U19MCP32	Analog and Digital Circuits Lab	PC	0	0	2	1	50	50	100
9	U19MCP33	Strength of Materials and Fluid Machinery Lab	PC	0	0	2	1	50	50	100
Emp	loyability Enhand	cement Course					-	-	-	
10	U19MCC3X	Certification Course – I**	EEC	0	0	4	-	100	-	100
11	U19MCS31	Skill Development Course 1: General Proficiency - I	EEC	0	0	2	-	100	-	100
12	U19MCS32	Skill Development Course 2 * EEC 0 0 2		-	100	-	100			
Mane	datory Course	· · · ·								
13	U19MCM31	Physical Education	MC	0	0	2	-	100	-	100
	21 700 600 1300									

	SEMESTER – IV									
SI.	Course Code	Course Title	Catogory	P	erio	ds	Crodite	N	/lax. Mai	'ks
No.	Course Coue	Course The	Calegory	L	Т	Ρ	Credits	CAM	ESM	Total
Theo	ry									
1	U19MCT41	Numerical Methods and Statistics	BS	2	2	0	3	25	75	100
2	U19MCT42	Electronic Devices and Circuits	PC	3	0	0	3	25	75	100
3	U19MCT43	Power Electronics and Drives	PC	3	0	0	3	25	75	100
4	U19MCT44	Theory of Machines	PC	2	2	0	3	25	75	100
5	U19MCE4X	Professional Elective – I [#]	PE	3	0	0	3	25	75	100
6	U19XXO4X	Open Elective - I ^{\$}	OE	3	0	0	3	25	75	100
Pract	Practical									
7	U19MCP41	Numerical Methods Lab	BS	0	0	2	1	50	50	100
8	U19MCP42	Electronic Devices and Circuits Lab	PC	0	0	2	1	50	50	100
9	U19MCP43	Power Electronics and Drives Lab	PC	0	0	2	1	50	50	100
10	U19MCP44	Dynamics of Machinery Lab	PC	0	0	2	1	50	50	100
Emp	oyability Enhand	cement Course								
11	U19MCC4X	Certification Course – II**	EEC	0	0	4	-	100	-	100
12	U19MCS41	Skill Development Course 3: General Proficiency - II	EEC	0	0	2	-	100	-	100
13	U19MCS42	Skill Development Course 4 * EEC 0 0 2		-	100	-	100			
Mano	latory Course	•	•					•	•	
13	U19MCM41	Indian Constitution	MC	2	0	0	-	100	-	100
							22	750	550	1300

[#] Professional Electives are to be selected from the list given in Annexure I ^{\$}Open electives are to be selected from the list given in Annexure II

** Certification courses are to be selected from the list given in Annexure III

* Skill Development Courses (2 and 4) are to be selected from the list given in Annexure IV

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)				
SI. No.	Course Code	Course Title		
1	U19MCE41	Additive Manufacturing		
2	U19MCE42	Heating Ventilation and Air-Conditioning		
3	U19MCE43	Computer Integrated Manufacturing		
4	U19MCE44	Instrumentation for Automotive Industries		
5	U19MCE45	Data Communication and Networking		

OPEN ELECTIVE COURSES

SI. No	Course Code	Course Title	Offering Department	Permitted Departments
Open	Elective – I (Off	ered in Semester IV)		
1	U19EEO41	Solar Photovoltaic Fundamentals and Applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics
2	U19EEO42	EO42 Electrical Safety EEE		ECE, ICE, MECH, CIVIL, Mechatronics, BME, IT, CSE
3	U19ECO41	Engineering Computation with MATLAB	ECE	ICE, EEE, MECH, CIVIL, BME, Mechatronics
4	U19ECO42	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, BME, Mechatronics
5	U19CSO41	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U19CSO42	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U19CSO43	Programming in JAVA	CSE	ECE, MECH, Mechatronics
8	U19ITO41	Database System: Design & Development	IT	EEE, ECE, ICE, BME
9	U19ITO42	R programming	IT	EEE, ECE, ICE, BME, MECH, Mechatronics
10	U19ICO41	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL
11	U19ICO42	Control System Engineering	ICE	CSE, IT, MECH
12	U19MEO41	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME
13	U19MEO42	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
14	U19MEO43	Power Plants for Electrical Engineering	MECH	EEE
15	U19CEO41	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics
16	U19CEO42	Building Science and Engineering	CIVIL	EEE, MECH, BME
17	U19BMO41	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, MECH, Mechatronics
18	U19BMO42	Telemedicine	BME	EEE, ECE, CSE, IT, ICE
19	U19CCO41	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME
20	U19CCO42	Introduction to Communication Systems	CCE partment of M	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics CE – First BoS Meeting

EMPLOYABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

SI. No	Course Code	Course Title
1	U19MCCX1	Artificial Intelligence And Edge Computing
2	U19MCCX2	Auto CAD for Mechanical
3	U19MCCX3	Basic Pneumatics'
4	U19MCCX4	Creo (Modeling and Simulation)
5	U19MCCX5	Electro Hydraulic Automation With PLC
6	U19MCCX6	Embedded System Using C
7	U19MCCX7	Java Programming
8	U19MCCX8	Mechatronics
9	U19MCCX9	Programming using Python

EMPLOYABILITY ENHANCEMENT COURSES – (B). SKILL DEVELOPMENT COURSES

SI. No	Course Code	Course Title
1	U19MCS31	Skill Development Course 1 : General Proficiency - I
		Skill Development Course 2 *
0		1) Excel for Statistical Approach
2	019MCS32	2) Training on Arduino
		3) Computer Vision
3	U19MCS41	Skill Development Course 3 : General Proficiency - II
	U19MCS42	Skill Development Course 4 *
4		1) Power Transmission Systems
-		2) 3D Printing
		3) Non-Destructive Testing
5	U19MCS51	Skill Development Course 5 : Foreign Language/ IELTS -I
6	U19MCS52	Skill Development Course 6 : Presentation Skills using ICT
7	U19MCS61	Skill Development Course 7 : Foreign Language/ IELTS - II
8	U19MCS62	Skill Development Course 8 : Technical Seminar
9	U19MCS63	Skill Development Course 9 : NPTEL/MOOC - I
10	U19MCS81	Skill Development Course 10 : NPTEL/MOOC-II

* Any one course to be selected from the list

REGULATION-2020 STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

SI.No	Course Category	Breakdown of Credits
1	Humanities and Social Science (HS)	7
2	Basic Sciences(BS)	19
3	Engineering Sciences (ES)	27
4	Professional Core (PC)	72
5	Professional Electives (PE)	18
6	Open Electives (OE)	9
7	Project Work and Internship (PW)	12
8	Employability Enhancement Courses (EEC)	-
9	Mandatory courses (MC)	-
	Total	164

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

SI.N	AICTE		Credits per Semester							Total
ο	Suggested Course Category	I	II		IV	V	VI	VII	VIII	Credits
1	Humanities and Social Science (HS)	-	-	1	1	-	3	1	1	7
2	Basic Sciences(BS)	6	3	3	4	3	-	-	-	19
3	Engineering Sciences (ES)	8	11	4	4	-	-	-	-	27
4	Professional Core (PC)	4	7	14	8	12	15	9	3	72
5	Professional Electives (PE)	I	-	-	3	3	3	3	6	18
6	Open Electives (OE)	I	-	-	3	3	-	3	-	9
7	Project Work (PW)	-	-	-	-	-	-	2	8	10
8	Internship (PW)	-	-	-	-	-	-	2	-	2
9	Employability Enhancement Courses (EEC*)	-	-	-	-	-	-	-	-	-
10 Mandatory courses (MC*)		-	-	-	-	-	-	-	-	-
	Total	18	21	22	23	21	21	20	18	164

* EEC and MC are not included for CGPA calculation

		Si	EMESTER -	•1						
SI.	Course Code	Course Title	Category	P	Periods		Credits	Max. Marks		larks
No.	Course Coue	Course Title	Category	L	Τ	Ρ	Credits	CAM	ESM	Total
Theo	ory	1					1			
1	U20BST101	Engineering Mathematics – I (Calculus and Linear Algebra)	BS	2	2	0	3	25	75	100
2	U20BST109	Biology for Engineers	BS	3	0	0	3	25	75	100
3	U20EST129	Introduction to Electrical Engineering	ES	3	0	0	3	25	75	100
4	U20EST130	Fundamentals of Mechanical Engineering	ES	3	0	0	3	25	75	100
5	U20MCT101	Thermodynamics and Heat Transfer	PC	2	2	0	3	25	75	100
Prac	tical									
6	U20ESP131	Basic Electrical Engineering Lab	ES	0	0	2	1	50	50	100
7	U20ESP112	Engineering Graphics using Auto CAD	ES	0	0	2	1	50	50	100
8	U20MCP101	Thermal Engineering Lab	PC	0	0	2	1	50	50	100
Emp	loyability Enhance	ement Course								
9	U20MCC1XX	Certification Course - I **	EEC	0	0	4	-	100	-	100
10	U20MCS101	Skill Development Course 1: Demonstration of Workshop Practices	EEC	0	0	2	-	100	-	100
Man	datory Course									
11	U20MCM101	Induction Programme	MC	3	Wee	eks	-	-	-	-
							18	475	525	1000

	SEMESTER – II									
SI.	Course Code	Course Title	Catagory	P	erio	ds	Crodite	Max. Marks		/larks
No.	Course Coue	Course The	Category	L	Τ	Ρ	Credits	CAM	ESM	Total
Theo	ory									
1	U20BST215	Engineering Mathematics – II (Multiple Integrals and Transforms)	BS	2	2	0	3	25	75	100
2	U20EST201	Programming in C	ES	3	0	0	3	25	75	100
3	U20EST219	Engineering Mechanics	ES	2	2	0	3	25	75	100
4	U20EST249	Introduction to Electronics Engineering	ES	3	0	0	3	25	75	100
5	U20MCT202	Material Science and Metallurgy	PC	3	0	0	3	25	75	100
6	U20MCT203	Manufacturing Technology	PC	3	0	0	3	25	75	100
Prac	tical		_							
7	U20ESP202	Programming in C Lab	ES	0	0	2	1	50	50	100
8	U20ESP250	Basic Electronics Engineering Lab	ES	0	0	2	1	50	50	100
9	U20MCP202	Manufacturing Technology Lab	PC	0	0	2	1	50	50	100
Emp	loyability Enhance	ement Course								
10	U20MCC2XX	Certification Course – II**	EEC	0	0	4	-	100	-	100
11	U20MCS202	Skill Development Course 2*	EEC	0	0	2	-	100	-	100
Man	datory Course									
12	U20MCM202	Environmental Science	MC	2	0	0	-	100	-	100
							21	600	600	1200

** Certification courses are to be selected from the list given in Annexure III * Skill Development Courses (2 and3) are to be selected from the list given in Annexure IV

	SEMESTER – III									
SI.	Course Code	Course Title	Category	Ρ	eriod	ls	Credits	N	lax. Mark	s
No.	Course Coue	oourse ritte	Category	L	Т	Ρ	oreans	CAM	ESM	Total
Theo	pry							-		
1	U20BST320	Complex Analysis and Applications of Partial Differential Equations	BS	2	2	0	3	25	75	100
2	U20EST356	Data Structures	ES	3	0	0	3	25	75	100
3	U20MCT304	Analog and Digital Circuits Design	PC	3	0	0	3	25	75	100
4	U20MCT305	Strength of Materials	PC	2	2	0	3	25	75	100
5	U20MCT306	Fluid Mechanics and Hydraulic Machinery	PC	2	2	0	3	25	75	100
6	U20MCT307	Sensors, Transducers and Measurement systems	PC	3	0	0	3	25	75	100
Prac	tical							-		
7	U20HSP301	General Proficiency - I	HS	0	0	2	1	50	50	100
8	U20ESP357	Data Structures Lab	ES	0	0	2	1	50	50	100
9	U20MCP303	Analog and Digital Circuits Lab	PC	0	0	2	1	50	50	100
10	U20MCP304	Strength of Materials and Fluid Machinery Lab	PC	0	0	2	1	50	50	100
Emp	loyability Enhanc	ement Course								
11	U20MCC3XX	Certification Course – III**	EEC	0	0	4	-	100	-	100
12	U20MCS303	Skill Development Course 3*	EEC	0	0	2	-	100	-	100
Man	datory Course									
13	U20MCM303	Physical Education	MC	0	0	2	-	100	-	100
							22	700	600	1300

	SEMESTER – IV									
SI.	Course Code	Course Title	Category	P	erioc	ls	Credits	Ν	/lax. Mai	ks
No.			outegoly	L	Т	Ρ	Oreans	CAM	ESM	Total
Theo	ry	1	1					I		
1	U20BST438	Numerical Methods and Statistics	BS	2	2	0	3	25	75	100
2	U20EST467	Programming in Java	ES	3	0	0	3	25	75	100
3	U20MCT408	Power Electronics and Drives	PC	3	0	0	3	25	75	100
4	U20MCT409	Theory of Machines	PC	2	2	0	3	25	75	100
5	U20MCE4XX	Professional Elective - I	PE	3	0	0	3	25	75	100
6	U20XXO4XX	Open Elective - I	OE	3	0	0	3	25	75	100
Pract	ical									
7	U20HSP402	General Proficiency – II	HS	0	0	2	1	50	50	100
8	U20BSP439	Numerical Methods Lab	BS	0	0	2	1	50	50	100
9	U20ESP468	Programming in Java Lab	ES	0	0	2	1	50	50	100
10	U20MCP405	Power Electronics and Drives Lab	PC	0	0	2	1	50	50	100
11	U20MCP406	Dynamics of Machinery Lab	PC	0	0	2	1	50	50	100
Empl	oyability Enhanc	ement Course								
12	U20MCC4XX	Certification Course – IV**	EEC	0	0	4	-	100	-	100
Mand	latory Course		-			-		-		
13	U20MCM404	NSS	MC	0	0	2	-	100	-	100
							23	650	650	1300

^{*} Professional Electives are to be selected from the list given in Annexure I ^{\$}Open electives are to be selected from the list given in Annexure II

PROFESSIONAL ELECTIVE COURSES

Professional Elective – I (Offered in Semester IV)					
SI. No.	Course Code	Course Title			
1	U20MCE401	Additive Manufacturing			
2	U20MCE402	Heating Ventilation and Air-Conditioning			
3	U20MCE403	Computer Integrated Manufacturing			
4	U20MCE404	Instrumentation for Automotive Industries			
5	U20MCE405	Data Communication and Networking			

OPEN ELECTIVE COURSES

S. No	Course Code	Course Title	Offering Department	Permitted Departments
Open	Elective – I (Of	fered in Semester IV)		
1	U20EEO401	Solar Photovoltaic Fundamental and applications	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE
2	U20EEO402	Electrical Safety	EEE	ECE, ICE, MECH, CIVIL, Mechatronics, CCE, BME, IT, CSE, FT
3	U20ECO401	Engineering Computation with MATLAB	ECE	EEE, ICE, MECH, CIVIL, CCE, BME, AI&DS, Mechatronics
4	U20ECO402	Consumer Electronics	ECE	EEE, ICE, CSE, MECH, IT, CIVIL, CCE, BME, Mechatronics, FT
5	U20CSO401	Web Development	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
6	U20CSO402	Analysis of Algorithms	CSE	EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics
7	U20ITO401	Database System: Design & Development	IT	EEE, ECE, ICE, CCE, BME
8	U20ITO402	R programming	IT	EEE, ECE, ICE, CCE, BME, MECH, Mechatronics
9	U20ICO401	Sensors and Transducers	ICE	ECE, CSE, IT, MECH, CIVIL, CCE, AI&DS, FT
10	U20ICO402	Industrial Safety Management	ICE	CSE, IT, MECH, CCE, AI&DS
11	U20MEO401	Rapid Prototyping	MECH	EEE, ECE, ICE, CIVIL, BME, FT
12	U20MEO402	Material Handling System	MECH	EEE, ICE, CIVIL, Mechatronics
13	U20MEO403	Industrial Engineering for Textile	MECH	FT
14	U20CEO401	Energy and Environment	CIVIL	EEE, ECE, MECH, BME, IT, Mechatronics, FT
15	U20CEO402	Building Science and Engineering	CIVIL	EEE, MECH, BME
16	U20BMO401	Medical Electronics	BME	EEE, ECE, CSE, IT, ICE, CCE, MECH, Mechatronics, AI&DS
17	U20BMO402	Telemedicine	BME	EEE, ECE, CSE, IT, ICE, CCE, AI&DS
18	U20CCO401	Basic DBMS	CCE	EEE, ECE, MECH, CIVIL, ICE, Mechatronics, BME

19	U20CCO402	Introduction to Communication Systems	CCE	EEE, CSE, IT, MECH, CIVIL, ICE, Mechatronics
20	U20ADO401	Knowledge Representation and Reasoning	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics
21	U20ADO402	Introduction to Data Science	AI&DS	EEE, ECE, CSE, IT, ICE, MECH, CIVIL, CCE, BME, Mechatronics

EMPLOYABILITY ENHANCEMENT COURSES – (A). CERTIFICATION COURSES

SI. No.	Course Code	Course Title
1	U20MCCX01	3ds Max
2	U20MCCX02	Advance Structural Analysis of Building using ETABS
3	U20MCCX03	Advanced Java Programming
4	U20MCCX04	Advanced Python Programming
5	U20MCCX05	Analog System Lab Kit
6	U20MCCX06	Android Medical App Development
7	U20MCCX07	Android Programming
8	U20MCCX08	ANSYS -Multiphysics
9	U20MCCX09	Artificial Intelligence
10	U20MCCX10	Artificial Intelligence and Edge Computing
11	U20MCCX11	Artificial Intelligence in Medicines
12	U20MCCX12	AutoCAD for Architecture
13	U20MCCX13	AutoCAD for Civil
14	U20MCCX14	AutoCAD for Electrical
15	U20MCCX15	AutoCAD for Mechanical
16	U20MCCX16	Azure DevOps
17	U20MCCX17	Basic Course on ePLAN
18	U20MCCX18	Basic Electro Pneumatics
19	U20MCCX19	Basic Hydraulics
20	U20MCCX20	Bio Signal and Image Processing Development System
21	U20MCCX21	Blockchain
22	U20MCCX22	Bridge Analysis
23	U20MCCX23	Building Analysis and Construction Management
24	U20MCCX24	Building Design and Analysis Using AECO Sim Building Designer
25	U20MCCX25	CATIA
26	U20MCCX26	CCNA (Routing and Switching)
27	U20MCCX27	CCNA (Wireless)
28	U20MCCX28	Cloud Computing
29	U20MCCX29	Computer Programming for Medical Equipments
30	U20MCCX30	Corel Draw
31	U20MCCX31	Creo (Modeling and Simulation)
32	U20MCCX32	Cyber Security
33	U20MCCX33	Data Science and Data Analytics
34	U20MCCX34	Data Science using Python
35	U20MCCX35	Data Science using R
36	U20MCCX36	Deep Learning
37	U20MCCX37	Design and Documentation using ePLAN Electric P8
38	U20MCCX38	Design of Biomedical Devices and Systems
39	U20MCCX39	Digital Marketing
40	U20MCCX40	Digital Signal Processing Development System
41	U20MCCX41	DigSILENT Power Factory
42	U20MCCX42	Electro Hydraulic Automation with PLC
43	U20MCCX43	Embedded System using Arduino
44	U20MCCX44	Embedded System using C

45	U20MCCX45	Embedded System with IoT
46	U20MCCX46	ePLAN Data Portal
47	U20MCCX47	ePLAN Electric P8
48	U20MCCX48	ePLAN Fluid
49	U20MCCX49	ePLAN PPE
50	U20MCCX50	Fusion 360
51	U20MCCX51	Fuzzy Logic and Neural Networks
52	U20MCCX52	Google Analytics
53	U20MCCX53	Hydraulic Automation
54	U20MCCX54	Industrial Automation
55	U20MCCX55	Industry 4.0
56	U20MCCX56	Internet of Things
57	U20MCCX57	Introduction to C Programming
58	U20MCCX58	Introduction to C++ Programming
59	U20MCCX59	IoT using Python
60	U20MCCX60	Java Programming
61	U20MCCX61	Machine Learning
62	U20MCCX62	Machine Learning and Deep Learning
63	U20MCCX63	Machine Learning for Medical Diagnosis
64	U20MCCX64	Mechatronics
65	U20MCCX65	Medical Robotics
66	U20MCCX66	Microsoft Dynamics 365 ERP for HR , Marketing and Finance
67	U20MCCX67	Mobile Edge Computing
68	U20MCCX68	Modeling and Visualization using Micro station
69	U20MCCX69	MX Road
70	U20MCCX70	Photoshop
71	U20MCCX71	PLC
72	U20MCCX72	Pneumatics Automation
73	U20MCCX73	Project Management
74	U20MCCX74	Python Programming
75	U20MCCX75	Revit Architecture
76	U20MCCX76	Revit Inventor
77	U20MCCX77	Revit MEP
78	U20MCCX78	Robotics
79	U20MCCX79	Search Engine Optimization
80	U20MCCX80	Software Testing
81	U20MCCX81	Solar and Smart Energy System with IoT
82	U20MCCX82	Solid Works
83	U20MCCX83	Solid Works with Electrical Schematics
84	U20MCCX84	Speech Processing
85	U20MCCX85	STAAD PRO V8i
86	U20MCCX86	Structural Design and Analysis using Bentley
87	U20MCCX87	Total Station
88	U20MCCX88	Video and Image Processing Development System
89	U20MCCX89	VLSI Design
90	U20MCCX90	Web Programming - I
91	U20MCCX91	Web Programming - II

EMPLOYABILITY ENHANCEMENT COURSES – (B). SKILL DEVELOPMENT COURSES

SI. No	Course Code	Course Title
1	U20MCS101	Skill Development Course 1 : Demonstration in Engineering Practice Lab
		Skill Development Course 2 *
_		1) Excel for Statistical Approach
2	02010105202	2) Training on Arduino
		3) Computer Vision
		Skill Development Course 3 *
3	U20MCS303	1) Power Transmission Systems
-		2) 3D Printing
		3) Non-Destructive Testing
4	U20MCS504	Skill Development Course 4 : Foreign Language/ IELTS -I
5	U20MCS505	Skill Development Course 5 : Presentation Skills using ICT
6	U20MCS606	Skill Development Course 6 : Foreign Language/ IELTS - II
7	U20MCS607	Skill Development Course 7 : Technical Seminar
8	U20MCS608	Skill Development Course 8 : NPTEL/MOOC - I
9	U20MCS809	Skill Development Course 9 : NPTEL/MOOC-II

* Any one course to be selected from the list

COMPLEX ANALYSIS AND APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

(Common to EEE, ICE, MECH, MECHATRONICS)

Course Objectives

U19MCT31

U20BST320

- To understand the analytic functions of complex variables.
- To apply the analytic function techniques to transform irregular geometry into regular geometry.
- Expose to the concept of complex integration.
- To understand the nature of wave equations.
- To know the solutions of one dimensional and two-dimensional heat flow equations.

Course Outcomes

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

- CO1- Understand the concepts of function of a complex variable. (K2)
- CO2 Transform complex functions from one plane to another plane. (K3)
- CO3 Apply the concepts of complex integration over contour. (K3)
- CO4 Understand the concept of initial and boundary value problems (K2)
- CO5 Solve the one- and two-dimensional heat equation using Fourier series. (K3)

UNIT I FUNCTION OF A COMPLEX VARIABLE

Continuity, derivative and analytic functions – Necessary conditions – Cauchy-Riemann equations and sufficient conditions – Harmonic and orthogonal properties of analytic function – Construction of analytic function

UNIT II CONFORMAL MAPPINGS

Conformal mapping – Simple and standard transformations like w = z+c, cz, z^2 , e^z , sin z, cosh z and <math>z+1/z – Bilinear transformation and cross ratio property - Taylor's and Laurent's theorem – Series expansion of complex valued functions – classification of singularities.

UNIT III COMPLEX INTEGRATION

Cauchy's integral theorem and its application – Cauchy's integral formula and problems – Residues and evaluation of residues – Cauchy's residue theorem – Contour integration: Cauchy's and Jordan's Lemma – Application of residue theorem to evaluate real integrals – unit circle and semicircular contour.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS

Solution of partial differential equation by the method of separation of variables – Boundary value problems – Fourier series solutions of one dimensional wave equation – Transverse vibration of an elastic string.

UNIT V ONE- AND TWO-DIMENSIONAL HEAT EQUATIONS

Fourier series solutions of one dimensional heat flow equation – Fourier series solutions of two dimensional heat flow equation under steady state conditions.

Text Books

- 1. B. S. Grewal., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 44th Edition, 2020.
- N.P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015.
- 3. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearsons Publications, New Delhi, 4th Edition, 2017.

Reference Books

- 1. C. Gupta, B. Shree Ram Singh, M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 1st Edition, 2015.
- 2. H.K. Dass & Dr. Rama Verma, "Introduction to Engineering Mathematics Volume II", S. Chand & Co, New Delhi, 9th Edition, 2019.
- 3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019.

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- 4. Ravish R. Singh and Mukul Bhatt, "Engineering Mathematics", Tata McGraw Hill, New Delhi, 1st Edition, 2016.
- 5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi, 3rd Edition, 2018.

Web Resources

- 1. https://nptel.ac.in/courses/122107036/
- 2. https://nptel.ac.in/courses/111107119/
- 3. https://youtu.be/W3HXK1Xe4nc
- 4. https://youtu.be/Mwpz1zjPlzI
- 5. https://youtu.be/CnrAivf9I6o

COs/POs/PSOs Mapping

COs				F	Progr	am O	utcon	nes (F	POs)				Program	Specific O (PSOs)	outcomes
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	1	1	-	-
2	3	2	1	1	-	-	-	-	-	-	-	1	1	-	-
3	3	2	1	1	-	-	-	-	-	-	-	1	1	1	-
4	2	1	-	-	-	1	-	-	-	-	-	1	2	2	-
5	3	2	1	1	-	1	-	-	-	-	-	1	2	2	-

Correlation Level: 1- Low, 2 - Medium, 3 - High

Dr.G.Balamuruga Mohan kaym.Tech.,Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Mauakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCT32 U20EST356

DATA STRUCTURES

(Common to ECE, EEE, IT, ICE, MECH, CIVIL, BME,

MECHTRONICS, CCE)

Course Objectives

- To impart the basic concepts of data structures and its terminologies.
- To understand concepts about stack and queue operations.
- To understand basic concepts about linked list and its various operations.
- To understand concepts about Tree and its applications.
- To understand basic concepts about Sorting, Hashing and Graph.

Course Outcomes

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

- CO1 Compute time and space complexity for given problems (K3)
- CO2 Demonstrate stack, queue and its operation. (K3)
- CO3 Illustrate the various operations of linked list. (K3)
- CO4 Use the concepts of tree for various applications. (K3)

CO5 - Outline the various sorting, hashing and graph techniques. (K3)

UNIT I BASIC TERMINOLOGIES OF DATA STRUCTURES

Introduction: Basic Terminologies: Elementary Data Organizations. Data Structure Operations: insertion, deletion, traversal. Analysis of an Algorithm, Asymptotic Notations, Time-Space trade off. Array and its operations. Searching: Linear Search and Binary Search Techniques and their complexity analysis.

UNIT II STACK AND QUEUE OPERATIONS

Stacks and Queues: ADT Stack and its operations, Applications of Stacks: Expression Conversion and evaluation. ADT Queue: Types of Queue: Simple Queue, Circular Queue, Priority Queue. Operations on each type of Queues.

UNIT III LINKED LIST OPERATIONS

Linked Lists: Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion, Deletion in linked list; Linked representation of Stack and Queue. Doubly linked list: operations. Circular Linked Lists: operations.

UNIT IV TREES

Trees: Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, Binary Tree Traversals, AVL Tree. Introduction to B-Tree and B+ Tree.

UNIT V SORTING, HASHING AND GRAPHS

Sorting: Bubble Sort, Selection Sort, Insertion Sort, Heap Sort, Shell Sort and Radix Sort. Performance and Comparison among the sorting methods. Hashing: Hash Table, Hash Function and its characteristics. Graph: Basic Terminologies and Representations, Graph traversal algorithms.

Text Books

- 1. Ellis Horowitz, Sartaj Sahni,"Fundamentals of Data Structures", Illustrated Edition, Computer Science Press, 2018.
- 2. Thomas H. Coreman, Charles E. Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", PHI, Third Edition, 2010.
- 3. Alfred V. Aho, Jeffrey D. Ullman, John E. Hopcroft, "Data Structures and Algorithms", 4th Edition, 2009.

Reference Books

- 1. Mark Allen Weiss," Algorithms, Data Structures and Problem Solving with C++", Illustrated Edition, Addison-Wesley Publishing Company, 1995.
- 2. D.Samanta, "Classic Data Structures, Second Edition, Prentice-Hall of India, Pvt. Ltd., India 2012.
- 3. Robert Kruse, C.L. Tondo and Bruce Leung, "Data Structures and Program Design in c", Prentice-Hall of India, Pvt.Ltd., Second edition, 2007.

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- 4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Pearson Education, Second edition, 2006.
- 5. Balagurusamy, "Data Structures", Tata McGraw-Hill Education, 2019.

Web Resources

- 1. https://www.geeksforgeeks.org/data-structures/
- 2. https://www.javatpoint.com/data-structure-tutorial/
- 3. https://www.studytonight.com/data-structures/
- 4. https://www.tutorialspoint.com/data_structures_algorithms/
- 5. https://www.w3schools.in/data-structures-tutorial/intro/

COs/POs/PSOs Mapping

COs					Prog	am O	utcom	nes (P	Os)				Program Specific Outcomes (PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	-	-	-	-	-	-	-	2	2	3
2	3	2	1	1	-	-	-	-	-	-	-	-	2	2	3
3	3	2	1	1	-	-	-	-	-	-	-	-	2	2	3
4	3	2	1	1	-	-	-	-	-	-	-	-	2	2	3
5	3	2	1	1	-	-	-	-	-	-	-	-	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

ANALOG AND DEGITAL CIRCUITS DESIGN

Course Objectives

U19MCT33

U20MCT304

- . To Understand the current voltage characteristics of PN junction diode and special diodes.
- . To Explain principle of operation of Bipolar junction transistor.
- To Describe the characteristics of power amplifier and its distortion.
- To present the Digital fundamentals, Boolean algebra and its applications in digital systems.
- To familiarize with the design of various combinational digital circuits using logic gates

Course Outcomes

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

- CO1 Understand the current voltage characteristics of PN junction diode and special diodes.(K2)
- CO2 Explain principle of operation of Bipolar junction transistor. (K2)
- **CO3** Describe the characteristics of power amplifier and its distortion. (K2)
- **CO4** Understand about the logic gates and apply the techniques to simplify the expression.(K3)
- CO5 Examine the various combinational digital circuits using logic gates. (K3)

UNIT I SEMICONDUCTOR DIODE

Theory of PN junction diode, Band structure of open circuited PN junction, Volt-Ampere Characteristics, Temperature Dependence of PN diode, LED, LCD and Photo- diodes, Tunnel diode ,Zener diode as Voltage Regulator

UNIT II TRANSISTORS, CHARACTERISTICS AND BIASING

Transistor, Types of Transistor, Transistor current components, Transistor as an Amplifier, Transistor characteristics in CB, CE and CC modes. Operating point, bias stability, various biasing circuits, stabilization against Ico, VBE and beta, Construction, Characteristics & applications of Junction Field Effect Transistor (JFET), UJT and MOSFET

UNIT III LARGE SIGNAL AMPLIFIERS

Class A direct coupled with resistive load, Transformer coupled with resistive load, harmonic distortion, variation of output power with load, Push-Pull Amplifiers, operation of class- B push-pull amplifier, crossover distortion, transistor phase inverter, complementary- symmetry amplifier

UNIT IV DIGITAL FUNDAMENTALS

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1's and 2's complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine-McCluskey method of minimization

UNIT V COMBINATIONAL CIRCUIT DESIGN

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder - Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder

Text Books

- 1. Electronic Devices & Circuits by Millman- Halkias, Tata Mcgraw Hill, 2015.
- 2. Electronic Devices & Circuits Theory by Boylested, Pearson Education, 2013.
- 3. M. Morris Mano and Michael D. Ciletti, "Digital Design", 5th Edition, Pearson, 2014

References

- 1. Electronic Devices, by Floyd, Pearson Education, 2012.
- 2. Charles H.Roth. "Fundamentals of Logic Design", 6th Edition, Thomson Learning, 2013.
- 3. S.Salivahanan and S.Arivazhagan"Digital Electronics", Ist Edition, Vikas Publishing House pvt Ltd, 2012.

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- 4. Anil K.Maini "Digital Electronics", Wiley, 2014.
- 5. A.Anand Kumar "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016.
- 6. Soumitra Kumar Mandal "Digital Electronics", McGraw Hill Education Private Limited, 2016

Web Resources

- 1. https://www.electronics-notes.com/
- 2. https://www.tutorialspoint.com/semiconductor_devices/index.htm
- 3. https://www.electronics-tutorial.net/electronic-devices/
- 4. https://www.allaboutcircuits.com/video-tutorials/
- 5. https://www.makerspaces.com/basic-electronics/

COs/POs/PSOs Mapping

					Drog	ram Oi	itcom		c)				Program Specific				
COs					Flogi			-3 (FU	3)				Outcomes (PSOs				
	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
1	2	1	2	3	-	-	-	-	-	-	-	2	2	-	2		
2	2	1	2	3	-	-	-	-	-	-	-	2	2	-	2		
3	3	1	2	3	-	-	-	-	-	-	-	2	2	-	2		
4	3	3	1	3	-	-	-	-	-	-	-	2	2	-	2		
5	3	3	1	3	-	-	-	-	-	-	-	2	2	-	2		

Correlation Level: 1-Low, 2-Medium, 3- High

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U19MCT34		L	Т	Ρ	С	Hrs
U20MCT305	STRENGTH OF MATERIALS	2	2	0	3	60
O						

Course Objectives

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells

Course Outcomes

On successful completion of this course, the student will be able to

- **CO1** Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
- **CO2** Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- CO3 Apply basic equation of simple torsion in designing of shafts and helical spring
- CO4 Calculate the slope and deflection in beams using different methods.
- **CO5** Analyze and design thin and thick shells for the applied internal and external pressures

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS

(12 Hrs)

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains –Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress

UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM

(12 Hrs)

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending– bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution

UNIT III TORSION

(12 Hrs)

Torsion formulation stresses and deformation in circular and hollows shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

UNIT IV DEFLECTION OF BEAMS

(12 Hrs)

Elastic curve of neutral axis of the beam under normal loads – Evaluation of beam deflection and slope: Double integration method and Macaulay's method.

UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS

(12 Hrs)

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure –Deformation in spherical shells – Lame's theorem.

Text Books

- 1. Bansal R.K, "Strength of Materials", Laxmi Publications, Sixth Edition 2019.
- 2. Bedi D.S, "Strength of Materials", Khanna Publishing, Sixth 2019.
- 3. Rajput R.K, "Strength of Materials", S. Chand Publications, Seventh Edition 2018.

References

- 1. Punmia, Jain and Jain, "Mechanics of Materials", Laxmi Publications, 2019
- 2. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, 9th Edition, 2018.
- 3. Egor. P.Popov "Mechanics of Materials" Pearson Education, 2nd Edition, 2016.
- 4. Subramanian R, "Strength of Materials", Oxford University Press, 3rd Edition 2016.
- 5. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., Second Edition New Delhi, 2018.

Web Resources

- 1. https://nptel.ac.in/courses/112107146/
- 2. https://nptel.ac.in/courses/112/106/112106141/
- 3. https://www.udemy.com/course/strengthofmaterials/
- 4. https://ae.linkedin.com/company/strength-of-materials-dept-spbstu
- 5. https://www.coursera.org/learn/mechanics

Cos Mapping with POs and PSOs

COs				Р	rogra	ım Oı	utcor	nes ((POs)				Pro Outo	gram Spe comes (P\$	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	1	-	-	1	2	1	1
2	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
3	3	2	2	2	-	-	-	-	1	-	-	1	2	1	1
4	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
5	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaym.Tech,Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Eagineering College, Madagadipet, Puducherry-605 107.

140MCT25		L	Т	Ρ	С	Hrs
		2	2	0	3	60
U20MCT306	MACHINERY					

Course Objectives

- To understand the structure and the properties of the fluid
- To understand and appreciate the complexities involved in solving the fluid flow problems.
- To understand the Impact of Fluid Jet on plates
- To understand energy exchange process in turbines
- To understand the working of Pumps and Air Vessels

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Understand the basic fluid property and law with their application..
- **CO2** Acquire knowledge regarding fluid static, kinematic, dynamic and study the different type of flow and boundary layer theory.
- CO3 Complete knowledge in Fluid Jet on plates
- CO4 Calculate the force, Power and efficiency in turbines
- **CO5** Understand the working of turbo machine like Pumps and Air Vessels.

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS

(12 Hrs)

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

UNIT II FLOW THROUGH CIRCULAR CONDUITS

(12 Hrs)

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli-Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor Moody diagram-commercial pipes- minor losses – Flow through pipes in series and parallel.

UNIT III IMPACT OF JETS

(12 Hrs)

Principles of Turbo Machinery: Fluid Machines – Classification – Impact of Fluid Jet on Stationary plates, Moving Plates and Vanes – Unit and Specific Quantities.

UNIT IV HYDRAULICS TURBINES

(12 Hrs)

Classification – Impulse Turbine – Pelton Wheel – Reaction Turbines – Francis and Kaplan Turbines – Draft Tube Theory – Velocity Triangle – Estimation of force, Power and efficiency – General Characteristics of Turbine – Similarity Study – Governing of Turbine – Cavitation in Turbine.

UNIT V HYDRAULICS PUMPS

(12 Hrs)

Classification - Centrifugal Pump – Velocity Triangle – Estimation of Power Required and efficiency – General characteristics - Similarity study – Cavitation in Pump – Reciprocating– Ideal and Actual Indicator Diagram – Estimation of Power Required, percentage Slip and Efficiency – Cavitation in Reciprocating pump.

Text Books

- 1. Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 2010.
- Kumar, K.L., "Engineering Fluid Mechanics", SchandPublications (P) Ltd., New Delhi (8th edition), 2009
- 3. Rajput.R.K "Fluid Mechanics and Hydraulics Machines", S. Chand Limited, 2008.

References

- 1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5th edition), Laxmi publications (P) Ltd., New Delhi, 2010.
- 2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5th Edition, New Delhi, 2016.
- 3. Som, S.K., and Biswas, G., "Introduction to fluid mechanics and fluid machines", Tata McGraw-Hill, 2nd edition, 2011.
- 4. K. Subramanya "Hydraulic Machines" Tata McGraw-Hill Education, 2013.
- 5. Goyal, Manish Kumar "Fluid Mechanics and Hydraulic Machines" PHI Learning Pvt. Ltd., 31-Aug-2015

Web Resources

- 1. https://nptel.ac.in/courses/112104118/
- 2. https://nptel.ac.in/courses/112104117
- 3. http://fm-nitk.vlabs.ac.in
- 4. https://www.coursera.org/courses?query=fluid%20mechanics
- 5. https://www.virtulearn.in/course/fluid-mechanics-and-hydraulic-machines-online-classes

COs				Р	rogra	m O	utcor	nes (POs)			Prog Outo	gram Spe comes (P\$	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
2	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
3	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
4	3	2	2	2	-	-	-	-	1	-	-	1	2	-	1
5	3	2	2	2	-	-	-	-	1	-	-	2	2	-	1

Cos Mapping with POs and PSOs

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.M.Tech., Ph.D., 1 Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCT36 U20MCT307 SENSORS TRANSDUCERS AND MEASUREMENT SYSTEMS 3 0 0 3 45

Course Objectives

- To understand the concepts of measurement systems.
- To know the principle of transduction and the characteristics of different transducers.
- To learn the various sensors used to measure various physical parameters.
- To know the various types of sensors in mechatronics applications.
- To learn the fundamentals of signal conditioning and data acquisition systems.

Course Outcomes

After completion of the course, the students are able to

CO1. Define the role of sensor module for automated system.(K2)

CO2. Apply the motion sensors for the required applications. (K3)

CO3. Apply the required force and heading sensors for the Mechatronics applications.(K3)

CO4. Apply the optical, pressure and temperature sensors for the required applications.(K3)

C05. Find suitable DAQ systems and data logging systems for real time requirements.(K4)

UNIT I INTRODUCTION

(9 Hrs)

Basics of Measurements - Classification of errors - Error analysis - Static and dynamic characteristics of transducers - Performance measures of sensors - Classification of sensors - Sensor calibration techniques - Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS

(9 Hrs)

Motion Sensors - Potentiometers, Resolver, Encoders - Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro - Microsyn, Accelerometer - GPS, Bluetooth, Range Sensors - RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS

(9 Hrs)

Strain Gage, Load Cell, and Magnetic Sensors - types, principle, requirement and advantages: Magnetorestrictive - Hall Effect - Current sensor Heading Sensors - Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS

(9 Hrs)

Photo conductive cell, photo voltaic, Photo resistive, LDR - Fiber optic sensors – Pressure - Diaphragm, Bellows, Piezoelectric - Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors - flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING AND DAQ SYSTEMS

(9 Hrs)

Amplification – Filtering - Sample and Hold circuits - Data Acquisition: Single channel and multi channel data acquisition - Data logging – applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

Text Books

1. Patranabis D, "Sensors And Transducers", Prentice-Hall India, 2nd Edition, 2011.

2. Ramon Pallas & John G. Webster, "Sensors and Signal Conditioning", John Wiley & Sons, 2nd Edition, 2011.

3. Webster John G, "Instrumentation and Sensors Handbook", CRC Press, 1st Edition, 2010.

4. Jacob Fraden, "Handbook of Modern Sensors: Physics, Designs and Applications", Springer, 3rd Edition, 2012.

5. Shawhney A. K., "Electrical And Electronics Measurements And Instrumentation", Dhanpat Rai & Sons, 2010.

Reference Books

1. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 2011.

- 2. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.
- 3. Nakra, B. C. and Chaudhry, K. K., Instrumentation Measurement and Analysis, Tata McGraw Hill 2010.
- 4. Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Private Limited, 2012.

5. Doeblin, E.O., Measurement systems, Applications and Design, McGraw Hill, 2009.

Web Resources

- 1. https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod2.pdf
- 2. https://www.electronics-tutorials.ws/

3. <u>https://www.analog.com/en/analog-dialogue/articles/transducer-sensor-excitation-and-measurement</u> techniques

- 4. http://www.kelm.ftn.uns.ac.rs/literatura/si/pdf/Measurement%20Instrumentation%20Sensors.pdf
- 5, https://www.udemy.com/course/sensors-sensor-fundamentals/

	CO / PO / PSO MAPPING														
CO	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
S	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
1	2	3	-	-	2	-	-	-	-	-	-	3	3	3	2
2	3	2	3	3	3	-	-	-	-	-	-	3	3	3	2
3	3	2	3	3	3	-	-	-	-	-	-	3	-	-	-
4	3	2	3	3	3	-	-	-	-	-	-	3	-	-	-
5	3	3	3	3	3	-	-	-	-	-	-	3	3	3	3

CO / PO / PSO Mapping

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.m.Tech.,Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Mauakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Department of MCE – First BoS Meeting

|--|

U19MCP31 U20ESP327

L T P C Hrs 0 0 2 1 30

(Common to CSE, ECE, EEE, IT, ICE, MECH, CIVIL, BME

MECHTRONICS,CCE)

Course Objectives

- □ To learn the basic concepts of Data Structures.
- □ To learn about the concepts of Searching and Sorting.
- □ To study about the linear and non-linear Data Structures.

Course Outcomes

- After completion of the course, the students will be able to
- CO1 Implement exemplary applications related to searching and sorting techniques. (K3)
- CO2 Compile, run and manipulate Programs using core data structures. (K3)
- CO3 Solve problems by applying linear Data Structures. (K3)
- CO4 Solve problems by applying non-linear Data Structures (K3)
- **CO5** -.Build solutions for online coding challenges (K3)

List of Exercises

- 1. Write a C program to implement recursive and non-recursive i) Linear search ii) Binary Search.
- 2. Write a C program to implement i) Bubble sort ii) Selection sort iii) Insertion sort iv) Shell sort v) Heap sort.
- 3. Write a C program to implement the following using an array. a) Stack ADT b) Queue ADT
- 4. Write a C program to implement list ADT to perform following operations a) Insert an element into a list.
 - b) Delete an element from list c) Search for a key element in list d) count number of nodes in list.
- 5. Write a C program to implement the following using a singly linked list. a) Stack ADT b) Queue ADT.
- 6. Write a C program to implement the dequeue (double ended queue) ADT using a doubly linked list and an array.
- 7. Write a C program to perform the following operations:
 - a) Insert an element into a binary search tree.
 - b) Delete an element from a binary search tree.
 - c) Search for a key element in a binary search tree.
- 8. Write a C program that use recursive functions to traverse the given binary tree in a) Preorder b) Inorder and c) Postorder.
- 9. Write a C program to perform the AVL tree operations.
- 10. Write a C program to implement Graph Traversal Techniques.

Reference Books

- 1. Yashavant Kanetkar, "Data Structures through C", BPB Publications, 3rd edition, 2019.
- 2. Gav.pai, "Data Structures and Algorithms", McGraw-Hill India, 1st edition, 2013.
- 3. Manjunath Aradhya M and Srinivas Subramiam, "C Programming and Data Structures", Cengage India 1st edition, 2017.
- 4. Reema Thareja, "Data structures using C", 2nd edition, Oxford University, 2014.
- 5. Tenebaum Aaron M, "Data Structures using C', Pearson Publisher, 1st edition, 2019.

Web Resources

- 1. https://www.tutorialspoint.com/data_structures_algorithms/
- 2. https://www.w3schools.in/data-structures-tutorial/intro/
- 3. https://nptel.ac.in/courses/106103069/
- 4. https://swayam.gov.in/nd1_noc20_cs70/preview
- 5. https://nptel.ac.in/courses/106103069/

COs/POs/PSOs Mapping (MECHTRONICS)

					Drogr		utcom	vos (P	0e)				Program Specific					
COs					Flogi		utcon	162 (L	05)				Outco	omes (F	'SOs)			
	P01	PO2	PO3	PO4	PO5	P06	P07	P08	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3			
1	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3			
2	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3			
3	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3			
4	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3			
5	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3			

Correlation Level: 1-

Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kar.M.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Masakula Vinayagar Esgineering College, Madagadipet, Puducherry-605 107.

U19MCP32 ANALOG AND DIGITAL CIRCUITS LAB U20MCP303

Course Objectives

- Study the characteristic of CE, CB and CC Amplifier and simulate using SPICE simulation
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristic of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Design and demonstrate various combinational and sequential circuits using Flip-flop

Course Outcomes

After completion of the course, the students are able to

- CO1 -Differentiate various amplifiers and Simulate amplifiers using Spice.(K4)
- CO2 -Analyse the limitation in bandwidth of single stage and multi stage amplifier. (K4)
- CO3 Measure CMRR in differential amplifier. (K3)
- CO4 Design and demonstrate various combinational logic circuits. (K5)
- CO5 Design and demonstrate various types of counters and Registers using Flip-flops. (K5)

List of Experiments

- 1. Frequency Response of CE, CB, CC and CS amplifiers
- 2. Construction of Darlington Amplifier
- 3. Differential Amplifiers- Transfer characteristic, CMRR Measurement
- 4. Class A and Class B Power Amplifiers
- 5. Determination of bandwidth of single stage and multistage amplifiers
- 6. Spice Simulation of Common Emitter and Common Source amplifiers
- 7. Design and implementation of code converters using logic gates
- (i) BCD to excess-3 code and vice versa (ii) Binary to Gray and vice-versa
- 8. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
- 9. Design and implementation of Multiplexer and De-multiplexer using logic gates
- 10. Design and implementation of encoder and decoder using logic gates
- 11. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
- 12. Design and implementation of 3-bit synchronous up/down counter
- 13. Implementation of SISO, SIPO, PISO and PIPO shift registers using Flip- flops.
- 14. Study of Shift register IC

References

- 1. Electronic Devices & Circuits Theory by Boylested, Pearson Education. 2015
- 2. A.Anand Kumar "Fundamentals of Digital Circuits", 4th Edition, PHI Learning Private Limited, 2016

Web Resources

- 1. https://www.industrial-electronics.com/experiments_0.html
- 2. http://vlabs.iitb.ac.in/vlabs-dev/labs/digital-electronics/index.html
- 3. https://de-iitr.vlabs.ac.in/
- 4. http://vlabs.iitb.ac.in/vlab/electrical/index.html
- 5. https://www.iare.ac.in/sites/default/files/lab1/Electronic%20Circuit%20laboratory%20MANUAL %20.pdf

COs/POs/PSOs Mapping

COs					Prog	ram Oເ	utcome	es (PO:	s)				Program Specific Outcomes (PSOs		
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	3	-	-	-	-	-	-	-	2	2	-	2
2	2	1	2	3	-	-	-	-	-	-	-	2	2	-	2
3	3	1	2	3	-	-	-	-	-	-	-	2	2	-	2
4	3	3	1	3	-	-	-	-	-	-	-	2	2	-	2
5	3	3	1	3	-	-	-	-	-	-	-	2	2	-	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.M.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Msuskula Vinayagar Esgineering College, Madagadipet, Puducherry-605 107.

U19MCP33	STRENGTH OF MATERIALS AND FLUID MACHINERY	L	Т	Ρ	С	Hrs
U20MCP304	LAB	0	0	2	1	30
Course Object	iveo					

Course Objectives

- To study the mechanical properties of materials when subjected to different types of loading.
- To verify the principles studied in Fluid Mechanics theory by performing experiments in lab

Course Outcomes

On successful completion of this course, the student will be able to

CO1 - Perform Tension, Torsion, Hardness, Compression, and Deformation test on Solid materials.

CO2- Use the measurement equipment's for flow measurement

CO3 - Perform test on different fluid machinery

List of Experiments

STRENGTH OF MATERIALS

- 1. Tension test on a mild steel rod
- 2. Double shear test on Mild steel and Aluminium rods
- 3. Torsion test on mild steel rod
- 4. Impact test on metal specimen
- 5. Hardness test on metals Brinnell and Rockwell Hardness Number
- 6. Deflection test on beams
- 7. Compression test on helical springs

FLUID MECHANICS AND MACHINES

- 1. Determination of the Coefficient of discharge of given Orifice meter.
- 2. Determination of the Coefficient of discharge of given Venturi meter.
- 3. Conducting experiments and drawing the characteristic curves of centrifugal pump/ submergible pump
- 4. Conducting experiments and drawing the characteristic curves of reciprocating pump.
- 5. Conducting experiments and drawing the characteristic curves of Gear pump.
- 6. Conducting experiments and drawing the characteristic curves of Pelton wheel.
- 7. Conducting experiments and drawing the characteristics curves of Francis turbine.
- 8. Conducting experiments and drawing the characteristic curves of Kaplan turbine

References

- 1. CWR, Hydraulics Laboratory Manual, 2004
- 2. N. Kumarasamy, Fluid Mechanics and Machinery laboratory manual, Charotar Publishing House Pvt. Ltd. 2008.
- 3. S C Gupta, Fluid Mechanics and Hydraulic Machines, Pearson Education India, 2006

Web Resources

- 6. https://nptel.ac.in/courses/112107146/
- 7. https://www.udemy.com/course/strengthofmaterials/
- 8. http://fmc-nitk.vlabs.ac.in/
Cos Mapping with POs and PSOs

COs				Ρ	rogra	m O	utcor	nes ((POs))			Pro Outo	gram Spe comes (P\$	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	-	-	-	2	3	-	-	1	1	1	1
2	3	2	2	2	-	-	-	2	3	-	-	1	1	1	1
3	3	2	2	2	1	-	-	2	3	-	-	1	1	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech, Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.



Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.G.Balamuruga Mohan kaym.Tech.Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Mauakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Department of MCE – First BoS Meetin	g
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U19MCS31GENERAL PROFICIENCY-ILTPCHrsU20HSP301(Common to all branches)002130

Course Objectives

- To enrich strong vocabulary and decoding skills *through comprehension analysis*
- To advance communication and leadership skills pragmatically
- To pronounce English sounds in isolation and in connected speech
- To expand effective written communication skills to meet organizational goals
- To extend knowledge on verbal aptitude and prepare for interviews

Course Outcomes

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

CO1- Interpret meaning and apply reading strategies in technical and non-technical context (K2)

CO2-Develop interpersonal communication skills professionally (K3)

CO3-Infer the distinct speech sounds and overcome native language influence (K2)

CO4- Demonstrate various forms of formal writing (K2)

CO5-Apply the techniques of verbal aptitude in competitive exams (K3)

UNIT I - COMPREHENSION ANALYSIS

Listening: Listening Comprehension (IELTS based) – **Speaking**: Break the iceberg - **Reading**: Reading technical passage (IELTS based) - **Writing**: Writing Task: 1 (IELTS: Graph/ Process /Chart Description) **Vocabulary:** Synonyms (IELTS)

UNIT II - PERSONALITY DEVELOPMENT

Listening: Interview Videos- Speaking: Extempore& Presentation (Soft Skills) - Reading: British & American Vocabulary, Read and review (Books, Magazines) - Writing: SWOT Analysis Vocabulary: Idioms (IELTS)

UNIT III -INFERENTIAL LEARNING

Listening: Listening Speech sounds to overcome Mother Tongue Influence, Anecdotes- Speaking: Interpersonal Interaction & Situational attribution-Reading: Distinguish between facts & opinions -Writing: Writing Conversation to different context Vocabulary: Phrasal Verbs (IELTS)

UNIT IV - INTERPRETATION AND FUNCTIONAL WRITING

Listening: Group Discussion videos - **Speaking:** Group Discussion Practice - **Reading:** Interpretation of data - Graph, table, chart, diagram (IELTS based) -**Writing**: Writing Task: 2 (IELTS) **Vocabulary:** Collocations (IELTS)

UNIT V- APTITUDE

Language Enhancement: Articles, Preposition, Tenses

Verbal Ability Enhancement: Blood Relation, Completing Statements- Cloze test, Spotting Errors – Sentence Improvement, One Word Substitution, Word Analogy, Word Groups(**GATE**)

Reference Books

- 1 Jeff Butterfield, "Soft Skills for Everyone", Cengage Learning, New Delhi, 2012.
- 2 Mn, Taylor, and Grant Taylor. "English Conversation Practice". Tata McGraw-Hill Education, 2004.
- 3 Bailey, Stephen. "Academic writing: A practical guide for students". Psychology Press, 2003.
- 4 Aggarwal, R. S. "A Modern Approach to Verbal & Non Verbal Reasoning". S. Chand, 2010.
- 5 Wren, Percival Christopher, and Wren Martin. "High School English Grammar and Composition". S Chand, 2005.

Web Resources

(6Hrs)

(6Hrs)

(6Hrs)

(6Hrs) Reading

(6Hrs)

- 1. https://www.ielts-exam.net/grammar/
- 2. https://ieltsfocus.com/2017/08/02/collocations-ielts/
- 3. https://www.fresherslive.com/online-test/blood-relations-questions-and-answers
- 4. https://www.toppr.com/guides/english-language/reading-comprehension/cloze-test/
- 5. https://www.examsbook.com/word-analogy-test-questions-with-answers

COs/POs/PSOs Mapping

					Drogr		utcon	noc /E	20c)				Prog	ram Sp	ecific
СО					Flogi		ulcon	nes (r	-05)				Outco	omes (I	PSOs)
S	PO	PO PO1 PO1 PO													
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
1	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-
2	1	-	-	-	-	-	-	1	-	3	-	1	1	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-
4	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., 1 Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Esgineering College, Madagadipet, Puducherry-605 107.

SKILL DEVELOPMENT COURSE - II

(Choose anyone of the below three courses)

1. EXCEL FOR STATISTICAL APPROACH

Course Content:

U19MCS32

U20MCS303

MODULE I SPREADSHEET ADMINISTRATION

Basic Navigation and Editing - Customizing Excel – Housekeeping - Connecting Workbooks - Sharing and Protecting - Excel Crashes

MODULE II ORIENTATION AND EFFICIENCY

Editing - Viewing - Outline - Cell References

MODULE III DATA HANDLING

Data Validation - Sorting and Filtering - Date and Time Functions - Text Functions - Lookup and Reference Functions - Logical and Informational Functions - Named Ranges – Macros

MODULE IV DATA ANALYSIS

Mathematical Functions - Summarising Data - Pivot Tables - Formula Auditing - What-If Analysis - Modelling Principles - Modelling Techniques

MODULE V PRESENTATION

Cell Formatting - Number Formatting - Conditional Formatting - Graphs and Charts – Review - Page and Print Setup

2. TRAINING ON ARDUINO

Course Content:

MODULE I INTRODUCTION OF ARDUINO AND BASIC PROGRAMMING

Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board. Basic Concepts: Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions.

MODULE II ARDUINO I/O FUNCTIONS AND ARDUINO TIME

Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalWrite() Function, analogRead() function, Arduino Interrupts. Arduino Time: Incorporating Arduino time, delay() function, delayMicroseconds() function, millis() function, micros() function.

MODULE III ARDUINO DISPLAYS AND ARDUINO SENSORS

Working with Serial Monitor, Line graph via serial monitor, Interfacing a 8 bit LCD to Arduino, Fixed one line static message display, Running message display, Using the LCD Library of Arduino. Arduino Sensors: Arduino – Humidity Sensor, Temperature Sensor, Water Detector, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Magnetic relay switches).

MODULE IV ARDUINO SECONDARY INTEGRATIONS AND INPUT TO THE CONTROLLER

Types of Relay, Controlling Electrical appliances with electromagnetic relays, working of a matrix keypad, Using the keypad library to interface with Arduino, Interfacing Servo motors to Arduino, Interfacing a RF Module. Input to the Controller: Using serial input, Controlling LEDs with keys, Keys as toggle switch, Interfacing a piezo Buzzer, Using a buzzer as an alarm unit

MODULE V ARDUINO COMMUNICATIONS AND ARDUINO PROJECTS

Parallel Communication, Serial Communication Modules, Types of Serial Communications, Arduino UART, GSM/GPRS Arduino Interfacing.

Arduino Projects (It involves designing, developing, coding and implement Arduino project): Intelligent home locking system, Intelligent water level management system, Home automation using RFID, Real time clock-based home automation, Intelligent Automatic Irrigation System.

3. COMPUTER VISION

Course Content:

MODULE I INTRODUCTION TO COMPUTER VISION AND IMAGE FORMATION

Background, requirements and issues, human vision. Image formation: geometry and photometry (brightness and color), quantization, camera calibration.

MODULE II SEGMENTATION, EXTRACTION, VIEW GEOMETRY, OBJECTRECOGNITION

Various methods of image segmentation, edge detection, object proposals, SIFT features. Multi-view Geometry: Shape from stereo and motion, feature matching, surface fitting, Active ranging. Object Recognition: Traditional Methods – HoG / SIFT features, Bayes classifiers, SVM classifiers

MODULE III NEURAL NETWORKS AND DEEP LEARNING

Introduction to Neural Networks: Artificial neural networks, loss functions, back propagation and SGD, Batch Normalization. Object Recognition: Deep Learning Methods, Image classification, object detection and semantic segmentation, adversarial attacks. Various neural network architectures, visualization techniques.

MODULE IV MOTION ANALYSIS AND ACTIVITY RECOGNITION

Motion analysis and Activity Recognition: Motion detection and tracking, Inference of human activity from image sequences

MODULE V CASE STUDIES AND EXAMPLES

Examples: Face recognition, Image grounding, Visual question answering

Dr.G.Balamuruga Mohan kaj.M.Tech.Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Mauakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCM31 U20MCM303

PHYSICAL EDUCATION

L	Т	Ρ	С	Hrs
0	0	2	-	30

Physical Education is compulsory for all the Undergraduate students and Pass in this course is mandatory for the award of degree. Physical Education activities will include games and sports/extension lectures. The student participation shall be for minimum period of 30 hours. Physical Education activities will be monitored by the Director of Physical Education. Pass/Fail will be determined on the basis of participation, attendance, performance and conduct. If a candidate fails, he/she has to repeat the course in the subsequent years.

Iohan Kal M.Tech. Ph.D. Dr.G.Balamuruga M Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College Madagadipet, Puducherry-605 107.

NUMERICAL METHODS AND STATISTICS

U19MCT41 U20BST438

Course Objectives

- Learn the techniques of solving algebraic and transcendental equations.
- To introduce the numerical techniques of differentiation and integration.
- To know the basic concepts of statistical parameters like mean, median, mode etc.
- To understand the concept of testing of hypothesis using statistical analysis.
- Identify the direction and strength of a linear correlation between two factors.

Course Outcomes

After completion of the course, students will be able to

- CO1 Solve algebraic and transcendental equations. (K3)
- CO2 Apply the knowledge of interpolation by using the numerical methods. (K3)
- CO3 Understand the basic concepts of Statistics. (K2)
- CO4 Apply the concept of testing of hypothesis for small and large samples. (K3)
- CO5 Know the applications of linear regression and correlation. (K2)

UNIT I SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS

Solution of algebraic and transcendental equations – Newton Raphson method – Gauss elimination method – Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel.

UNIT II NUMERICAL DIFFERENTIATION AND INTEGRATION

Interpolation: Interpolation by Newton's forward and backward difference formulae for equal intervals – Solution of ordinary differential equations – Single step methods – Taylor series method – Euler methods – Integration by Trapezoidal and Simpson's rules – Lagrange's method for unequal intervals.

UNIT III MEASURES OF DISPERSION

Standard deviation – Mean deviation – Quartile deviation – Range – Measures of Skewness and Pearson's coefficient of skewness – Moments about the arbitrary origin and moments based on measures of skewness and kurtosis.

UNIT IV TESTING OF HYPOTHESIS

Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations. Small samples: Test for single mean, difference of means and correlation coefficients – test for ratio of variances – Chi–Square test for goodness of fit and independence of attributes.

UNIT V CORRELATION AND REGRESSION

Curve fitting – Method of least squares – Correlation – Rank correlation – Regression – Multiple and partial correlation – Plane of regression – Coefficient of multiple correlation – Coefficient of partial correlation.

Text Books

- 1. B. S. Grewal, "Numerical Methods in Engineering and Science ", Mercury learning & Information, Kindle Edition, 2018.
- 2. T. Veerarajan and T. Ramachandran, "Statistics and Numerical methods", McGraw Hill, 1st Edition, 2019.
- 3. Richard A. Johnson, Irwin Miller and John E. Freund, "Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2018.

Reference Books

- 1. Rajesh Kumar Guptat, "Numerical Methods, Fundamental and its Applications", Cambridge University, 2019.
- 2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019
- 3. Timothy Sauer, "Numerical Analysis", Pearson Education, 3rd Edition, 2017.
- 4. Arvind Pragati Gautam, "Numerical Methods", Alpha Science International Limited, 2019.
- 5. N. P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th

L T P C 2 2 0 3

(12 Hrs)

(12 Hrs)

(12 Hrs)

(12 Hrs)

(12 Hrs)

Hrs

60

Web Resources

- 1. http://nptel.ac.in/courses/111107063/
- 2. https://nptel.ac.in/courses/111107119/
- 3. https://easyengineering.net/ma6452-statistics-and-numerical-methods/
- 4. https://nptel.ac.in/courses/110/105/110105087/
- 5. https://nptel.ac.in/courses/111/105/111105077/

COs/POs/PSOs Mapping

COs					Progr	am O	utcon	nes (P	Os)				Prog Outo	gram Spe comes (P	ecific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	1	1	-	1	-	-	-	-	-	1	3	3	2
2	3	2	1	1	-	1	-	-	-	-	-	1	3	3	2
3	2	1	-	-	-	1	-	-	-	-	-	1	3	2	1
4	3	2	1	1	-	-	-	-	-	-	-	1	3	2	1
5	2	1	-	-	-	-	-	-	-	-	-	1	3	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karm.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCT42 ELECTRONIC DEVICES AND CIRCUITS

L T P C Hrs 3 0 0 3 45

Course Objectives

- To study the applications of diodes and rectifiers.
- To know about the Bipolar Junction Transistor and their operation.
- To analyse about junction field effect transistor and then the special purpose devices.
- To analyse and Design of Small Signal Low Frequency BJT Amplifiers.
- To give understanding of various types of amplifier circuits.

Course Outcomes

After completion of the course, the students are able to

- CO1 Discuss the characteristics of diodes and its applications.(K2)
- **CO2** Devise the configuration and biasing concepts of Bipolar Junction.(K2)
- CO3 Describe the characteristics if JFET and special diodes. (K2)
- CO4 Illustrate the characteristics of various BJT small signal amplifier circuits. (K3)
- CO5 Interpret the characteristics of various FET amplifiers. (K3)

UNIT I DIODE AND APPLICATIONS

(9 Hrs)

Diode - Static and Dynamic resistances, Equivalent circuit, Load line analysis, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times. Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers with Capacitive and Inductive Filters, Clippers-Clipping at two independent levels, Clamper-Clamping Circuit Theorem, Clamping Operation, Types of Clampers.

UNIT II BIPOLAR JUNCTION TRANSISTOR (BJT)

(9 Hrs)

Principle of Operation, Common Emitter, Common Base and Common Collector Configurations, Transistor as a switch, switching times, Transistor Biasing and Stabilization - Operating point, DC & AC load lines, Biasing - Fixed Bias, Self-Bias, Bias Stability, Bias Compensation using Diodes.

UNIT III JUNCTION FIELD EFFECT TRANSISTOR (FET)

(9 Hrs)

Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor.

Special Purpose Devices: Zener Diode - Characteristics, Voltage Regulator. Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

UNIT IV ANALYSIS AND DESIGN OF SMALL SIGNAL LOW FREQUENCY BJT AMPLIFIERS (9 Hrs)

Transistor Hybrid model, Determination of h-parameters from transistor characteristics, Typical values of h- parameters in CE, CB and CC configurations, Transistor amplifying action, Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

UNIT V FET AMPLIFIERS

Hrs)

Small Signal Model, Analysis of JFET Amplifiers, Analysis of CS, CD, CG JFET Amplifiers. MOSFET Characteristics in Enhancement and Depletion mode, Basic Concepts of MOS Amplifiers.

Text Books

- 1. Electronic Devices and Circuits- Jacob Millman, McGraw Hill Education.
- 2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11th Edition, 2009.
- 3. Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.

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Reference Books

- 1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press.
- 2. Electronic Devices and Circuits, David A. Bell 5th Edition, Oxford.
- 3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2Ed., 2008, Mc Graw Hill.

Web Resources

- 1. <u>http://www.electronics-tutorials.ws</u>
- 2. www.allaboutcircuits.com
- 3. www.tutorialspoint.com
- 4. https://nptel.ac.in/courses/117/103/117103063/
- 5. https://www.electrical4u.com/diode-working-principle-and-types-of-diode/

COs/POs/PSOs Mapping

COs					Progr	am Ou	Itcome	es (PO	s)				Progr Outco	ram Spo omes (F	ecific PSOs)
	P01	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	1	2	1	-	-	-	-	-	-	-	-	2	-	-
2	2	1	2	1	-	-	-	-	-	-	-	-	2	-	-
3	2	1	2	1	-	-	-	-	-	-	-	-	2	-	
4	2	1	2	1	-	-	-	-	-	-	-	-	2	-	1
5	2	1	2	1	-	-	-	-	-	-	-	-	2	-	1

Correlation Level: 1-Low, 2-

Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech., Ph.D., 1 Professor & Head,

Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Department of MCE – First BoS Meeting

U19MCT43 POWER ELECTRONICS AND DRIVES **U20MCT408**

Course Objectives

- To get an overview of different types of power devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers.
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators. .
- To study the operation of induction motor drives and various configurations. .
- To learn the operation of DC drives and their control using power electronic circuits.

Course Outcomes

After completion of the course, the students are able to

- CO1 Define about various power switching circuits used in Electrical drives. (K1)
- CO2 Explain the operations of controlled converters for different types of Loads.(K2)
- **CO3** –Classify the different controlled chopper. (K2)
- **CO4** Discuss different types of drives used in automation. (K2)
- CO5 Explain the concept of DC motor drives and their control using power electronic circuits. (K2)

UNIT I INTRODUCTION

Power Devices-MOSFET, IGBT, SCR- Linear regulated vs Switched mode power supplies Electrical drive system-Advantages-Types of Electric drives-Dynamic of Drives- selection of electrical drives- Modes of operation of electrical drives- -closed loop control of Drives.

UNIT II CONTROLLED RECTIFIERS (CONVERTERS) FED DC DRIVES (9 Hrs)

Single Phase Half wave / full wave half controlled /fully controlled converters with R, RL and RLE loads, Continuous and discontinuous current operations- Evaluation of performance parameters - Phase controlled DC drives.

UNIT III CHOPPER CONTROLLED DC DRIVES

Principle of operation of chopper-Types-Four Quadrant Chopper Circuits- Buck and Boost Chopper fed DC machines.

UNIT IV INDUCTION MOTOR DRIVES

Dynamic Modelling of Induction machines- Single phase bridge inverters with R, RL and RLE loads -Phase controlled Induction motor drive-Frequency controlled Induction motor drives-Variable frequency Drives Three phase 120 and 180 degree mode Inverter fed AC machine -Vector controlled Induction motor drives -Direct and Indirect vector control.

UNIT V PERMANENT MAGNET SYNCHRONOUS AND BRUSHLESS DC MOTOR DRIVES (9 Hrs)

Synchronous Machines with PMs-Vector control of PMSM-Permanent magnet brushless DC motor-Sensor less control BLDC motor.

Text Books

- 1. R.Krishnan, "Electrical motor drives modelling, analysis and control" Pearson India, 2015.
- 2. Gopal K.Dubey, "Fundamentals of Electrical Drives" Narosa Publishing house, 2017.

Reference Books

- 1. P. S. Bimbhra, "Power Electronics" KHANNA PUBLISHSERS-DELHI, 2012.
- 2. Mohammed H Rashid, "Power electronics" Pearson Education India, 2009.
- 3. Bimal Bose, "Power electronics and driver circuits" Elseveir, 2006.
- 4. Bogdan M. Wilamowski, J. David Irwin,"Power Electronics and Motor Drives"CRC Press, 2011.
- Bimal K Bose, "Modern Power electronics and AC drives" Prentice hall, 2002. 5.

Web Resources

Hrs Т Ρ С L 3 n 3 45

(9 Hrs)

(9 Hrs)

(9 Hrs)

- 1. https://onlinecourses.nptel.ac.in/noc19_ee03
- 2. https://nptel.ac.in/downloads/108105066/
- 3. https://nptel.ac.in/content/storage2/courses/108105066/PDF/L(SSG)(PE)%20((EE)NPTEL).pdf
- 4. https://www.hindustanuniv.ac.in/assets/pdf/pg/PED_Syllabus.pdf
- 5. http://vnit.ac.in/academic/wp-content/uploads/2019/01/M.-Tech.-in-Power-Electronics-and-Drives-.pdf

COs/POs/PSOs Mapping

COs					Progr	am Oເ	utcome	es (PO	s)				Progr Outco	ram Spo omes (F	ecific PSOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-
2	2	1	-	1	-	-	-	-	-	-	-	-	2	-	-
3	2	1	-	1	-	-	-	-	-	-	-	-	2	-	-
4	2	2	-	2	-	-	-	-	-	-	-	-	2	-	-
5	2	2	-	1	-	-	-	-	-	-	-	-	2	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karM.Iech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

AC 1 409	2	Z	U	3	60
se Objectives					
o understand the principles in the formation of mechanisms and their kinematic	S				
o understand velocity and acceleration of different mechanisms					
o analyze the principles in mechanisms used for speed control and stability con	trol				
o understand balancing of mass and its position					
o understand the effect of Dynamics of undesirable vibrations					
se Outcomes					
completion of the course, the students will be able to					
Understand the principles of mechanisms and their kinematics (K1)					
Extract velocity and acceleration of different mechanisms(K2)					
Apply the forces in speed and stability control systems(K3)					
Analyzing balancing of mass and its position(K4)					
Prioritize different types of vibration, their causes and remedies(K5)					
INTRODUCTION				((12 Hrs
	AC 1409 se Objectives o understand the principles in the formation of mechanisms and their kinematics o understand velocity and acceleration of different mechanisms o analyze the principles in mechanisms used for speed control and stability con o understand balancing of mass and its position o understand the effect of Dynamics of undesirable vibrations se Outcomes completion of the course, the students will be able to Understand the principles of mechanisms and their kinematics (K1) Extract velocity and acceleration of different mechanisms(K2) Apply the forces in speed and stability control systems(K3) Analyzing balancing of mass and its position(K4) Prioritize different types of vibration, their causes and remedies(K5)	ACC 1409 2 See Objectives 0 understand the principles in the formation of mechanisms and their kinematics 0 understand velocity and acceleration of different mechanisms 0 analyze the principles in mechanisms used for speed control and stability control 0 understand balancing of mass and its position 0 understand the effect of Dynamics of undesirable vibrations See Outcomes Completion of the course, the students will be able to Understand the principles of mechanisms and their kinematics (K1) Extract velocity and acceleration of different mechanisms(K2) Apply the forces in speed and stability control systems(K3) Analyzing balancing of mass and its position(K4) Prioritize different types of vibration, their causes and remedies(K5)	ACC 1409 Z Z Z Se Objectives Dunderstand the principles in the formation of mechanisms and their kinematics Dunderstand velocity and acceleration of different mechanisms De understand velocity and acceleration of different mechanisms Develocity and acceleration of different mechanisms De understand balancing of mass and its position Develocity and acceleration of undesirable vibrations Develocity and the effect of Dynamics of undesirable vibrations Develocity and acceleration of different mechanisms (K1) Extract Velocity and acceleration of different mechanisms(K2) Apply the forces in speed and stability control systems(K3) Analyzing balancing of mass and its position(K4) Prioritize different types of vibration, their causes and remedies(K5)	AC 1409 2 2 0 se Objectives 0 understand the principles in the formation of mechanisms and their kinematics 0 0 understand velocity and acceleration of different mechanisms 0 analyze the principles in mechanisms used for speed control and stability control 0 understand balancing of mass and its position 0 understand the effect of Dynamics of undesirable vibrations se Outcomes completion of the course, the students will be able to Understand the principles of mechanisms and their kinematics (K1) Extract velocity and acceleration of different mechanisms(K2) Apply the forces in speed and stability control systems(K3) Analyzing balancing of mass and its position(K4) Prioritize different types of vibration, their causes and remedies(K5)	AC 1409 2 2 0 3 se Objectives o understand the principles in the formation of mechanisms and their kinematics o understand velocity and acceleration of different mechanisms o analyze the principles in mechanisms used for speed control and stability control o understand balancing of mass and its position o understand the effect of Dynamics of undesirable vibrations se Outcomes completion of the course, the students will be able to Understand the principles of mechanisms and their kinematics (K1) Extract velocity and acceleration of different mechanisms(K2) Apply the forces in speed and stability control systems(K3) Analyzing balancing of mass and its position(K4) Prioritize different types of vibration, their causes and remedies(K5) INTRODUCTION

Theory of machines: introduction, need, scope and importance in design and analysis. Kinematics, kinetics and dynamics-concept and examples. Basic terminology related to machines and mechanisms. Development of different mechanisms and its inversions like four bar chain mechanism, slider crank mechanism, double slider crank mechanism

Unit II VELOCITY AND ACCELERATION DIAGRAM

Basic concept used in solving velocity and acceleration problems. Approach to solve velocity and acceleration related to mechanisms using, Relative velocity method for single slider crank mechanism and Four bar chain mechanism. Klein's construction for single slider cranks mechanism

Unit III GOVERNOR AND GYROSCOPES

Governors - Types - Centrifugal governors, Gyroscopes - Gyroscopic forces and torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes

Unit IV BALANCING OFMASSES

Concepts and types of balancing. Effects of unbalanced masses. Balancing of revolving masses in same plane: Analytical and graphical methods to find balancing mass. Balancing of reciprocating masses

Unit V VIBRATIONS

Vibration-Terminology-Effects-Causes-Remedies. Free Vibration - Damped vibrations - Forced vibrations, Transverse vibrations, Torsional Vibrations – Equivalent shaft systems, single, Double and triple rotor systems

Text Books

U19MCT44

- 1. Rattan S.S, "Theory of Machines" Tata McGraw-Hill Publishing Company Ltd., New Delhi, and 2nd edition -2005.
- 2. Sadhu Singh, "Theory of Machines," Pearson Education (Singapore) Pvt. Ltd., India Branch, New Delhi, 2ND Edi. 2006.

References

- 1. Shigley. J. V. and Uickers, J.J., "Theory of Machines & Mechanisms" OXFORD Universitypress.2004
- 2. Theory of Machines -I", by A.S.Ravindra, Sudha Publications, Revised 5th Edi. 2004.
- 3. Grover. G.T., "Mechanical Vibrations", Nem Chand and Bros., 2006.
- 4. JagadishLal, 'Theory of Machine', DhanpatRai Publications, New Delhi.
- 5. Rao.J.S. and Dukkipatti R.V. "Mechanisms and Machines", Wiley-Eastern Ltd., New Delhi, 2012

Web Resources

- 1. http://mm-nitk.vlabs.ac.in/
- 2. https://nptel.ac.in/courses/112104114
- 3. https:/ocw.mit.edu
- 4. https://www.researchgate.net/publication/278026450_Introduction_to_Theory_of_Machines

(12 Hrs)

(12 Hrs)

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(12 Hrs)

(12 Hrs)

Hrs



Ρ С 5. http://ecoursesonline.iasri.res.in/mod/page/view.php?id=1303

COs				P	rogra	m O	utcor	nes (POs)				Prog Outo	gram Spe comes (P\$	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	3	-	-	-	-	-	-	-	2	1	-	1
CO2	3	2	3	3	-	-	-	-	-	-	-	2	2	1	1
CO3	3	2	3	3	-	-	-	-	-	-	-	1	2	2	1
CO4	3	2	3	3	-	-	-	-	-	-	-	1	1	1	2
CO5	3	2	3	3	-	-	-	-	-	-	-	1	1	-	1

Cos Mapping with POs and PSOs

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Mauskula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCP41	NUMERICAL METHODS LAB	L	т	Ρ	С	Hrs
U20BSP439		0	0	2	1	30

Course Objectives

- To learn the techniques of solving non-linear equation.
- To find the solutions of simultaneous equations.
- To introduce the numerical techniques of differentiation and integration.
- To understand the curve fitting techniques.
- To study about the single mean and difference of means.

Course Outcomes

After completion of the course, students will be able to

- CO1 Solve algebraic and transcendental equations. (K3)
- CO2 Solve the system of simultaneous equations. (K3)
- CO3 Apply the knowledge of interpolation by using the numerical methods. (K3)
- CO4 Apply the concept of least square method. (K3)
- CO5 Know the concept of testing of hypothesis. (K3)

List of Experiments

- 1. Roots of non-linear equation using bisection method.
- 2. Roots of non-linear equation using Newton's method.
- 3. Solve the system of linear equations using Gauss Elimination method.
- 4. Solve the system of linear equations using Gauss Seidal iteration method.
- 5. Solve the system of linear equations using Gauss Jordan method.
- 6. Find the area by using trapezoidal rule.
- 7. Fit a straight line by method of least squares.
- 8. Fit a parabola by method of least squares.
- 9. Test for Single mean.
- 10. Test for difference of mean.

Reference Books

- 1. Rajesh Kumar Guptat, "Numerical Methods, Fundamental and its Applications", Cambridge University, 2019.
- 2. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019
- 3. Timothy Sauer, "Numerical Analysis", Pearson Education, 3rd Edition, 2017.
- 4. Arvind Pragati Gautam, "Numerical Methods", Alpha Science International Limited, 2019.
- 5. N. P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015.

Web Resources

- 1. http://scilab.in
- 2. http://nptel.ac.in/courses/111107063
- 3. http://nptel.ac.in/courses/122102009
- 4. https://youtu.be/luEOMyGuulg
- 5. https://youtu.be/i VKsST3kkQ

COs/POs/PSOs Mapping

COs					Pro	ogram O	utcon	nes (P	'Os)				Prog Outco	ram Spo omes (F	ecific PSOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO110	PO111	PO112	PSO1	PSO2	PSO3
1	3	2	1	1	-	1	-	-	-	-	-	1	3	1	-
2	3	2	1	1	-	1	-	-	-	-	-	1	3	1	-
3	3	2	1	1	-	1	-	-	-	-	-	1	2	2	-
4	3	2	1	1	-	-	-	-	-	-	-	1	2	2	-
5	3	2	1	1	-	-	-	-	-	-	-	1	2	2	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech., Ph.D., 1

Ul. 5.5212MUIIUga WOlldin Raj.M. tech., Ph.D., Professor. & Head, Dept. of Mechatronics Engineering Sri Manakula Viazyagar Eagineering College, Madagadipet, Puducherry-605 107.

U19MCP42 ELECTRONIC DEVICES AND CIRCUITS

LAB

T P C Hrs 0 2 1 30

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Course Objectives

- To study the characteristics of diodes.
- To make the student to understand about rectifiers.
- To enable the student to understand about the Bipolar Junction Transistor and their operation.
- To analyse about junction field effect transistor, UJT and SCR.
- To give understanding of various types of amplifier circuits.

Course Outcomes

After completion of the course, the students are able to

- CO1 Examine the characteristics of various Diodes. (K4)
- CO2 Distinguish the principles of rectifier circuits. (K4)
- **CO3 -** Appraise the BJT operations in various configurations **(K4)**
- CO4 Experiment the various characteristics of FET, UJT and SCR. (K4)
- CO5 Test the frequency responses of various types of amplifiers. (K4)

LIST OF EXPERIMENTS

- 1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
- 2. Zener diode characteristics and voltage regulator
- 3. Half wave Rectifier with and without filter.
- 4. Full wave Rectifier with and without filter.
- 5. Transistor CB characteristics (Input and Output).
- 6. Transistor CE characteristics (Input and Output).
- 7. FET Characteristics
- 8. UJT characteristics.
- 9. SCR characteristics.
- 10. Frequency response of CE Amplifier
- 11. Frequency response of CC Amplifier (Emitter Follower).
- 12. Frequency Response of CS Amplifier and CD Amplifier

Reference Books

- 1. The Art of Electronics, Horowitz, 3rd Edition Cambridge University Press.
- 2. Electronic Devices and Circuits, David A. Bell 5th Edition, Oxford.
- 3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2Ed.,2008, Mc Graw Hill.

Web Resources

- 1. http://www.electronics-tutorials.ws
- 2. https://nptel.ac.in/courses/117/103/117103063/
- 3. https://www.electrical4u.com/diode-working-principle-and-types-of-diode/
- 4. www.allaboutcircuits.com
- 5. www.tutorialspoint.com

COs/POs/PSOs Mapping

COs					Progr	ram Oເ	utcom	es (PO	s)				Prog Outco	ram Sp omes (F	ecific PSOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	2	-	1	-	-	-	3	-	-	-	2	-	-
2	2	1	2	-	1	-	-	-	3	-	-	-	2	-	-
3	2	2	2	-	1	-	-	-	3	-	-	-	2	-	-
4	2	2	2	-	1	-	-	-	3	-	-	-	2	-	-
5	2	2	2	-	1	-	-	-	3	-	-	-	2	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Di.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCP43	POWER ELECTRONICS AND DRIVES	L	т	Ρ	С	Hrs
U20MCP405	LAB	0	0	2	1	30

Course Objectives

- To study about switching characteristics of different types of power semi-conductor devices
- To determine the operation, characteristics and performance parameters of converters
- To understand the concept of DC and AC drives

Course Outcomes

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

- CO1 Know the construction, operation and characteristics of different types of power semiconductor devices.(K2)
- CO2 Understand the operation, characteristics and performance parameters of converters and choppers. (K2)
- CO3 Interpret the operation and characteristics of invertors and its related techniques.(K3)
- CO4 Acquire the knowledge on solid-state DC drives and its control.(k3)

LIST OF EXPERIMENTS

- 1. Gate Pulse Generation using R, RC and UJT.
- 2. Characteristics of SCR and TRIAC.
- 3. Characteristics of MOSFET and IGBT
- 4. AC to DC half controlled converter
- 5. AC to DC fully controlled Converter
- 6. Step down and step up MOSFET based choppers
- 7. IGBT based single phase PWM inverter
- 8. IGBT based Three Phase PWM Inverter Fed AC Drives
- 9. AC Voltage controller
- 10. Switched mode power converter.
- 11. Characteristics of PMBLDC motor.
- 12. Resonant dc to dc converter
- 13. Speed control of Universal Motor
- 14. Intelligent Power Module of DSP based AC Drives
- 15. Vector control of Induction Motor Drive

References

- 1. Bogdan M. Wilamowski, J. David Irwin, "Power Electronics and Motor Drives", CRC Press, 2017.
- 2. <u>K Sundareswaran</u>, "<u>Elementary Concepts of Power Electronic Drives</u>", CRC Press, 2019.
- 3. Vinod Kumar, Ranjan Kumar Behera, Dheeraj Joshi, Ramesh Bansal, "Power Electronics, Drives, and Advanced Applications", CRC press, 2020.
- 4. **Orlowska-Kowalska**, Teresa, **Blaabjerg**, Frede, **Rodríguez**, José, "Advanced and Intelligent Control in Power Electronics and Drives", Springer, 2014.
- 5. Vukosavic, Slobodan-Boban, "Digital Control of Electrical Drives", Springer, 2007.

Web Resources

- 1. https://www.vvitengineering.com/lab/EE6611-POWER-ELECTRONICS-AND-DRIVES-LAB.pdf
- 2. http://www.srmvalliammai.ac.in/qb/EEE/UG/6th%20Semester/EE8661-Power%20Electronics%20and%20Drives-Lab%20Manual.pdf
- 3. http://pnbalamurugan.yolasite.com/resources/EE6611%20POWER%20ELECTRONICS%20AND%20D RIVES%20LAB%20MANUAL.pdf
- 4. https://lecturenotes.in/practicals/19388-lab-manuals-for-power-electronics-and-drives-power-electronics-by-anna-superkings
- 5. http://ezhil-ecesait.webs.com/Power-Electronics-Lab-Manual.pdf

COs/POs/PSOs Mapping

Correlation Level: 1-Low, 2-Medium, 3- High

COs					Program Specific Outcomes (PSOs)										
	P01	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12													PSO3
1	3	2	2	3	3	-	-	-	3	2	2	3	3	2	2
2	3	2	2	3	3	-	-	-	3	2	2	3	3	2	2
3	3	2	2	3	3	-	-	-	3	2	2	3	3	2	2
4	3	3 2 2 3 3 3 2 2												2	2

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Masakula Vinayagar Esgintering College, Madagadipet, Puducherry-605 107.

U19MCP44 U20MCP406

Course Objectives

- To teach the students principle of working of various governor
- To teach the students the different modes of balancing
- To teach the students, various modes of vibration

Course Outcomes

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

- **CO1** Ability to perform the working of various governor
- CO2 Ability to perform different modes of balancing and cam analysis
- CO3 Ability to perform different types various modes of vibration

List of Experiments

- 1. Demonstration of four bar inversion mechanism
- 2. Natural frequency of single mass, single helical spring system.
- 3. Natural frequency of combination of springs springs in parallel, springs in series
- 4. Natural frequency of undamped torsional single rotor, double rotor system. Effect of inertia (I)and stiffness(k).
- 5. Determination of radius of gyration of a given compound pendulum
- 6. Determination of radius of gyration, moment of inertia bifilar suspension method trifler suspension method

7. Damping coefficient of torsional single rotor system – Effect of depth of immersion in oil and damping ratio

- 8. Resonance frequency of equivalent spring mass system undamped and damped condition a) To plot amplitude Vs frequency graph for different damping.
- 9. Determination of characteristic curves of Watt, Porter, Proell and spring loaded governors.
- 10. Static and Dynamic balancing.
- 11. Whirling of shafts/ determination of critical speed with and without Rotors.
- 12. Gyroscopic couple verification.
- 13. Journal bearing pressure distribution of different loads at different Speeds.
- 14. Cam motion analysis.

Reference Books

- 1. S.S.Rattan, Theory of Machines, 3rd edition, Tata McGraw-Hill Education India, 2019
- Sadhu Singh, Theory of Machines: Kinematics and Dynamics, 3rd Edition, Publisher: Pearson Education India, 2014
- 3. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006
- 4. **Ghosh**, Amitabha, "Introduction to Dynamics", Springer, 2018.
- 5. David Myszka, "Machines & Mechanisms: Applied Kinematic Analysis", Pearson, 2010.

Web Resources

- 1. http://mm-nitk.vlabs.ac.in/
- 2. https://nptel.ac.in/courses/112104114
- 3. https:/ ocw.mit.edu

COs/POs/PSOs Mapping

CO/P	PO	PO1	PO1	PO1	PSO	PSO	PSO								
0	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO1	3	2	2	2	3	-	-	-	3	-	-	3	3	2	2
CO2	3	2	2	2	3	-	-	-	3	-	-	3	3	2	2
CO3	3	2	2	2	3	-	-	-	3	-	-	3	3	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Msuakula Vinayagar Esgincering College, Madagadipet, Puducherry-605 107.

U19MCC4X CERTIFICATION COURSE – II

L T P C Hrs 0 0 4 - 50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Maushula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

GENERAL PROFICIENCY-II

(Common to all branches)

Course Objectives

U19MCS41

U20HSP402

- To examine various standardized test in English language
- To recognize the key features of various technical writing
- To integrate LSRW skills to endorse multifarious skill set in practical situation
- To understand the factors that influence the usage of grammar
- To understand the basic concepts of logical reasoning skills

Course Outcomes

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

- Infer ideas to attend international standardized test by broadening receptive and productive skills (K2)
- Interpret the types of writing in different state of affairs (K2)
- Develop language skills professionally to groom the overall personality through sensitizing various etiquettes in real time situation (K3)
- Identify the rules of grammar in academic discourse settings (K3)
- Extend the skills to compete in various competitive exams like GATE, GRE, CAT, UPSC, etc. (K2)

UNIT I -CAREER SKILLS

Listening: Listening at specific contexts **Speaking:** Mock interview (Personal & Telephonic)-**Reading**: Read and Review -Newspaper, Advertisement, Company Handbooks, and Guidelines (IELTS based) **Writing:** Essay Writing (TOEFL) **Vocabulary:** Words at specified context (IELTS)

UNIT II - CORPORATE SKILLS

Listening: Listening and replicating **Speaking**: Team Presentation (Work Place Etiquettes) **Reading**: Short texts (signs, emoticons, messages) **Writing**: E-mail writing- Hard skills -Resume' Writing, Job Application Letter, Formal Letter **Vocabulary**: Glossary (IELTS)

UNIT III - FUNCTIONAL SKILLS

Listening: Listening TED Talks – **Speaking:** Brainstorming &Individual Presentation, Persuasive Communication – **Reading:** Text Completion (GRE Based) **Writing:** Expansion of Compound Words **Vocabulary:** Expansion of vocabulary (IELTS)

UNIT IV - TRANSFERABLE SKILLS

Listening: Listening Documentaries and making notes –**Speaking:** Conversation practice at formal & informal context **Reading:** Read and transform- report, memo, notice and advertisement, **Writing:** Euphemism, Redundancy, and Intensifiers **Vocabulary:** Refinement of vocabulary (IELTS)

UNIT V -APTITUDE

Transformational Grammar: Phrases & Clauses, Concord, Conditional Clauses, Voice, Modals **Verbal Ability Enhancement:** Letter Series, Coding & Decoding, Sentence Completion (GATE), Critical Reasoning & Verbal Deduction (GATE), Syllogism

Reference Books

- 1. Lougheed, Lin. "Barron's Writing for the TOEFL IBT: With Audio CD". Barron's Educational series, 2008.
- 2. Tulgan, Bruce. "Bridging the soft skills gap: How to teach the missing basics to today's young talent". John Wiley & Sons, 2015.
- 3. Sherfield, Robert M. "Cornerstone: Developing Soft Skills". Pearson Education India, 2009.
- 4. Cullen, Pauline, Amanda French, and Vanessa Jakeman. "The official Cambridge guide to IELTS for academic & general training". Cambridge, 2014.

(6Hrs) eading:

(6Hrs)

(6Hrs)

(6 Hrs)

(6Hrs)

L T P C Hrs 0 0 2 - 30

5. Ramesh, Gopalaswamy. "The ace of soft skills: attitude, communication and etiquette for success". Pearson Education India, 2010.

Web Resources

- 1. https://www.englishclub.com/grammar/nouns-compound.htm
- 2. https://lofoya.com/Verbal-Test-Questions-and-Answers/Sentence-Completion/I3p1
- 3. https://www.grammarwiz.com/phrases-and-clauses-quiz.html
- 4. https://www.clarkandmiller.com/25-english-euphemisms-for-delicate-situations/
- 5. http://www.englishvocabularyexercises.com/general-vocabulary/

COs/POs/PSOs Mapping

			Program Specific												
СО					Outco	omes (I	PSOs)								
S	PO	PO PO1 PO1 PO													
	1	1 2 3 4 5 6 7 8 9 0 1 2 1													
1	1	1 1 - 3 - 1													-
2	1	-	-	-	-	-	-	1	-	3	-	1	1	-	-
3	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-
4	1	1 1 - 3 - 1												-	-
5	1	-	-	-	-	-	-	-	-	3	-	1	1	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech., Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107. U19MCS42

L	Т	Ρ	С	Hrs
0	0	2	-	30

1. Power Transmission Systems

Mechanical power transmission involves using different types of systems to transfer energy from one component to another without changing its nature. When motion coming from a driving mechanical component is transferred to another without being changed, there is power transmission. In a mechanical power transmission system, the moving component transfers the energy to the receiving component. These two components can be in direct contact, but power can also be transmitted via an intermediary component. **Gears:** Characteristics of gear systems – Advantages and Limitations - Applications

Chain drive systems: Characteristics of chain drive systems – Advantages and Limitations - Applications

Worm drives: Characteristics of worm systems - Advantages and Limitations - Applications

Rack and Pinion: Characteristics of rack and pinion systems – Advantages and Limitations – Applications

Belt and pulley systems: Characteristics of belt and pully systems – Advantages and Limitations - Applications

2. 3D Printing

The official said that the theory classes have been designed in a simple manner to ensure that the students are able to grasp the topics in a short period of time. On successful completion of this course, student will be able to Acquire knowledge in 3D printing Machine, Analyze the fundamental concepts of software and hardware of 3D printing. Design and development of simple model by 3D printing. Create real time model of 3D Printing object. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence. The skill training to improve the employability of the students and also impart industry relevant training for up-skilling the faculty and Industrial persons.

3. Non – Destructive Testing

Non – Destructive Testing is a testing and analysis technique used by industry to evaluate the properties of a material, component, structure or system for characteristic differences or welding defects and discontinuities without causing damage to the original part.

Electromagnetic Testing (ET) - Ground Penetrating Radar (GPR) - Laser Testing Methods (LM) - Leak Testing (LT) - Magnetic Flux Leakage (MFL) - Microwave Testing - Liquid Penetrant Testing (PT) - Magnetic Particle Testing (MT) - Radiographic Testing (RT).

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U19MCM41

INDIAN CONSTITUTION

L T P C Hrs 2 0 0 - 30

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" - a modern and progressive concept historically developed by the thinkers of "liberalism" - an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America. The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950.

Course content

- 1. Meaning of the constitution law and constitutionalism
- 2. Historical perspective of the Constitution of India
- 3. Salient features and characteristics of the Constitution of India
- 4. Scheme of the fundamental rights
- 5. The scheme of the Fundamental Duties and its legal status
- 6. The Directive Principles of State Policy Its importance and implementation
- 7. Federal structure and distribution of legislative and financial powers between the Union and the States
- 8. Parliamentary Form of Government in India The constitution powers and status of the President of India
- 9. Amendment of the Constitutional Powers and Procedure
- 10. The historical perspectives of the constitutional amendments in India
- 11. Emergency Provisions : National Emergency, President Rule, Financial Emergency
- 12. Local Self Government Constitutional Scheme in India
- 13. Scheme of the Fundamental Right to Equality
- 14. Scheme of the Fundamental Right to certain Freedom under Article 19
- 15. Scope of the Right to Life and Personal Liberty under Article 21.

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

- To usage of CAD & Reverse Engineering concept in Additive Manufacturing
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.

• To know the principle methods, areas of usage, possibilities and limitations as well as environmental

ADDITIVE MANUFACTURING

- To be familiar with various rapid prototyping and additive Manufacturing Techniques
- To usage of Additive Manufacturing in Bio Products.

Course Outcomes

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

- CO1 Compare various methods of Additive Manufacturing technologies(K2)
- **CO2** Use apply latest technologies like CAD Modeling and Simulation tools and do computer assisted Additive Manufacturing(K3)
- CO3 Analyze the characteristics of the different materials in Additive Manufacturing.(K4)
- CO4 Will learn the latest trends and opportunities in 3D printing, localize services, production parts(K2)
- **CO5** Understand the latest trends and business opportunities in Additive Manufacturing, distributed manufacturing and mass customization.(K2)

UNIT I INTRODUCTION

Overview – History – Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology – Tooling – Applications.

UNIT II CAD & REVERSE ENGINEERING

Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology: CAD model preparation – Part Orientation and support generation – Model Slicing–Tool path Generation – Software for Additive Manufacturing Technology: MIMICS, MAGICS.

UNIT III LIQUID AND SOLID BASED ADDITIVE MANUFACTURING

Classification – Liquid based system – Stereo-lithography Apparatus (SLA)- Principle, process, advantages and applications – Solid based system –Fused Deposition Modeling – Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS

Selective Laser Sintering – Principles of SLS process – Process, advantages and applications, Three Dimensional Printing – Principle, process, advantages and applications-Laser Engineered Net Shaping (LENS), Electron Beam Melting

UNIT V BIO-ADDITIVE MANUFACTURING & SOFTWARES

Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing- Computer Aided Tissue Engineering (CATE) – Case studies Preparation of Drawings for Parts and Assembly of the following by using Drafting software. Designing for Additive Manufacturing (DfAM), Software Tools vs. Requirements

U19MCE41 U20MCE401

Course Objectives

Hrs)

(9

(9

Hrs)

(9 Hrs)

(9

Hrs)

(9 Hrs)

Text Books

- 1. John O. Milewski" Additive Manufacturing of Metals:" Springer, 2017
- 2. Li Yang, Keng Hsu, Brian Baughman, Donald Godfrey, Francisco Medina, "Additive Manufacturing of Metals: The Technology, Materials, Design and Production" Springer, 2017
- **3.** Ian Gibson, David Rosen, Brent Stucker, "Additive Manufacturing Technologies: 3D Printing, Rapid Prototyping, and Direct Digital Manufacturing", Springer Nature; 2nd ed., 2015.

References Books

- 1. <u>Manu Srivastava</u>, <u>Sandeep Rathee</u>, <u>Sachin Maheshwari</u>" Additive Manufacturing: Fundamentals and Advancements" <u>CRC Press</u>2019
- 2. Rupinder Singh, J. Paulo Davim, "Additive Manufacturing: Applications and Innovations <u>Manufacturing</u> <u>Design and Technology</u>" CRC Press / Taylor & Francis Group 2018
- 3. Amit Bandyopadhyay, Susmita Bose, "Additive Manufacturing" CRC Press/Taylor & Francis Second Edition 2019
- 4. <u>Martin Leary</u>, " Design for Additive Manufacturing", <u>Elsevier</u>2019.
- 5. <u>David J. Fisher</u>, "Additive Manufacturing of Metals", <u>Materials Research Forum LLC</u>2020.

Web Resources

- 1. http://www.digimat.in/nptel/courses/video/112104204/L47.html
- 2. <u>https://www.coursera.org/lecture/digital-thread-implementation/additive-manufacturing-Ah2w6</u>
- 3. https://nptel.ac.in/courses/110/106/110106146/
- 4. https://learn-xpro.mit.edu/additive-manufacturing
- 5. https://www.youtube.com/watch?v=BdyQSC0tbqU

со				Program Specific Outcomes (PSOs)											
s	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	2	2	2	2	3	-	-	-	-	-	-	3	2	2	2
CO 2	3	2	3	2	3	-	-	-	-	-	-	3	3	3	2
CO 3	3	3	3	3	3	-	-	-	-	-	-	3	2	2	3
CO 4	3	2	3	2	3	-	-	-	-	-	-	3	3	3	2
CO 5	2	2	2	2	3	-	-	-	-	-	-	3	2	3	2

COs Mapping with POs and PSOs

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19MCE42HEATING VENTILATION AND AIRLTPCHrsU20MCE402CONDITIONING30345

Course Objectives

- Understand the thermodynamic concepts to be used for HVAC applications
- Understand and describe the major concepts of the psychrometric chart.
- Define heating, ventilating and air conditioning.
- Define the heating and cooling loads to be considered in designing a HVAC system.
- Explain how a HVAC system can be controlled for better performance.

Course Outcomes

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

- **CO1** Apply the law of thermodynamics for simple HVAC systems(K3)
- CO2 Solve problems using refrigerant table / charts and psychrometric charts(K3)
- CO3 Recognizing various components needed for HVAC systems(K2)
- $\textbf{CO4} \quad \text{Able to estimate the heating and cooling loads to design HVAC units. (K3)}$
- CO5 Developing control systems for controlling the performance of HVAC units. (K3)

UNIT I INTRODUCTION

Fundamentals of Thermodynamics - Conservation of Mass, Laws of Thermodynamics, Thermodynamic Cycles, Fundamentals of Heat Transfer, Conduction, Convection, Thermal Radiation. HVAC - Scope of HVAC, Air-Conditioning Processes, Environment for Human Comfort.

UNIT II PSYCHROMETRY

Psychrometrics, Ideal Gas Approximation, Fundamental Parameters, Equation of State, Humidity, Degree of Saturation, Wet Bulb Temperature, Partial Pressure of Water Vapor, Dew Point Temperature, Saturation, Enthalpy, Thermodynamic Wet Bulb Temperature, Properties of Moist Air, Psychrometric Chart, simple exercises using psychrometry

UNIT III AIR CONDITIONING PROCESSES AND VENTILATION

Introduction, Basic processes - Heating and Cooling Process, Cooling with Dehumidification, Heating with Humidification, Adiabatic Mixing of Two Air Streams, Evaporative Cooling, Heating and Air Conditioning System Cycles. Basic air-conditioning system and zoned air-conditioning system. Indoor air quality and ventilation - Indoor Air Quality, Ventilation Procedure, Concentration of Air Pollutants, Indoor Air Quality Procedure, Filters – Types, Ozone, Ultraviolet Light

UNIT IV HEATING AND COOLING LOAD CALCULATIONS

Emissivities of Materials, Heat Transfer Coefficient, Coefficient of Transmission, Thermal Conductivities of Materials, Thermal Resistances of Materials, Outdoor Air Load Components – introduction, Basic Concepts and Terminologies. Heating load calculations – Introduction, Calculating Design Heating Loads. Cooling load calculations - Basic Definitions, Transfer Function Method (TFM), Heat Sources and heat gains, CLTD / SCL / CLF Calculation Procedure, Cooling Load by CLTD/SCL/CLF Method

UNIT V DIGITAL CONTROLS FOR HVAC SYSTEMS

Introduction, control types, Basic Control – open and closed loop controls, Typical Control Loops, Direct Digital Control – Introduction, control schemes, Direct Digital Control of an Air-Handler – Introduction, Schemes, Architecture and Advantages of Direct Digital Controls.

Text Books

- 1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ",Fifth Edition,2017.
- 2. <u>Joseph Wagner</u>, <u>Kirk VanGelder</u> "Automotive Heating, Ventilation, and Air Conditioning" Jones & Bartlett Learning, 2018.
- 3. A. Vedavarz, S. Kumar, M. Hussain, "Heating, Ventilation and Air Conditioning Handbook", Industrial Press Inc., 2006

(9 Hrs)

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(9 Hrs)

(9 Hrs)

Reference Books

- 1. <u>Red-Hot Careers</u> "Heating, Ventilation, and Air Conditioning (HVAC) "CreateSpace Independent Publishing Platform, 2018–2018
- 2. Jan F. Kreider, "Handbook of Heating, Ventilation, and Air Conditioning", Taylor & Francis Limited, 2019.
- 3. <u>Amrutha Rao MALLI</u>, "A Practical Approach on Heating Ventilation and Air Conditioning Technology", Independently Published, 2017.
- 4. <u>Russell E. Smith</u>, "Electricity for Refrigeration, Heating, and Air Conditioning", <u>Cengage Learning</u>- 2018
- 5. <u>David W. Bearg</u>, "Indoor Air Quality and HVAC Systems", <u>Routledge</u>, 2019.

Web Resources

- 1. https://nptel.ac.in/courses/112/105/112105129/
- 2. https://swayam.gov.in/nd1_noc19_me58/preview
- 3. https://drive.google.com/open?id=0B7JWdKw_4Q07VWNrLVNkRXpyUmM
- 4. https://www.google.com/url?sa=t&source=web&rct=j&url=https://ocw.mit.edu/courses/architecture/4-401-environmental-technologies-in-buildings-fall-2018/lecture-slideslec17.pdf&ved=&usg=AOvVaw3XYdn
- 5. https://www.epa.gov/iaq-schools/heating-ventilation-and-air-conditioning-systems-part-indoor-airquality-design-tools

со	Prog	ram O		Program Specific Outcomes (PSOs)											
S	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	P01	PSO	PSO	, PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	3	3	2	3	3	1	2	2	1	1	2	3	3	2	2
CO 2	3	3	3	3	3	2	2	1	1	2	2	3	3	3	3
CO 3	3	3	3	3	3	1	1	1	2	1	1	3	3	3	3
CO 4	3	3	3	3	3	2	2	2	3	2	2	3	3	3	3
CO 5	3	3	2	3	3	2	2	2	3	2	2	3	3	3	3

COs Mapping with POs and PSOs

Dr.G.Balamuruga Mohan kaı, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Mauslula Viazyagar Esgineering College, Madagadipet, Puducherry-605 107.

U19MCE43 Ρ С Hrs т L COMPUTER INTEGRATED MANUFACTURING **U20MCE403** 3 0 0 3 45

Course Objectives

- To discuss the basic concepts of CIM and Communication.
- To deal with the information related to Database management system and Product design
- To learn the principles of Concurrent engineering and Process planning
- To discuss about basic principles of Automatic Data Collection and Quality inspection
- To introduce various concepts of FMS, AGV and Industrial robotics

Course Outcomes

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

- CO1 Apply the knowledge of computer integrated manufacturing and communication.(K3)
- CO₂ Identify the required DBMS architecture and product design details for various systems.(K2)
- Apply the knowledge of Concurrent engineering and process planning in manufacturing CO3 planning.(K3)
- CO4 Identify the methods for Automated Data Collection and Quality inspection, as required.(K2)
- CO5 Determine the required Flexible manufacturing system components along with the required AGV and Robotics.(K3)

UNIT I INTRODUCTION TO CIM AND COMMUNICATION

Introduction to CIM, Evolution, Benefits, Computers in Manufacturing: Factory tasks for Computer Integration, CIM Hardware and Software.

Fundamentals of Communication: Representation of data, Coding, Transmission, Medium, Types of Communication Lines and Hardware. Network Architectures.

UNIT II DATABASE MANAGEMENT SYSTEMAND PRODUCT DESIGN (9 Hrs)

Data base: Introduction, Manufacturing data, Data base models, Data base Management, Data base required for a shop floor control (Fundamentals only)

Product Design: Design Process, CAD - areas of Application, Benefits, Fundamentals of CAD. CAM, CAE.

UNIT III CONCURRENT ENGINEERING AND PROCESS PLANNING

Concurrent / Simultaneous engineering: Introduction, Design for manufacturing and assembly, and other product design objectives. Advanced Manufacturing Planning. Introduction to Reverse Engineering. Process Planning: CAPP, Retrieval and Generative Model.

UNIT IV DATA COLLECTION AND QUALITY INSPECTION

Automated Data Collection - Bar Codes, OCR, Image Processing, Computer vision, RF Identification, Magnetic Identification, Voice Technology, Comparison.

CAQC, Contact & Non-Contact type inspection, Introduction to CMM, Application of Various Techniques and Equipments in inspection, interfacing inspection with CAD/CAM.

UNIT V FLEXIBLE MANUFACTURING SYSTEM

Types of Flexibility - FMS - FMS Components - FMS Application & Benefits. Automated Guided Vehicle System- AGVS Application - Vehicle Guidance technology - Vehicle Management & Safety. Industrial robotics: Robot Anatomy, Classification of Robots - End Effectors - Sensors in Robotics- Industrial Robot Applications.

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

- 1. Mikell. P. Groover, 'Automation, Production Systems and computer integrated manufacturing', Prentice Hall of India, New Delhi, 2007.
- 2. P. Radhakrishnan , S. Subramanyan, V. Raju, 'CAD/CAM/CIM', New Age International (P) Ltd., New Delhi, 2000.
- 3. Bedworth, Henderson & Wolfe, 'Computer Integrated Design and Manufacturing', McGraw Hill
- 4. William. W. Luggen, 'Flexible Manufacturing Cells and System', Prentice Hall, New jersy
- 5. Rao. P, N Tewari & T. K. Kundra, "Computer Aided Manufacturing", Tata McGraw Hill Publishing Company, 2000.

References Books

- 1. S. Kant Vajpayee, 'Principles of Computer Integrated Manufacturing', Prentice Hall of India, 2003.
- 2. Teicholtz, Orr, 'CIM Handbook', McGraw Hill publishing.
- 3. Roger Hanman, 'Computer Intergrated Manufacturing', Addison Wesley, 1995.
- 4. Gideon Halevi and Roland Weill, "Principles of Process Planning A Logical Approach"
- 5. James A. Rehg, H. W. Kraebber, "Computer Integrated Manufacturing, 2nd edition, Pearson Education

Web Resources

- 1. www.cimlearningzone.co.uk/
- 2. http://nptel.ac.in/courses/112102101/
- 3. http://nptel.ac.in/courses/112102103/
- 4. http://elearning.vtu.ac.in/06ME72.html
- 5. https://ocw.mit.edu/courses/mechanical-engineering/2-008-design-and-manufacturing-ii-spring-2004/lecture-notes/

COs Mapping with POs and PSOs

со	Prog	ram Oı	itcome	s (POs)								Program Specific Outcomes (PSOs)			
s	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO	
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	
CO 1	3	2	2	2	3	-	1	2	-	3	-	3	3	3	2	
CO 2	3	3	3	2	3	-	2	2	-	-	-	3	3	3	2	
CO 3	3	3	2	2	3	-	1	1	-	-	-	3	3	3	2	
CO 4	3	3	2	2	3	-	2	2	-	-	-	3	3	3	3	
CO 5	3	3	2	2	3	-	2	2	-	-	-	3	3	1	2	

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

INSTRUMENTATION FOR AUTOMOTIVE **U19MCE44** P C Hrs L Т 0 **U20MCE404** INDUSTRIES 3 0 3 45

Course Objectives

- 1. To provide knowledge about various techniques used for the measurement of industrial parameters
- 2. To provide knowledge on measurement of velocity, displacement, viscosity, temperature using various types of sensors and related circuits
- 3. To introduce Force & Torque Measuring Instruments
- 4. To introduce Pressure & flow Measuring Instruments
- 5. To impart knowledge on measuring of process variables, analytical instrumentation, automatic process controls

Course Outcomes

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

- CO1 Capable to select and use strain measuring instruments(K2)
- CO2 Check various available techniques available and select appropriate to obtain satisfactory task for the parameter to be measured like displacement, Force & Torque(K3)
- CO3 Be acquainted with measurement of Pressure & flows. (K2)
- CO4 Be acquainted with measurement of Level & Temperature of a system(K2)
- CO5 Acquire and Interpret the measurement results and cause of any possible error(K4)

UNIT I INTRODUCTION AND STRAIN MEASUREMENT

Introduction to instrumentation system, static and dynamic characteristics of an instrumentation system. Strain Gauge and Strain Measurement: Factors affecting strain measurements, Types of strain gauges, theory of operation of resistive strain gauge, gauge factor, types of electrical strain gauges, strain gauge materials, gauging techniques and other factors, strain gauge circuits and temperature compensation, applications of strain gauges

UNIT II DISPLACEMENT, FORCES AND TORQUE MEASUREMENT

Resistive potentiometer (Linear, circular and helical), LVDT, RVDT and their characteristics, variable inductance and capacitance transducers, Piezo electrical transducers-output equations and equivalent circuit, Hall effect devices and Proximity sensors, Large displacement measurement using synchros and resolvers, Shaft encoders. Load cells and their applications, various methods for torque measurement. Use of torque wrenches.

UNIT III PRESSURE AND FLOW MEASUREMENT

Mechanical devices like Diaphragm, Bellows, and Bourdon tube for pressure measurement, Variable inductance and capacitance transducers, Piezo electric transducers, LVDT for measurement of pressure, Low pressure and vacuum pressure measurement using Pirani gauge, McLeod gauge, Ionization gauge, Pressure gauge calibration. Differential pressure meter like Orifice plate, Venturi tube, flow nozzle, Pitot tube, Rotameter, Turbine flow meter, Electromagnetic flow meter, hot wire anemometer, Ultrasonic flow meter.

UNIT IV LEVEL AND TEMPERATURE MEASUREMENT

Resistive, inductive and capacitive techniques for level measurement, Ultrasonic and radiation methods, Air purge system (Bubbler method).Resistance type temperature sensors - RTD & Thermistor, Thermocouples & Thermopiles, Laws of thermocouple - Fabrication of industrial thermocouples - Signal conditioning of thermocouples output - Radiation methods of temperature measurement - Radiation fundamentals - Total radiation & selective radiation pyrometers - Optical pyrometer - Two colour radiation pyrometers

UNIT V DIGITAL DATA ACQUISITION SYSTEMS & CONTROL (9 Hrs)

Use of signal conditioners, scanners, signal converters, recorders, display devices, A/D & D/A circuits in

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

digital data acquisition. Instrumentation systems. Types of Instrumentation systems. Components of an analog Instrumentation Data – Acquisition system. Multiplexing systems. Uses of Data Acquisition systems. Use of Recorders in Digital systems. Digital Recording systems. Modern Digital Data Acquisition system. Analog Multiplexed operation, operation of sample Hold circuits.

Text Books

- 1. Salah H. R. Ali, "Automotive Engine Metrology", CRC Press, 2017.
- 2. Tom Denton, "Automotive Technician Training: Theory", Routledge, 2014.
- 3. S Sheeba Rani, P Subha Hency Jose, P Rajalakshmy, "Automotive Electrics and Instrumentation", Educreation Publishing, **2**019

Reference Books

- 1. Frank Lamb, "Industrial Automation: Hands On", McGraw Hill Professional, 2013
- 2. Jerker Delsing, "IoT Automation: Arrowhead Framework", <u>CRC Press</u>, 2017.
- 3. <u>Gregory K. McMillan</u>, <u>P. Hunter Vegas</u>, "Process / Industrial Instruments and Controls Handbook", McGraw-Hill Education, 2019.
- 4. Bela G. Liptak, Kriszta Venczel, "Instrument and Automation Engineers' Handbook: Process Measurement and Analysis", Taylor & Francis, 2016.
- **5.** Ronald L Krutz, "Industrial Automation and Control System Security Principles", International Society of Automation

Web Resources

- 1. https://nptel.ac.in/course.html
- 2. https://nptel.ac.in/courses/108/105/108105062/
- 3. https://swayam.gov.in/nd1_noc20_me39/preview
- 4. https://www.aimil.com/blog/role-of-instrumentation-in-automobile-industry/
- 5. https://sites.google.com/site/sjredu/subje/instru-auto

со	Prog	ram Oı	itcome	s (POs)								Program Specific Outcomes (PSOs)			
s	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO	
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3	
CO 1	3	3	3	2	3	1	2	2	1	1	-	3	3	3	3	
CO 2	3	3	3	3	3	2	2	1	1	2	-	3	3	2	3	
CO 3	3	3	3	3	3	1	1	1	2	1	-	3	3	2	3	
CO 4	3	3	3	3	3	2	2	2	3	2	-	3	3	2	3	
CO 5	3	3	2	3	3	2	2	2	3	2	-	3	3	3	3	

COs Mapping with POs and PSOs

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U190MCE45 U20MCE405 DATA COMMUNICATION AND NETWORKING

Course Objectives

- To introduce the fundamental various types of computer networks.
- To demonstrate the TCP/IP and OSI models with merits and demerits.
- To explore the various layers of OSI Model.
- To introduce UDP and TCP Models.
- To develop an understanding of computer networking basics

Course Outcomes

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

- CO1 Students should be understanding and explore the basics of Computer Networks and Various Protocols. He / She will be in a position to understand the World Wide Web concepts.(K2)
- **CO2** Students will be in a position to administrate a network and flow of information further he/she can understand easily the concepts of network security, Mobile and adhoc networks.(K3)
- CO3 Recognize the technological trends of Computer Networking. (K2)
- CO4 Discuss the key technological components of the Network. (K2)
- **CO5** Evaluate the challenges in building networks and solutions to those. (K4)

UNIT I DATA COMMUNICATIONS

Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies –Protocols and Standards – ISO / OSI model, Example Networks such as ATM, Frame Relay, ISDN Physical layer: Transmission modes, Multiplexing, Transmission Media, Switching, Circuit Switched Networks, Datagram Networks, Virtual Circuit Networks.

UNIT II DATA LINK LAYER

Introduction, Framing, and Error – Detection and Correction – Parity – LRC – CRC Hamming code, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point to Point Protocols. 111 Medium Access sub layer: ALOHA, CSMA/CD, LAN – Ethernet IEEE 802.3, IEEE 802.5 – IEEE 802.11, Random access, Controlled access, Channelization.

UNIT III NETWORK LAYER

Logical Addressing, Internetworking, Tunneling, Address mapping, ICMP, IGMP, Forwarding, Uni-Cast Routing Protocols, Multicast Routing Protocols.

UNIT IV TRANSPORT LAYER

Process to Process Delivery, UDP and TCP protocols, Data Traffic, Congestion, Congestion Control, QoS, Integrated Services, Differentiated Services, QoS in Switched Networks

UNIT V APPLICATION LAYER

Domain name space, DNS in internet, electronic mail, SMTP, FTP, WWW, HTTP, SNMP.

Text Books

- 1. <u>Lakhmi C. Jain, George A. Tsihrintzis, Valentina E. Balas, Dilip Kumar Sharma</u>, "Data Communication and Networks: Proceedings of GUCON 2019", Springer Nature, 2019.
- 2. <u>Dr M. P. Vani</u>, "Data Communication and Computer Network: Easy to Learn and Simple to Develop", Notion Press, 2019.
- 3. <u>Forouzan</u>, "Data Communications and Networking", McGraw Hill Education; Fifth edition, 2017.

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References Books

- 1. <u>Oliver C. Ibe</u>, "Fundamentals of Data Communication Networks", <u>John Wiley & Sons</u>, 2017.
- 2. Shashi Banzal, "Data and Computer Network Communication", Laxmi Publications Pvt. Limited, 2015
- 3. <u>R. K. Ghosh</u>, "Wireless Networking and Mobile Data Management", <u>Springer</u>, 2017.
- 4. <u>Thiagarajan, Viswanathan, Manav Bhatnagar</u>, "Telecommunication Switching Systems And Networks", <u>PHI Learning Pvt. Ltd</u>, 2015.
- 5. Adamu, Murtala Zungeru, S Subashini, P Vetrivelan, "Wireless Communication Networks and Internet of Things: Select Proceedings", <u>Springer</u>, 2018.

Web Resources

- 6. https://nptel.ac.in/courses/106/105/106105082/
- 7. https://nptel.ac.in/courses/106/105/106105080/
- 8. https://swayam.gov.in/nd2_cec19_cs07/preview
- 9. https://nptel.ac.in/courses/117/105/117105076/
- 10.https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-263j-data-communicationnetworks-fall-2002/lecture-notes/

со	Prog	ram Ou	utcome	s (POs	i)								Prog Outc	ram Spe omes (P	ecific 'SOs)
s	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	2	2	2	2	3	1	2	2	1	1	2	3	2	3	2
CO 2	3	2	3	2	3	2	2	1	1	2	2	3	3	2	3
CO 3	3	3	3	3	3	1	1	1	2	1	1	3	2	3	2
CO 4	3	2	3	2	3	2	2	2	3	2	2	3	3	2	2
CO 5	2	2	2	2	3	2	2	2	3	2	2	3	2	2	2

COs Mapping with POs and PSOs

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

SOLAR PHOTOVOLTAIC FUNDAMENTALS AND L ТРС Hrs APPLICATIONS

U19EEO41 U20EEO401

(Common to ECE, ICE, MECH, CIVIL, Mechatronics)

Course Objectives

- To impart fundamental knowledge of solar cell formation and its properties. •
- To understand the various technologies used to improve solar cells.
- To discuss the various components in On-grid connected systems.
- To gain knowledge on components in Off-grid connected systems using Solar PV.
- To design the PV systems for various real load applications with cost benefits.

Course Outcomes

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

CO1 -Explain the fundamentals of solar cells. (K2)

CO2 -Recognize the various solar PV technologies and their up gradations along with their benefits. (K2)

CO3 -Design and analyze on-grid PV applications. (K4)

CO4 -Design and analyze off-grid PV applications. (K4)

CO5 -Realize cost benefit analysis of PV installations. (K4)

UNIT I ESSENTIAL BASICS OF SOLAR CELL

Solar cell – physics – Photovoltaics in Global Energy Scenario – Fundamentals of Semiconductors, Energy band, Charge carriers – Motion, PN Junction diode, Solar cells – Design characteristics, Solar radiation.

UNIT II COMMERCIAL AND DEVELOPING TECHNOLOGIES

Commercial technologies - Mono crystalline and Multi crystalline, Silicon - Wafer based Solar cell, Thin film solar cells - A-Si, Cd-Te and CIGS, Concentrated PV cells, Developing technologies - Organic cells, Dye sensitized cells.

UNIT III SOLAR PV FOR ON-GRID APPLICATIONS

Solar cells to solar array - On-Grid PV system - With and Without storage - Balance of system - DC-DC converters - Inverters - Net Metering - Design and analysis - Performance evaluation and monitoring - Field visit - Grid tied PV power plant.

UNIT IV SOLAR PV FOR OFF-GRID APPLICATIONS

Off-Grid stand alone PV system - System sizing - Module and Battery - Storage - Batteries for PV systems -Sun Tracking mechanism – Types of tracking – One-axis, Two-axis – Maximum power point tracking – Design and analysis – Performance evaluation and monitoring – Field visit – Off–grid PV system

UNIT V COST BENEFIT ANALYSIS FOR SOLAR PV INSTALLATIONS (9 Hrs) Cost and manufacturability – Manufacturing economics – Scaling – Pricing – Trends in retail pricing – Energy

economics - Grid tied power plant - Solar street lighting system

Text Books

- 1. C.S. Solanki, "Solar Photovoltaics Fundamentals, Technologies and Applications", PHI Learning Pvt. Ltd., 2nd Edition, 2011.
- 2. Martin A. Green, "Solar Cells Operating Principles, Technology, and System Applications", Prentice Hall, 1st Edition, 2008.

Reference Books

- 1. J. Nelson, "The Physics of Solar Cells", Imperial College Press, 1st Edition, 2003.
- 2. Thomas Markvart, "Solar Electricity", John Wiley and Sons, 2nd Edition, 2000.
- 3. Stuart R. Wenham, Martin A. Green, Muriel E. Watt, Richard Corkish, "Applied Photovoltaics", Earthscan, 3rd Edition, 2011.
- 4. Michael Boxwell, "The Solar Electricity Handbook", Green stream Publishing, 10th Edition, 2016.
- 5. RikDe Gunther, "Solar Power-Your Home for Dummies", Wiley Publishing Inc, 2nd Edition, 2010.

Web Resources

- 1. https://swayam.gov.in/nd1_noc20_ph21/preview
- 2. https://swayam.gov.in/nd2_nou20_ag13/preview
- https://www.studentenergy.org/topics/solar-pv
- 4. https://www.eia.gov/energyexplained/solar/photovoltaics-and-electricity.php

Department of MCE – First BoS Meeting

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- 5. https://www.energysage.com/solar/
- 6. https://www.bca.gov.sg/publications/others/handbook_for_solar_pv_systems.pdf
- 7. http://www.oas.org/dsd/publications/unit/oea79e/ch05.htm

COs/POs/PSOs Mapping

COs					Progr	am O	utcon	nes (P	POs)				Prog Outco	ram Sp omes (F	ecific PSOs)
	PO1	PO2	PO3	PO4	PO5	P06	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	2	-	3	-	-	-	-	3	2	2	2
2	3	3	3	3	2	-	3	-	-	-	-	3	2	2	2
3	3	3	3	3	2	-	3	-	-	-	-	3	2	2	2
4	3	3	3	3	2	-	3	-	-	-	-	3	2	2	2
5	3	3	3	3	2	-	3	-	-	-	-	3	2	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karM.Tech.Ph.D., 1 Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Eagineering College, Madagadipet, Puducherry-605 107.

ELECTRICAL SAFETY

(Common to ECE, ICE, MECH, CIVIL, Mechatronics,

BME, IT, CSE)

Course Objectives

U19EEO42

U20EEO402

- To familiarize the Indian Electricity Rules and Act related with electrical safety.
- To provide a knowledge about electrical shocks and safety precautions. •
- To create awareness of the electrical safety associated with installation of electrical equipment. •
- To analyze different Hazardous areas for electrical safety. •
- To expose knowledge about necessity of safety policy and safety management. •

Course Outcomes

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

- CO1 Describe the Indian Electricity (IE) acts and various rules for electrical safety.(K2)
- CO2 Expose safety measures to prevent electrical shock in handling of domestic electrical appliances.(K3)
- CO3 Evaluate the safety aspects during installation of plant and equipment. (K3)
- CO4 Describe the various hazardous area and application of electrical safety in various places. (K3)
- CO5 Acquire knowledge about importance of electrical safety training to improve quality management in electrical systems. (K3)

UNIT I CONCEPTS AND STATUTORY REQUIREMENTS

Objective and scope of electrical safety - National electrical Safety code - Statutory requirements - Indian Electricity acts related to electrical Safety - Safety electrical one line diagram - International standards on electrical safety safe limits of current and voltage - Grounding of electrical equipment of low voltage and high voltage systems - Safety policy - Electrical safety certificate requirement

UNIT II ELECTRICAL SHOCKS AND THEIR PREVENTION

Primary and secondary electrical shocks - Possibilities of getting electrical shock and its severity - Effect of electrical shock of human being - Shocks due to flash/ Spark over's - Firing shock - Multi storied building - Prevention of shocks - Safety precautions - Safe guards for operators - Do's and Don'ts for safety in the use of domestic electrical appliances - Case studies on electrical causes of fire and explosion

UNIT III SAFETY DURING INSTALLATION, TESTING AND COMMISSIONING, OPERATION AND MAINTENANCE (9 Hrs)

Need for inspection and maintenance - Preliminary preparations - Field quality and safety - Personal protective equipment - Safe guards for operators - Safety equipment - Risks during installation of electrical plant and equipment - Effect of lightning current on installation and buildings - Safety aspects during installation -Safety during installation of electrical rotating machines - Importance of earthing in installation - Agricultural pump installation

UNIT IV HAZARDOUS ZONES

Primary and secondary hazards - Hazardous area classification and of electrical equipments (IS, NFPA, API and OSHA standards) - Explosive gas area classifications: Class I(Division 1) - Zone 0, Zone 1, zone 2 classified locations, Design Philosophy for Equipment and installations-Classification of equipment enclosure for various hazardous gases and vapors - flash hazard calculation and approach distances- calculating the required level of arc protection

UNIT V SAFETY MANAGEMENT OF ELECTRICAL SYSTEMS

Principles of Safety Management - Occupational safety and health administration standards - Safety organization -Safety auditing - Employee electrical safety teams - Electrical safety training to improve Quality management - Total quality control and management - Importance of high load factor - Causes of low power factor - Disadvantages of low power factor - Power factor improvement - Importance of P.F. improvement - Case studies of electrical workplace safety practices.

Text books

- 1. John Cadick, Mary CapelliSchellpfeffer, Dennis Neitzel, Al Winfield, "Electrical Safety Handbook", McGraw-Hill Education, 4th Edition, 2012.
- 2. Madden, M. John, "Electrical Safety and the Law: A Guide to Compliance", Wiley publications, 4th Edition, 2002.
- 3. Mohamed A. El-Sharkawi, "Electric Safety: Practice and Standards", CRC Press; 1st Edition, 2013.

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Reference books

- 1. Rob Zachariason, "Electrical Safety", Delmar Cengage Learning, 1st Edition, 2011.
- 2. Peter E. Sutherland, "Principles of Electrical Safety", Wiley-IEEE Press; 1st Edition, 2014.

Web Resources

- 1. https://www.apeasternpower.com/downloads/elecact2003.pdf
- 2. https://safetyculture.com/topics/electrical-hazards/
- 3. https://www.jove.com/science-education/10114/electrical-safety-precautions-and-basic-equipment
- 4. https://electrical-engineering-portal.com/21-safety-rules-for-working-with-electrical-equipment
- 5. https://www.electrical4u.com/safety-precautions-for-electrical-system/
- 6. https://www.constellation.com/energy-101/electrical-safety-tips.html

COs/POs/PSOs Mapping

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COs					riogi		ucon	169 (F	03)				Outco	omes (F	'SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO 9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	2	-	2	-	-	-	-	-	-	1	1	1
2	3	3	3	2	-	2	-	-	-	-	-	-	2	2	2
3	3	3	3	2	-	2	-	-	-	-	-	-	2	2	2
4	3	3	3	2	-	2	-	-	-	-	-	-	2	2	2
5	3	3	3	2	-	2	-	-	-	-	-	-	1	1	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay.M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Menakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U19ECO41		L	Т	Ρ	С	Hours
U20ECO401	ENGINEERING COMPUTATION WITH MATLAB	3	0	0	3	45

Course Objectives

- To understand basic representation of Matrices and vectors in MATLAB
- To learn various programming structures in MATLAB
- To study built in and user defined functions in MATLAB.
- To become conversant with 2D as well as 3D graphics in MATLAB
- To make a Graphical User Interface (GUI) in MATLAB in order to achieve interactivity

Course Outcomes

After completion of the course, students will be able to

- CO1 State the basics of MATLAB (K1)
- CO2 Explain how to work with matrices, and their operations (K2)
- CO3 –Use the MATLAB functions relevant to communication engineering, (K3)
- CO4 Demonstrates various file operations in MATLAB (K3)
- CO5 Applying the plotting capabilities of MATLAB effectively to various systems. (K3)

UNIT 1 INTRODUCTION TO MATLAB (9Hrs)

Menus & Tool bars, Variables - Matrices and Vectors - initializing vectors - Data types- Functions – User defined functions - passing arguments - writing data to a file-reading data from a file - using functions with vectors and matrices- cell arrays & structures - Strings - 2D strings-String comparing - Concatenation - Input and Output statements - Script files .

UNIT 2 LOOPS& CONTROL STATEMENTS

(9Hrs)

Introduction; Relational & Logical operations - Example programs - Operator precedence - Control & Decision statements- IF - IF ELSE - NESTED IF ELSE - SWITCH - TRY & CATCH - FOR -WHILE - NESTED FOR - FOR with IF statements, MATLAB program organization, Debugging methods - Error trapping using eval&lastern commands.

UNIT 3 PLOTS IN MATLAB & GUI

(9Hrs)

Basic 2D plots, Labels, Line style, Markers, plot, subplot, LOG, LOG-LOG, SEMILOG-POLARCOMET, Grid axis, labeling, fplot, ezplot, ezpolar, polyval, exporting figures, HOLD, STEM, BAR, HIST, Interactive plotting, Basic Fitting Interface – Polyfit - 3D plots – Mesh - Contour - Example programs. GUI - Creation Fundamentals – Capturing mouse actions

UNIT 4 MISCELLANEOUS TOPICS

(9 Hrs)

File & Directory management - Native Data Files - Data import & Export - Low Level File I/O – Directory management - FTP File Operations - Time Computations -Date & Time – Format Conversions - Date & Time, Functions - Plot labels - Optimization - zero Finding - Minimization in one Dimension - Minimization in Higher Dimensions- Practical Issues. Differentiation & Integration using MATLAB, 1D & 2D Data Interpolation

UNIT 5 SIMULINK & APPLICATIONS

(9Hrs)

How to create & run Simulink, Simulink Designing - Using SIMULINK Generating an AM signal & 2nd order systems - Designing of FWR & HWR using Simulink - Creating a subsystem in Simulink. Applications Programs -Frequency response of filters. Open Loop gain of OPAMP, I/P characteristics of BJT, Plotting the graph between Breakdown voltage & Doping Concentration.

Text Books

- 1. RudraPratap, Getting Started with MATLAB 6.0 ,1st Edition, Oxford University Press-2004.
- 2. Duane Hanselman ,Bruce LittleField, "Mastering MATLAB 7", Pearson Education Inc, 2005
- 3. William J.Palm, "Introduction to MATLAB 6.0 for Engineers", McGraw Hill & Co, 2001.

Reference Books

- 1. M.Herniter, "Programming in MATLAB", Thomson Learning, 2001
- 2. John OkyereAltla, "Electronics and circuit analysis using MATLAB", CRC press, 1999
- 3. K.K.Sharma, "MATLAB Demustifyied", Vikas Publishing House Pvt Ltd. 2004

Web Resources

- 1. https://www.mathworks.com/products/matlab.html
- 2. https://www.tutorialspoint.com/matlab/index.htm
- 3. https://www.cmu.edu/computing/software/all/matlab/
- 4. https://ctms.engin.umich.edu/CTMS/index.php?aux=Home

COs Mapping with POs and PSOs

COs					Progr	am O	utcon	nes (P	Os)				Prog Outco	ram Spo omes (F	ecific PSOs)
	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2	-	2	3	-	-	-	-	-	-	-	1	3	3
CO2	2	2	-	2	3	-	-	-	-	-	-	-	1	3	3
CO3	2	2	-	2	3	-	-	-	-	-	-	-	1	3	3
CO4	2	2	-	2	3	-	-	-	-	-	-	-	1	3	3
CO5	2	2	-	2	3	-	-	-	-	-	-	-	1	3	3

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

	L	Т	Ρ	С	Hours
CONSOMER ELECTRONICS	3	0	0	3	45

Course Objectives

U19ECO42 U20ECO402

- To enable thetroubleshoot of different types of microphones and loudspeakers
- To make the students to analyse the working of digital console, digital FM tuner and troubleshoot audio systems
- To train to test the working of various colour TV
- To empower them to troubleshoot colour TV receivers
- To equip them to maintain various electronic home and office appliances

Course Outcomes

After completion of the course, students will be able to

- CO1 -Describe the fundamental audio characteristics and measurements, operating principles of microphone and loudspeaker (K1)
- CO2 Explain the working of digital console, digital FM tuner and troubleshoot the audio systems (K2)
- CO3 -Distinguish the salient features of colour TV and Monochrome and troubleshoot TV camera (K2)
- CO4 -Demonstrate various interfaces in digital TV, the working of DTH receiver, CD/DVD players (K3)
- **CO5** -Explain the working of FAX, Microwave oven, Washing machine, Air conditioner, Refrigerators and camera (K2)

UNIT -1 AUDIO FUNDAMENTALS AND DEVICES

(9Hrs)

Basic characteristics of sound signal, Microphone- working principle, sensitivity, nature of response. Types of Microphone, Loud speaker- working principle, Woofers and Tweeters, characteristics.Types of Loudspeaker. Sound recording

UNIT-II AUDIO SYSTEMS

(9Hrs)

Introduction to audio system, Digital Console- Block diagram, working principle, applications, FM tunerconcepts of digital tuning, ICs used in FM tuner TD702IT, PA address system- Planning, speaker impedance matching, characteristics, Power amplifier specification

UNIT -III TELEVISION SYSTEMS

(9Hrs)

Monochrome TV standards, Components of TV system, scanning process, aspect ratio, persistence of vision and flicker, interlace scanning, picture resolution. Composite video signal,Colour TV standards, colour theory, hue, brightness, saturation, luminance and chrominance. Different types of TV camera.

UNIT -IV TELEVISION RECEIVERS AND VIDEO STANDARDS

(9Hrs)

Colour TV receiver- block diagram, Digital TVs- LCD, LED, PLASMA, HDTV, 3-D TV, projection TV, DTH receiver, Video interface: Composite, Component, Separate Video, Digital Video, SDI, HDMI, Digital Video Interface, CD and DVD player: working principles, interfaces

UNIT -V HOME AND OFFICE APPLIANCES (9Hrs)

Microwave Oven: Types, Etechnical specifications. Washing Machine: hardware and software. Air conditioner and Refrigerators: Components features, applications, and technical specification. Digital camera and cam coder: - pick up devices, picture processing, picture storage

Text Books

- 1 Bali S.P., 'Consumer Electronics', copyright 2008, Pearson Education India
- 2 Bali R and Bali S.P. 'Audio video systems : principle practices & troubleshooting', Khanna Book

Publishing Co. (P) Ltd

3 Gulati R.R., 'Modern Television practices', 5th edition, 2015, New Age International Publication (P) Ltd

Reference Books

- 1 Gupta R.G., 'Audio video systems', 2nd edition, 2017, Tata Mcgraw Hill, New Delhi, India
- 2 Whitaker Jerry & Benson Blair, 'Mastering Digital Television', McGraw-Hill Professional, 2006
- 3 Whitaker Jerry & Benson Blair, 'Standard handbook of Audio engineering', 2nd edition,2002, McGraw-Hill Professional

Web Resources

- 1 http://www.scientificamerican.com/article.cfm?id = experts.bluetooth-work
- 2 http://www.cosc.brocku.ca/Offerings/3P92/seminars/HDTV.ppt
- 3 http://www.circuitstoday.com/blu-ray-technology-working
- 4 http://www.freevideolectures.com

COs Mapping with POs and PSOs Program Specific **Program Outcomes (POs)** Outcomes (PSOs) COs PO2 PO3 PO4 PO1 PO5 PO6 PO7 **PO8** PO9 PO10 PO11 PO12 PSO1 PSO2 PSO3 CO1 2 2 1 1 2 1 ---------2 2 1 2 1 CO2 -1 --------CO3 2 -2 1 1 2 1 --------2 2 2 1 1 1 CO4 ---------CO5 2 1 2 1 1 --_ -2 ---_ -

Correlation Level: 1-Low, 2-Medium, 3- High

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Department of MCE – First BoS Meeting

111905041	WEB DEVELOPMENT	L	Т	Ρ	С	Hrs
U20DSO401	(Common to EEE, ECE, ICE, MECH, CIVIL, BME, Mechatronics)	3	0	0	3	45
Course Objectives						

- To study the fundamentals of web application development
- To understand the design components and tools using CSS
- To learn the concepts JavaScript and programming fundamentals.
- To study about advance scripting and Ajax applications.
- To understand the working procedure of XML

Course Outcomes

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

- CO1 Develop basic web applications. (K5)
- CO2 Design the web applications using CSS. (K5)
- CO3 Validate the web pages using javascripts functions. (K5)
- CO4 Demonstrate the web 2.0 application to advance scripts. (K3)
- CO5 Update the knowledge of XML Data. (K4)

UNIT I INTRODUCTION TO WWW & HTML

(9 Hrs)

Protocols – Secure Connections – Application and development tools – Web browser – Server definition – Dynamic IP. Web Design: Web site design principles – Planning the site and navigation. HTML: Development process – Html tags and simple HTML forms – Web site structure.

UNIT II STYLE SHEETS

(9 Hrs)

Introduction to CSS: Need for CSS - Basic syntax and structure using CSS - Background images - Colors and properties - Manipulating texts using fonts, borders and boxes - Margins, padding lists, positioning using CSS - CSS2.

UNIT III JAVASCRIPTS

(9 Hrs)

Client side scripting: Basic JavaScript - Variables - Functions - Conditions - Loops. Applications: Page Validation - Reporting.

UNIT IV ADVANCE SCRIPT

Hrs)

JavaScript and objects - DOM and Web browser environments - Forms and Validations - DHTML. AJAX: Introduction – Web applications – Alternatives of AJAX.

UNIT V XML

(9 Hrs)

Introduction to XML – Uses of XML – Simple XML – XML key components – DTD and Schemas – Well-formed XML document – Applications of XML – XSL and XSLT.

Text Books

- 1. Keith Wald, Jason Lengstorf," Pro PHP and jQuery", Paperback, 2016.
- 2. Semmy Purewal, "Learning Web App Development", O'Reilly Media, 2014.
- 3. P.J. Deitel AND H.M. Deitel," Internet and World Wide Web How to Program", Pearson Education, 2009.

Reference Books

- Yakov Fain, Victor Rasputnis, Anatole Tartakovsky and Viktor Gamov, "Enterprise Web 1. Development ", O'Reilly Media, 2014.
- 2. Steven Suehring, Janet Valade, "PHP, MySQL, JavaScript & HTML5 All-in-One", John Wiley & Sons, Inc, 2013.
- 3. UttamK.Roy, "Web Technologies", Oxford University Press, 2010.

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- 4. Rajkamal, "Web Technology", Tata McGraw-Hill, 2009.
- 5. Shklar, Leon, Rosen, Rich, "Web Application Architecture: Principles, Protocols and Practices", Wiley Publication, 2009.

Web Resources

- 1. https://www.w3schools.com
- 2. https://www.geeksforgeeks.org/web-technology/
- 3. https://www.guru99.com/cakephp-tutorial.html
- 4. https://www.ithands.com/blog/cms-or-php-framework-which-technology-is-better-for-my-business
- 5. http://Oriel.ly/learning-web-app

COs/POs/PSOs Mapping

Correlation Level: 1-Low, 2-Medium, 3- High

COs					Progr	am O	utcon	nes (P	'Os)				Prog Outco	ram Sp omes (F	ecific PSOs)
	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	3	3	3	-	-	3	-	1	2	3
2	2	2	2	2	-	2	-	2	-	2	-	2	1	2	3
3	3	3	3	3	3	3	3	3	-	-	3	-	1	2	3
4	2	2	2	2	-	2	-	2	-	2	-	2	1	2	3
5	2	2	2	2	-	2	-	2	-	2	-	2	1	2	3

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

111905042	ANALYSIS OF ALGORITHMS	L	Т	Ρ	С	Hrs
	(Common to EEE, ECE, ICE, MECH, CIVIL, BME,	3	0	0	3	45
020030402	Mechatronics)	•	•	•	•	

Course Objectives

- To analyze the performance of algorithms in terms of time and space complexity.
- To understand the performance of the algorithms such as divide and conquer, greedy method
- To solve problems using Dynamic Programming and derive the time complexity.
- To solve problems using Backtracking technique and derive the time complexity.
- To solve problems using Branch and Bound technique and derive the time complexity.

Course Outcomes

Upon completion of the course, students shall have ability to

- CO1 Choose the appropriate data structure and algorithm design method for a specified application.(K2)
- CO2 Ability to understand the design technique such as divide and conquer, greedy method applied to realistic problems and analyse them. (K3)
- CO3 Ability to understand the dynamic programming design technique and how it is applied to realistic problems and analyze them. (K3)
- CO4 Ability to understand the backtracking design technique and how it is applied to realistic problems and analyze them. (K3)
- CO5 Ability to understand Branch and Bound design technique and how it is applied to realistic problems and analyze them. (K2)

UNIT I INTRODUCTION

(9 Hrs)

Introduction: Algorithm, Pseudo code for expressing algorithms, Performance Analysis – Time complexity, Space complexity, Asymptotic Notation – Big oh notation, Omega notation, Theta notation and Little oh notation.

UNIT II DIVIDE AND CONQUER METHOD AND GREEDY METHOD

(9 Hrs)

Divide and Conquer method: Applications – Binary search, Merge sort, Quick sort. Greedy method: General method, applications – Knapsack problem, Minimum cost spanning trees, Single source shortest path problem.

UNIT III DYNAMIC PROGRAMMING

(9 Hrs)

Dynamic Programming: Applications - Multistage graphs, 0/1 knapsack problem, All pairs shortest path problem, Traveling salesperson problem, Reliability design.

UNIT IV BACKTRACKING

(9 Hrs)

Backtracking: General method, Applications – N-queen problem, Sum of subsets problem, Graph Coloring – Hamiltonian Cycles.

UNIT V BRANCH AND BOUND

(9 Hrs)

Branch and Bound: General method, Applications – Traveling sales person problem, 0/1 Knapsack problem, LC Branch and Bound solution, FIFO Branch and Bound solution.

Text Books

- 1. E. Horowitz and S.Sahni, "Fundamentals of Algorithms", Galgotia Publications, 2nd Edition, 2010.
- 2. T.H.Cormen, C.E.Leiserson, R.L.Rivest, and C.Stein, "Introduction to Algorithms", PHI/Pearson Education, 3rdEdition, 2009.
- 3. Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Pearson Education, Third Edition, 2012.

Reference Books

- 1. Michael T. Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples", Wiley India, 2006.
- 2. Sara Baase and Allen Van Gelder, "Computer Algorithms Introduction to Design and Analysis", Pearson Education Asia, 3rd Edition, 2010.
- 3. Donald E Knuth, "The Art of Computer Programming, Volume I & II", Addison Wessely, Third Edition, 2011.
- 4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, 2006.
- 5. Harsh Bhasin, "Algorithms Design and Analysis", Oxford university press, 2016.

Web Resources

- 1. https://swayam.gov.in/nd1_noc20_cs71/preview
- 2. https://www.tutorialspoint.com/design_and_analysis_of_algorithms/
- 3. https://www.javatpoint.com/daa-tutorial
- 4. https://www.guru99.com/design-analysis-algorithms-tutorial.html
- 5. https://www.geeksforgeeks.org/fundamentals-of-algorithms/

COs/POs/PSOs Mapping

Correlation Level: 1-Low, 2-Medium, 3- High

COs					Progr	am O	utcon	nes (P	'Os)				Progr Outco	ram Sp omes (F	ecific PSOs)
	P01	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	2	3	2	2	1	-	-	-	-	-	2	2	3
2	3	2	3	3	2	2	1	-	-	-	-	-	2	2	3
3	3	3	3	3	2	2	2	-	2	-	-	-	2	2	3
4	3	2	3	3	3	2	2	-	-	-	3	-	2	2	3
5	3	3	3	3	2	2	2	-	-	-	3	2	2	2	3

Dr.G.Balamuruga Mohan kar.M.Tech.Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107. **PROGRAMMING IN JAVA**

(Common to ECE, MECH,

L T P C Hrs 3 0 0 3 45

Mechatronics)

Course Objectives

- To gain and explore the knowledge of Java programming.
- To know the principles of inheritances and packages.
- To learn about the usage of interfaces in Java.
- To gain and explore the event handling in Java.
- To get familiarized to the interfaces generic programming, multithreading concepts.

Course Outcomes

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

- CO1 Write a maintainable java Program for a given algorithm and implement the same. (K2)
- CO2 Demonstrate the use of inheritance and package in relevant applications. (K3)
- CO3 Construct Java programs using interfaces. (K3)
- CO4 Build Java applications using Event Handling. (K3)
- CO5 Create Java applications using multithreading and generic programming. (K3)

UNIT I INTRODUCTION TO JAVA PROGRAMMING

(9 Hrs)

The History and Evolution of Java - Byte code - Java buzzwords - Data types – Variables – Arrays – Operators - Control statements - Type conversion and casting – Objects and classes in Java – Defining classes – Methods - Access specifiers – Static members – Constructors – Finalize method.

UNIT II INHERITANCE AND PACKAGES

(9 Hrs)

Arrays – Strings - Packages – Java-Doc comments – Inheritance – Class hierarchy – Polymorphism – Dynamic binding – Final keyword – Abstract classes

UNIT III INTERFACES

(9 Hrs)

The Object class – Reflection – Interfaces – Object cloning – Inner classes – Proxies - I/O Streams - Graphics programming – Frame – Components – Working with 2D shapes.

UNIT IV EVENT HANDLING (9 Hrs)

Basics of event handling – Event handlers – Adapter classes – Actions – Mouse events – AWT event hierarchy – Introduction to Swing – Model-View-Controller design pattern – Buttons – Layout Management – Swing Components – Exception handling – Exception hierarchy – Throwing And catching exceptions.

UNIT V GENERIC PROGRAMMING AND MULTITHREADING (9 Hrs)

Motivation for generic programming – Generic classes – Generic methods – Generic code and virtual machine – Inheritance and generics – Reflection and generics - Multi-threaded programming – Interrupting threads – Thread States – Thread properties – Thread synchronization – Executors – Synchronizers. Enumeration – Autoboxing – Generics.

Text Books

- 1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
- 2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018.
- 3. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I Fundamentals", Sun Microsystems Press, Eighth Edition, 2008.

4. Herbert Schildt, "The Complete Reference JAVA 2", TMH, Seventh Edition, 2006.

Reference Books

- 1. Cay S. Horstmann, Gary cornell, "Core Java Volume –I Fundamentals", 9th Edition, Prentice Hall, 2013.
- 2. H.M.Dietel and P.J.Dietel, "Java How to Program", Pearson Education/PHI, 11th Edition, 2017.
- 3. Cay.S.Horstmann and Gary Cornell, "Core Java 2", Vol 2, Advanced Features, Pearson Education,8th Edition, 2008.
- 4. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:
- 5. Programming in Java, S.Malhotra and S.Choudary, Oxford Univ. Press.

Web Resources

- 1. http://www.ibm.com/developerworks/java/
- 2. http://docs.oracle.com/javase/tutorial/rmi/.
- 3. IBM's tutorials on Swings, AWT controls and JDBC.
- 4. https://www.edureka.co/blog
- 5. https://www.geeksforgeeks.org

CO-POs/PSOs Mapping

COs					Progr	am O	utcom	nes (P	Os)				Prog Outco	ram Spo omes (F	ecific PSOs)
	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	2	-	-	-	-	-	-	-	2	2	3
2	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3
3	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3
4	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3
5	3	2	1	1	3	-	-	-	-	-	-	-	2	2	3

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., 1 Professor & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19ITO42 U20ITO402

R PROGRAMMING

P C Hrs 3 0 0 3 45

Course Objectives

- To understand the basics in R programming in terms of constructs, control statements, string functions
- To learn to apply R programming for Text processing
- To understand the use of data frames and tables
- To able to appreciate and apply the R programming from a statistical perspective
- To understand the interface model

Course Outcomes

After completion of the course the students will be able to:

- CO1 Create artful graphs to visualize complex data sets and functions.(K3)
- CO2 Write more efficient code using parallel R and vectorization.(K3)
- CO3 Create data frames and working with tables.(K3)
- CO4 Interface R with C/C++ and Python for increased speed or functionality.(K2)

CO5 - Find new packages for text analysis, image manipulation & perform statistical analysis.(K4)

UNIT I INTRODUCTION

Introducing to R - R Data Structures - Help functions in R - Vectors - Scalars - Declarations - recycling - Common Vector operations - Using all and any - Vectorized operations - NA and NULL values -Filtering – Vectorised if-then else – Vector Equality – Vector Element names

UNIT II MATRICES AND ARRAYS

Matrices, Arrays And Lists Creating matrices – Matrix operations – Applying Functions to Matrix Rows and Columns – Adding and deleting rows and columns – Vector/Matrix Distinction – Avoiding Dimension Reduction - Higher Dimensional arrays - lists - Creating lists - General list operations - Accessing list components and values - applying functions to lists - recursive lists.

UNIT III DATA FRAMES

Data Frames Creating Data Frames – Matrix-like operations in frames – Merging Data Frames – Applying functions to Data frames - Factors and Tables - factors and levels - Common functions used with factors - Working with tables - Other factors and table related functions

UNIT IV FUNCTIONS AND ARGUMENTS

Control statements - Arithmetic and Boolean operators and values - Default values for arguments -Returning Boolean values - functions are objects - Environment and Scope issues - Writing Upstairs -Recursion - Replacement functions - Tools for composing function code - Math and Simulations in R Creating Graphs – Customizing Graphs – Saving graphs to files – Creating three-dimensional plots

UNIT V INTERFACING

Interfacing R to other languages - Parallel R - Basic Statistics - Linear Model - Generalized Linear models - Non-linear models - Time Series and Auto-correlation - Clustering.

Text Books

- 1. Norman Matloff, "The Art of R Programming: A Tour of Statistical Software Design", No Starch Press, 2011.
- 2. Jared P. Lander, "R for Everyone: Advanced Analytics and Graphics", Addison-Wesley Data & Analytics Series, 2013.

Reference books

1. Mark Gardener, "Beginning R – The Statistical Programming Language", Wiley, 2013

2. Robert Knell, "Introductory R: A Beginner's Guide to Data Visualisation, Statistical Analysis and Programming in R", Amazon Digital South Asia Services Inc, 2013.

Web Resources

Department of MCE – First BoS Meeting

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

1. <u>https://www.coursera.org/learn/r-programming</u>

2. https://www.r-project.org/

CO-POs/PSOs Mapping

					Drogr	am ∩	utcon	nos (E	20c)				Prog	ram Sp	ecific
СО					Outco	omes (I	PSOs)								
S	PO	PO	PO	P01	PSO	PSO	PSO								
	1 2 3 4 5 6 7 8 9 0 1 2 1														3
1	1	-	2	2	2										
2	3	2	1	1	-	-	-	-	-	-	-	-	2	2	2
3	3	2	1	1	-	-	-	-	-	-	-	-	2	2	2
4	3	2	1	1	-	-	-	-	-	-	-	-	3	2	2
5	2	1	-	-	-	-	-	-	-	-	-	-	3	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

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U19MEO42 U20MEO402

MATERIAL HANDLING SYSTEM

(Common to EEE, ICE, CIVIL, Mechatronics)

Course Objectives

- To understand the principal groups of material handling equipment's
- To learn about the Flexible hoisting appliances
- To learn about the material handling attachments, hook bearings, crane attachment
- To understand about the basic material handling system, selection
- · To introduce concepts of ergonomics of material handling equipment and safety in handling

Course Outcomes

On successful completion of this course, the student will be able to

CO1 - Describe the principal groups of material handling equipment's. (K2)

CO2 - Describe about the flexible hosting appliances. (K2)

CO3 - Explains about the material handling attachments, hook bearings, crane attachment. (K1)

CO4 - Illustrate the basic material handling system, selection. (K1)

CO5 - Define the ergonomics related to material handling equipment. (K1)

UNIT I MATERIAL HANDLING EQUIPMENTS

Types of intra plant transporting facility - principal groups of material handling equipments - choice of material handling equipment - hoisting equipment, screw type, hydraulic and pneumatic conveyors - general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications - Introduction to control of hoisting equipments.

UNIT II FLEXIBLE HOSTING APPLIANCES

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains - selection of hemp rope chains and steel wire rope - selection of ropes - fastening of chain sand ropes - different types of load suspension appliances - fixed and movable pulleys, different types of pulley systems, multiple pulley systems - Chain and rope sheaves and sprockets.

UNIT III MATERIAL HANDLING ATTACHMENTS

Load handling attachments - standard forged hook, hook weights, hook bearings, cross piece and casing of hook - crane grab for unit and piece loads - carrier beams and clamps - load platforms and side dump buckets - electric lifting magnets - grabbing attachments for loose materials - crane attachments for handling liquid materials.

UNIT IV MATERIAL HANDLING SYSTEMS

Basic Material Handling systems - Selection, Material Handling method - path, Equipment - function oriented systems.

UNIT V METHODS TO MINIMIZE COST OF MATERIAL HANDLING

Methods to minimize cost of material handling - Maintenance of Material Handling Equipments - Safety in handling - Ergonomics of Material Handling equipment - Design, Miscellaneous equipment

Text Books

- 1. Rudenko N, Materials Handling Equipment, Envee Publishers, New Delhi, 2017
- 2. Alexandrov M.P Materials Handling Equipment, Mie publications, Moscow, 2013
- 3. White, John A., Pence, Ira W, Materials handling and logistics, Envee Publishers, New Delhi, 2016

Reference Books

- 1. K.C, Arora Vikas, V. Shinde, Aspects of Material handling, Laxmi Publications; First edition, 2015.
- 2. Siddhartha Ray, Introduction to Material Handling, New Age International, Edition: 2, 2017.
- 3. RB Chowdary, <u>G. R. N. Tagore</u>, Plant Layout and Material Handling-, Khanna publishers; 2nd edition 2016.
- 4. James A Apple, Plant layout and Material Handlin, Krieger Pub Co, 2016.
- 5. P.B Mahapatra, Operations Management, PHI, 2016.

L T P C Hrs 3 0 0 3 45

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

Web Resources

- 1.<u>https://nptel.ac.in/courses/112/102/112102011/</u>
- 2. https://nptel.ac.in/courses/112/107/112107142/
- 3. <u>https://nptel.ac.in/courses/112/107/112107143/</u>
- 4. <u>https://www.youtube.com/watch?v=WXmIdbVDJqE</u>
- 5. https://www.youtube.com/watch?v=BBWPIByOEfI

COs Mapping with POs and PSOs

COs				F	Progra	am O	utcon	nes (F	POs)				Prog Outc	ram Spe omes (P	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
2	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
3	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
4	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-
5	3	3	3	3	-	-	-	-	-	-	-	1	3	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.M.Tech.Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19CEO41 P C Т ENERGY AND ENVIRONMENT L U20ICO401 (Common to ECE, ECE, MECH, BME, IT, FT, Mechatronics) 3 0 0

Course Objectives

- Explain the importance of energy, classifications of energy sources and energy demand scenario •
- Analyze the impacts of energy on environment & sustainability energy options
- Outline the harness of hydropower and geothermal energy sources
- Discuss the aspects of solar and wind energy
- To study the importance of biomass energy and its applications

Course Outcomes

At the end of Course students will be able to.

CO1 - Apply the knowledge of science & engineering to the contemporary issues of Energy for better humankind & environment (K3)

CO2 - Identify, review & analyze the complex problems of Energy crises in environment (K4)

CO3 - Designing solutions for the energy crises in the form of renewable energy systems to meet the needs by understanding the limitations (K4)

CO4 - Understanding the impact of energy on environment and providing solutions for sustainable development. (K5)

CO5 - Apply biomass energy under relevant technologies (K3)

UNIT I ENERGY

Introduction, Importance of energy, role of energy consumption in economic and social transformation, Energy needs and crisis. Energy production and utilization. Types and classification of energy sources, Conventional & unconventional energy, Renewable sources & Nonrenewable sources of energy advantages, limitations, comparisons

UNIT II ENVIRONMENT

Impact of energy on economy & environment. Regional impacts of temperature change - Global warming, Greenhouse effect, Acid rain, Ozone layer depletion. Indian environment degradation, Environmental laws -Water Act-1974 (Prevention & control of pollution), The environment protection act 1986, Air act.

UNIT III HYDROPOWER & GEOTHERMAL ENERGY

Hydropower Energy - Introduction, Site selection, layout of hydro power plant, components & working, classifications, power station, structure and control. Geothermal Energy - Introduction, Site selection, layout of power plant, components & working, Advantages and disadvantages.

UNIT IV SOLAR & WIND ENERGY

Sun as source of energy - Introduction, Site selection, layout of power plant components & working, classifications, Types of collectors, collection systems efficiency, Solar cells. Wind Energy - Introduction, advantages/limitations, Site selection, layout of power plant, components &working, classification.

UNIT V BIOMASS ENERGY

Introduction, advantages/limitations, Photosynthesis, biomass fuel, biomass gasification, biogas from waste biomass, factors affecting biogas generation, types of biogas plant, Biomass programme in India,

Text Books

- 1. Trivedi R.R. and Jalka K.R, "Energy Management", Commonwealth Publication, 20177.
- 2. Diamant R.M.E., "Total Energy", Pergamon, OxfordPublishers, 2017.
- 3. N.G. AJJANNA " Energy auditing & demand side management" first edition, Gouthami Publications, Shimoga
- 4. Chakrabarti, M.L.Soni, P.V. Gupta, U.S. Bhatnagar "Power system Engineering" 2001, DhanpatRai&Co, New Delhi.
- 5. D.P.Kothari, K.C Singal, Rajesh Ranjan, "Renewable Energy sources and Emerging Technologies" second edition, PHI, India

Reference Books

- 1. Boyle G, Everett B and Ramett J, "Energy systems and sustainability", Oxford University Press, 2018
- 2. "Pollution Control Acts, Rules and Notifications", CPCB, Pollution Control series, PC/2/2014, Vol.I,2014
- 3. Peavy.H, Rowe.D, and Tchobanoglous, G., Environmental Engineering, Tata McGraw-Hill, 2013

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

3 45

Hours

- 4. S.Rao, Dr. BB Parulekar "Energy Technologies" Khanna Publications , New Delhi
- 5. David M Buchla, Thomas E Kissel, Thomas L Floyd "Renewable Energy systems" Pearson, India
- 6. Godfrey Boyle "Renewable Energy power for sustainable future" oxford Publications , New Delhi

Web Resources

- 1. https://onlinecourses.nptel.ac.in/noc20_ce23/announcements
- 2. <u>https://swayam.gov.in/nd1_noc20_ce23/preview</u>
- 3. www.iucn.org
- 4. www.cites.org
- 5. www.thesummitbali.com/
- 6. http://engineering geology.gov.in/

COs/POs/PSOs Mapping

					Progr	am O	utcom	nes (P	Os)				Prog Outco	ram Sp omes (F	ecific PSOs)
	PO1	PO2	PO3	PO4	PO5	P06	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	2	3	-	1	2								
CO2	1	1	1	3	-	1	1								
CO3	2	2	2	2	2	3	3	-	1	1	2	3	-	2	2
CO4	2	2	2	2	3	3	3	-	1	1	2	3	-	2	2
CO5	2	2	2	2	3	3	3	-	1	1	2	3	-	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.M.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

MEDICAL ELECTRONICS L U19BMO41 (Common to EEE, ECE, CSE, IT, ICE, CCE, MECH, 3 U20BMO401 Mechatronics, AI&DS)

Course Objectives

- To gain knowledge about the various physiological parameters measurements
- To understand the various biochemical and nonelectrical sensors •
- To study about the assist devices
- To gain knowledge on surgical equipments and telemetry in healthcare .
- To understand the concepts of recent advancements in healthcare

Course Outcomes

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

CO1 - Explain the electro- physiological parameters and bio-potentials recording (K2)

- CO2 Measure the biochemical and non-electrical physiological parameters (K2)
- CO3 Interpret the various assist devices used in the hospitals (K3)
- CO4 Identify physical medicine methods and biotelemetry (K3)
- CO5 Analyse recent trends in medical instrumentation (K3)

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING

Sources of bio medical signals, Bio-potentials, Bio potential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT (9 Hrs)

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES

Artificial kidney, Dialysis action, hemodialyser unit, membrane dialysis, portable dialyser monitoring and functional parameters, Heart-Lung Machine.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY

Diathermies - Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry - Single Channel and Multiple Channel.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION (9 Hrs)

Telemedicine, Insulin Pumps, Radio pill, Endo-microscopy, Brain machine interface, Lab on a chip, Cryogenic Technique.

Text Books

- 1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2011
- 2. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, New Delhi, 2017.
- 3. John G.Webster, "Medical Instrumentation Application and Design", Third Edition, Wiley India, 2012.

Reference Books

- 1. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2011.
- 2. R.Anandanatarajan, "Biomedical Instrumentation and Measurements", Second Edition, PHI Learning, 2016.
- 3. Mandeep singh, "Introduction to Biomedical Instrumentation", Second Edition, Prentice Hall of India, New Delhi,2014
- 4. Shakti Chatterjee, Aubert Miller, "Biomedical Instrumentation Systems", Cengage Learning, 2012
- 5. C.Raja Rao, Sujoy K.Guha, " Principles of Medical Electronics and Biomedical Instrumentation", Universities Press, 2010

(9 Hrs)

(9 Hrs)

Web Resources

- 1. https://www.nap.edu/read/21794/chapter/7
- 2. https://www.embs.org/about-biomedical-engineering/our-areas-of-research/diagnostic-therapetic systems
- 3. https://nptel.ac.in/courses/127/106/127106136/
- 4. medicinenet.com/script/main/art.asp?articlekey=6414
- 5. https://www.verywellhealth.com/cardiopulmonary-bypass-machine-used-for-surgery-3157220

COs/POs/PSOs Mapping

C0e					Prog	ram O	utcom	es (PC	s)				Prog	ram Spe	ecific PSOs)
005	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	2	-	2	2	2	-	1	-	-	-	-	-	-	1
2	3	3 2 - 2 2 2 - 1 - - 3 2 - 2 2 2 - 1 - - -												-	1
3	3	-	-	2	3	3	-	1	-	-	-	-	-	-	1
4	3	-	2	2	3	2	-	1	-	-	-	-	-	-	1
5	3	2	2	3	3	2	-	1	-	-	-	-	-	-	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karm.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U19CCO41	BASIC DBMS	L	Т	Ρ	С	Hrs
	(Common to EEE, ECE, MECH, CIVIL, ICE,	2	0	0	2	45
020000401	Mechatronics, BME Branches)	ు	U	U	ა	

Course Objectives

- To understand about basics of Database Management System.
- To provide a general introduction to relational model and relational algebra.
- To study about normalization and SQL.
- To acquire knowledge about storage indexing and transaction management.
- To gain knowledge about the backup and recovery in database.

Course Outcomes

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

- CO1 Explain the concept of database management system.(K2)
- CO2 Create conceptual data model using entity relationship diagram.(K2)
- **CO3** Analyze the various normalization.(**K4**)
- **CO4** Describe the concept of storage indexing and transactions.(**K2**)
- CO5 Explain the database recovery and security.(K2)

UNIT - I INTRODUCTION TO DATABASE MANAGEMENT

Introduction to Database Management systems – History - Characteristics – Users- three-level architecture- Entity-- relationship data model.

UNIT – II - THE RELATIONAL DATA MODEL AND RELATIONAL ALGEBRA (9 Hrs)

Data structures – Mapping E-R Model to Relational model – data manipulation – integrity – advantages – rules for fully relational systems – relational algebra – relational algebra queries.

UNIT - III - STRUCTURED QUERY LANGUAGE AND NORMALIZATION (9 Hrs)

SQL – Data definition – manipulation – views SQL in procedural programming – data integrity and constraints – triggers – data control – database security. Normalization – Undesirable properties – single-valued normalization – desirable properties of decompositions – multivalued dependencies

UNIT –IV STORAGE INDEXING AND TRANSACTIONS MANAGEMENT (9 Hrs)

Different types of memories – secondary storage – buffer management – file structures – heap files – sorted files – index and types – indexed sequential file – B-tree – B+ tree. Transaction management – concepts – examples – schedules – serializability – concurrency control – deadlocks – lock and multiple granularity – nonlocking techniques.

UNIT -V DATABASE BACKUP, RECOVERY AND SECURITY

Database system failure – backup – recovery and concept of log – log-based recovery techniques – types of recovery – log-based immediate update recovery technique. Database Security – violations – identifications and authentication – authorization / access control – security of statistical databases – audit policy – internet applications and encryption.

Text Books

- 1. Gupta.G.K, "Database Management Systems", Tata McGraw Hill, 2011
- 2. Abraham Silberschatz, Henry F Korth, S Sudharshan, Database System Concepts 7th Edition, McGraw-Hill International Edition, 2019.
- 3. Ramez Elmasri and Shamkant Navathe, Durvasula V L N Somayajulu, Shyam K Gupta, "Fundamentals of Database Systems", Pearson Education, United States of America, 2018.

Reference Books

1. Silberschatz, Korth.H and Sudarshan.S, "Database System Concepts", 6th Edition, McGraw-HillInternational, 2011.

(9 Hrs)

- 2. Hector Garcia-Molina, Jeffrey D.Ullman, Jennifer Widom, "Database System The Complete Book, 1st Edition, Pearson 2002.
- 3. Date CJ, Kannan A, Swamynathan S, An Introduction to Database System, 8th Edition, Pearson Education-2006.
- 4. Raghu Ramakrishna, Johannes Gehrke, Database Management Systems, 3rd Edition, McGraw Hill, 2014.
- 5. Ramez Elmasri, Durvasul VLN Somyazulu, Shamkant B Navathe, Shyam K Gupta, Fundamentals of Database Systems", 7th Edition, Pearson Education, 2016.

Web Resources

- 1. https://docs.oracle.com/cd/E11882_01/server.112/e41084/toc.htm MySQL Online Documentation
- 2. http://dev.mysql.com/doc/
- 3. http://www.rjspm.com/PDF/BCA-428%20Oracle.pdf
- 4. http://www.w3schools.com/
- 5. https://www.codecademy.com/learn/learn-

006				I	Progr	am O	utcon	nes (F	Os)				Progr Outco	ram Sp omes (F	ecific PSOs)
003	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	3	1	1	-	1	1	1	-							
CO 2	3	1	1	-	1	-	-	-	-	-	1	1	1	1	-
CO 3	3	3	1	-	1	-	-	-	-	-	1	1	1	1	-
CO 4	3	1	1	-	1	-	-	-	-	-	1	1	1	1	-
CO 5	3	1	1	-	1	-	-	-	-	-	1	1	1	1	-

COs/POs/PSOs Mapping

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

	INTRODUCTION TO COMMUNICATION	L	Т	Ρ	С	Hrs
U19CCO42	SYSTEMS					
U20CCO402	(Common to EEE, CSE, IT, MECH, CIVIL, ICE,	3	0	0	3	45
	Mechatronics, BME)					

Course Objectives

- To provide basic knowledge of signals
- To study the various analog and digital modulation techniques
- To study the pulse modulation and multiplexing
- To infer Digital transmission techniques
- To provide knowledge about various multiple access technology and advanced communication techniques

Course Outcomes

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

CO1- Comprehend the basic Characteristics of the signals.(**K2**)

- CO2- Comprehend needs of modulation and various analog modulation techniques (K2)
- CO3- Illustrate pulse modulation and multiplexing (K3)
- CO4- Explain Digital transmission techniques (K2)

CO5- Describe multiple access techniques and advanced communication systems.(K2)

UNIT I SIGNAL ANALYSIS

Introduction to Signals- Representation and classification of Signals, Representation of signal in frequency domain, introduction to Spectrum of signal- Introduction to Fourier series and Fourier Transform

UNIT II ANALOG COMMUNICATION

Need for Modulation--- Block diagram of analog communication System- Amplitude Modulation -- AM, DSBSC, SSBSC, modulators and demodulators -- Angle modulation -- PM and FM -- modulators and demodulators -- Superheterodyne receivers

UNIT III PULSE COMMUNICATION

Low pass sampling theorem – Quantization – PAM – PCM, DPCM, DM, and ADPCM And ADM - Time Division Multiplexing, Frequency Division Multiplexing

UNIT IV DIGITAL COMMUNICATION

Comparison of digital and analog communication system- Block diagram of digital communication system Phase shift keying – BPSK, DPSK, QPSK

UNIT V MULTIPLE ACCESS TECHNIQUES AND ADVANCED COMMUNICATION (9 Hrs)

Multiple Access techniques- FDMA, TDMA, CDMA- Frequency reuse, Handoff- Block diagram of advanced communication systems – satellite communication – Cellular Mobile Communication – Fibre Optical Communication System.

Text Books

- 1. H Taub, D L Schilling, G Saha, "Principles of Communication Systems", 3rd edition, TMH 2007
- 2. S. Haykin, "Digital Communications", John Wiley, 2005
- B.P.Lathi," Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007

Reference Books

- 1. H P Hsu, Schaum Outline Series, "Analog and Digital Communications", TMH 2006
- 2. B.Sklar," Digital Communications Fundamentals and Applications", 2nd edition Pearson Education 2007.

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- 3. A.Bource Carson and Paul B.Crilly, "Communication Systems", 5th Edition, Mc Graw Hill, 2010
- 4. Torrieri, Don, "Principles of Spread Spectrum Communication Systems", Springer, 2015
- 5. Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001.

Web Resources

- 1. www.allaboutcircuits.com
- 2. https://nptel.ac.in/courses/108/102/108102096/
- 3. http://www.electronics-tutorials.ws
- 4. www.tutorialspoint.com
- 5. https://nptel.ac.in/courses/108/104/108104091/

CO 2					Progr	am O	utcon	nes (F	Os)				Progr Outco	am Sp omes (F	ecific PSOs)
COS	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO	PSO
	1	2	3	4	5	6	7	8	9	0	1	2	1	2	3
CO 1	3	1	1	-	1	-	-	-	-	-	1	1	1	-	1
CO 2	3	1	1	-	1	-	-	-	-	-	1	1	1	-	1
CO 3	3	3	1	-	1	-	-	-	-	-	1	1	1	-	1
CO 4	3	1	1	-	1	-	-	-	-	-	1	1	1	-	1
CO 5	3	1	1	-	1	-	-	-	-	-	1	1	1	-	1

COs/POs/PSOs Mapping

Dr.G.Balamuruga Mohan karM.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20BST101

ENGINEERING MATHEMATICS-I CALCULUS AND LINEAR ALGEBRA

(Common to all branches)

Course Objectives

- To familiarize the concept of matrices. •
- To introduce mathematical tools to solve first order differential equations. •
- To learn linear differential equations of higher order with constant coefficients.
- To understand the concept of partial differentiation. •
- To introduce the concepts of curl, divergence and integration of vectors in vector calculus. •

Course Outcomes

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

- CO 1 Find eigen values and eigen vectors, diagonalization of a matrix. (K5)
- CO 2 Solve differential equations. (K3 & K4)
- CO 3 Solve higher order differential equations. (K3 & K4)
- CO 4 Solve different types of partial differential equation. (K3 & K4)
- CO 5 Understand the use of vector calculus. (K2)

UNIT-I MATRICES

Rank of a Matrix- Consistency of system of equations. Eigen values and Eigen vectors of a real matrix -Characteristic equation - Properties of Eigen values and Eigen vectors. Cayley-Hamilton Theorem -Diagonalization of matrices.

UNIT – II DIFFERENTIAL EQUATIONS

Exact equations, First order linear equations, Bernoulli's equation, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

UNIT – III DIFFERENTIAL EQUATIONS (HIGHER ORDER)

Linear differential equations of higher order with constant coefficients, the operator D, Euler's linear equation of higher order with variable coefficients, Solution by variation of parameter method.

UNIT – IV PARTIAL DIFFERENTIAL EQUATIONS

Partial derivatives, Total derivatives, Differentiation of implicit functions, Maxima and Minima of two variables. Partial differential equations of higher order with constant coefficients.

UNIT – V VECTOR CALCULUS

Gradient, divergence and curl - Directional derivative- Irrotational and Solenoidal vector fields - Gauss Divergence Theorem and Stoke's Theorem.

Text Books

- 1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley, Tenth edition, 2019
- 2. B.V.Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi, Sixth edition 2018.
- 3. N.P. Bali and Manish Goyal, "A Text Book of Engineering Mathematics", Lakshmi Publications, New Delhi, Ninth Edition, 2018

Reference Books

- 1. CW. Evans, "Engineering Mathematics", A Programmed Approach, 3th Edition, 2019
- 2. Singaravelu. A., "Engineering Mathematics I", Meenakshi publications, Tamil Nadu, 2019
- 3. M.K. Venkataraman, "Engineering Mathematics (Third Year-Part A)", The National Publishing Company, Madras, 2016.
- 4. S. Narayanan," Differential Equations and Its Applications", Viswanathan, S., Printers &

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Publishers Pvt Ltd , 2009

5. Dr.G Balaji., " Engineering Mathematics-I", G.Balaji publishers, 2017

Web Resources

- 1. http://www.yorku.ca/yaoguo/math1025/slides/chapter/kuttler-linearalgebra --slidessystemsofquation-handout.pdf
- 2. http://www.math.cum.edu/~wn0g/2ch6a.pdf
- 3. https://nptel.ac.in/courses/122/104/122104017/
- 4. https://nptel.ac.in/courses/111/106/111106051/
- 5. https://nptel.ac.in/courses/111/108/111108081/

COs/POs/PSOs Mapping

					Drogr	am O	utcom	os (D	0e)				Prog	ram Sp	ecific
COs					Flogi		utcom	103 (17	03)				Outco	omes (F	'SOs)
	P01	PO2	PO3	PO4	PO5	P06	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	2	-	-	1	1	-	-	-	-	1	-	-	-
2	3	3	2	-	-	-	1	-	-	-	-	1	-	-	-
3	3	3	2	-	-	-	1	-	-	-		1	-	-	-
4	3	2	2	-	-	-	1	-	-	-	-	-	-	-	-
5	2	2	1	-	-	-	1	-	-		-	-	-	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaµM.Tech.,Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U20BST109	BIOLOGY FOR ENGINEERS	L 3	Т 0	P 0	C 3	Hrs 45	
Course Objectives		Ū	Ũ	·	Ū		
• To know the basic	structural and functional elements of human body.						
To know the signification	cance of biomolecules in biological systems.						
To get a clear idea	of macromolecules and their functions.						
To study about the	mechanics involved with various physiological sys	stems.					
To know the variou	s static and dynamic human activities.						
Course Outcomes							
After completion of th	e course. the students will be able to						
CO1 - Describe basic st	ructural and functional elements of human body ((1)					
CO2 - Assess the signif	icance of Enzymes in biological systems (K2)						
CO3 - Explain functions	of bio molecules (K2)						
CO4 - Understand the fu	unctional mechanism of biological systems (K2)						
CO5 - Knowledge about	t Gait analysis, body and limbs of movement mech	nanics (K3))				
	ON					(9 H	rs)
Exciting aspect of Bio	logy as an independent Scientific Discipline -	Structure	and	funct	ion o	fCell & d	cellular
components – Membrai	ne Potential – Action Potential – NUCLEIC ACID:	Compositi	ion ar	nd Fu	nctior	n, Genes, (Outline
of DNA Structure, Re-C	ombinant DNA and its applications.						
UNIT II ENZYMES						(9 H	rs)
Enzymes: Chemical Nat	ture, General Properties, Spectrophotometric mea	surement	of enz	zyme	s, Isol	ation techr	niques,
Diagnostic enzymes. Er	zyme biotechnology. Hormones: Chemical Nature	e, Propertie	es of	horm	ones,	Hormonal	Assay

UNIT III MACROMOLECULES

and their Significance.

Carbohydrate: Classification of carbohydrates mono, di, oligo and polysaccharides. Structure, physical and chemical properties of carbohydrates

Protein: Classification, Amino acids, Chromatography, electrophoresis and architecture of protein molecules.

UNIT IV BIOLOGICAL SYSTEMS

Hrs)

Cardiovascular system - Heart and vascular system, Nervous System - Structure and functions of Neurons, Synapse, Reflex action and Receptors, Respiratory system - Physiological aspects of respiration - Exchange of gases, Temperature regulation.

UNIT V JOINTS AND MOVEMENT BIOMECHANICS

Types of joint, biomechanical analysis of elbow, shoulder, hip, knee and ankle. Gait analysis, body and limbs- mass and motion characteristics actions, forces transmitted by joints. Joints forces results in the normal and disable human body, normal and fast gait on the level.

Text Books

- 1. Guyton, "Text book of Medical Physiology", Tenth edition, WB Jaunder company Philadelphia, 2010
- 2. David L.Nelson, Michael M.Cox, Lehninger "Principles of Biochemistry Macmillan", 6th Edition 2013.
- 3. Carol A. Oatis, "The Mechanics and Pathomechanics of Human Movement", Lippincott Williams and Wilkins, 2010

Reference Books

1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, "Fundamentals of Anatomy and Physiology", Pearson Publishers, 2014

(9 Hrs)

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- 2. Gillian Pocock, Christopher D. Richards, "The Human Body An introduction for Biomedical and Health Sciences", Oxford University Press, USA, 2013
- 3. Pamela. C. Champe and Richard. A. Harvey, "Biochemistry Lippincott's Illustrated Reviews. Lippincott" Raven publishers, 6th Edition, 2013.
- 4. Keith Wilson and John Walker, "Practical Biochemistry– Principles &Techniques", Oxford University press, 7th Edition, 2010.
- 5. Sean P. Flanagan, Flanagan, "Biomechanics: A case based Approach", Jones and Bartlett Publishers, March 2018

Web References

- 1. https://byjus.com/biology/human-body-anatomy/
- 2. https://www.khanacademy.org/
- 3. https://www.youtube.com/channel/UCJayvjGvKEblkA3KYK1BQQw
- 4. https://tinyurl.com/y8osnq6d
- 5. https://tinyurl.com/y78y4cvy

COs/POs/PSOs Mapping

COs					Prog	ram O	utcom	es (PC)s)				Prog Outc	ram Spe omes (P	ecific SOs)
	P01	PO2	PO3	PO12	PSO1	PSO2	PSO3								
1	3	-	-	-	-	-	-	-							
2	3	-	-	-	-	-	-	-							
3	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-
4	3	-	-	-	-	-	-	1	-	-	-	-	-	-	-
5	3	2	2	-	2	-	-	1	-	-	-	-	2	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

т **U20EST102** INTRODUCTION TO ELECTRICAL ENGINEERING

Course Objectives

- To introduce fundamental concepts, various laws and principles associated with electrical circuits and its analysis.
- To provide knowledge about the various factors in AC circuits and resonance condition.
- To establish the concepts of three-phase circuits and measuring instruments.
- To describe the concept of electrical safety, power system and working of transformers.
- To explain the concepts of generators, motors and their applications.

Course Outcomes

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

CO1 - Interpret the basic concepts, various laws and theorems used in DC circuits.

CO2 - Analyze and solve the AC circuits and develop resonance circuits for transmitter and receiver circuits.

CO3 - Gain knowledge about the three phase circuits and its advantages and working principle of measuring instruments.

CO4 - Diagnose the concept of power system, importance of electrical safety measures and application of transformers.

CO5 - Inspect the concept of electromechanical energy conversion and its working principles of generators and motors.

UNIT I D.C CIRCUIT ANALYSIS AND NETWORK THEOREMS

Circuit concepts: Concept of network, Active and passive elements, concept of linear network, unilateral and bilateral elements, source transformation, ohm's law, Kirchhoff's current and voltage Law- Series and Parallel Combination - loop and nodal methods of analysis, star-delta transformation

Network theorems: Superposition Theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem.

UNIT II STEADY STATE ANALYSIS OF AC CIRCUITS

AC fundamentals: Sinusoidal, square and triangular waveforms- Instantaneous, Peak, average and effective value, formfactor and peak factors, Phasor diagram, phasors representation of sinusoidally varying voltage and current, analysis of series-parallel RLC circuits. Apparent, active and reactive powers, Impedance diagram, power triangle, power factor, causes and problems of low power factor, power factor improvement, Resonance in series and parallel circuits, bandwidth and guality factors.

UNIT III THREE PHASE AC CIRCUITS AND MEASUREMENT INSTRUMENTS (9 Hrs)

Three phase system: Necessity and advantages, phase sequence, star and delta connections, balanced supply and balanced/unbalanced load, line and phase voltage/current relation, three phase power measurements-two wattmeter method.

Types of instruments: Construction and working principle of PMMC and MI type instruments, single phase dynamometer type wattmeter and induction type energy meter, use of multipliers.

UNIT IV INTRODUCTION OF POWER SYSTEM

General layout of electrical power system and its functions, Safety measures in electrical system, insulators, cables, fuse and circuit breakers.

Magnetic Circuit: Concepts, analogy between electric and magnetic circuit, magnetic circuits with DC and AC excitation, magnetic leakage, BH curve, hysteresis and eddy current losses, mutual coupling-Single/Three Phase Transformer- construction-Principle of operation, emf equation, load test, OC and SC test, equivalent circuit, power losses, efficiency, Introduction to auto transformers- copper savings in autotransformers.

UNIT V DC AND AC MACHINES

DC Machines: Construction-Principle of operation of DC Motor /Generator-Types, Torque equation of motor and Emf equation of generator, load test, Torque-Speed characteristics and applications of DC motors/Generators.

(9 Hrs)

(9 Hrs)

(9 Hrs)

Hrs 3 3 45

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AC Machines: Construction-Principle of operation of single /three phase induction Motors-types- slip-torque Characteristics-applications-Principle of operation of alternator and synchronous motor, load test -applications.

Text Books

- 1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016
- 2. Sudhakar.A and ShyamMohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.
- 3. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements &Instrumentation' Dhanpat Rai and Co 2004.
- 4. V. K. Metha&RohitMetha,"Principles of Power System", S.Chand, 2005

Reference Books

- 1. V.Deltoro, "Principle of Electrical Engg." PHI.
- 2. M.A Mallick, Dr. I. Ashraf, "Fundamental of Electrical Engg," Word Press, Lucknow.
- 3. A. Hussain, "Basic Electrical Engg" DhanpatRai& sons.

Web References

- 1. https://www.youtube.com/watch?v=Vd2UJiIPbag
- 2. https://www.youtube.com/watch?v=GHrHRBMjno0
- 3. https://nptel.ac.in/courses/108/108/108108076/
- 4. https://nptel.ac.in/courses/108/105/108105112/
- 5. https://www.allaboutcircuits.com/video-lectures/

COs/POs/PSOs Mapping

					Drogr	am O	utcom						Prog	ram Sp	ecific
COs					Flogi		utcom	162 (11	55)				Outco	omes (F	PSOs)
	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	1	2	3	-	-	-	-	-	-	3	3	3	2
2	3	3	2	1	3	-	-	-	-	-	-	3	3	3	2
3	3	3	2	1	3	-	-	-	-	-	-	3	3	3	2
4	3	3	2	1	3	-	-	-	-	-	-	3	3	3	2
5	3	3	2	1	3	-	-	-	-	-	-	3	3	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U20EST130 FUNDAMENTALS OF MECHANICAL ENGINEERING

Course Objectives

- To discuss various Energy Resources available for power generation.
- To explain the various methods of power generation.
- To describe different types of combustion systems such as Internal and External Combustion systems.
- To discuss various methods of air-conditioning systems
- To explain the working of various metal machining processes.

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Identify various energy resources used for power generation (K1)
- CO2 Understand various power generating systems (K2)
- CO3 Understand different types of combustion systems(K2)
- CO4 Define the air-conditioning system required for various applications (K3)
- CO5 Develop various shapes through different machining processes.(K3)

UNIT I ENERGY RESOURCES

Non-renewable and renewable energy resources, Petroleum based solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fubbels, Solar Power: Solar radiation, solar constant (Definitions only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (Principle of operation only), Solar photovoltaic principle. Bio Fuels: Introduction to biofuels, examples of various biofuels used in engineering applications, Comparison of biofuels with petroleum fuels in terms of calorific value and emission.

UNIT II POWER GENERATION SYSTEMS

Power Generation Systems - Conventional and Non-Conventional: Hydraulic - Thermal - Nuclear power plants - Schemes and layouts (Description Only) Solar - wind -Geothermal - Wave - Tidal and Ocean Thermal Energy Conversion systems – Basic power plant schemes and layouts (Description only).

UNIT III INTERNAL AND EXTERNAL COMBUSTION SYSTEMS

IC engines - Classification - Working principles - Diesel and Petrol Engines: Two stroke and Four stroke engines - merits and demerits. Steam generators (Boilers) - Classification - Constructional features (of only low pressure boilers) – Boiler mountings and accessories – Merits and demerits – Applications.

UNIT IV REFRIGERATION AND AIR CONDITIONING SYSTEM

Refrigerants: Properties of refrigerants, list of commonly used refrigerants, Refrigeration: Definition, Refrigeration effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, Unit of Refrigeration, Principle and working of vapour compression refrigeration and vapour absorption refrigeration, Principles and applications of air conditioners, Room air conditioner.

UNIT V MACHINE TOOLS

Machine Tools (Basic elements, Working principle and types of operations): Lathe, Drilling Machine, Shaper Machine, Planner Machine, Slotter Machine, Milling Machine and Grinding Machine.

TextBooks

- 1. Shanmugam G, Palanichamy MS, Basic Civil and Mechanical Engineering,1st Edition, McGraw Hill Education, 2018.
- 2. Vaishnavi R., Prabhakaran M, Vijayan .V, Basic Civil and Mechanical Engineering, S. Chand Publisher, 2013.
- 3. Pravin Kumar, Basic Mechanical Engineering Pearson Publications, May 2018.

(9 Hrs)

(9 Hrs)

(9 Hrs)

Hrs Т Ρ С 3 0 3 45

(9 Hrs)

Reference Books

- 1. Rai G.D, Non-Conventional Energy Resources, Khanna Publishers, 6th Edition.
- 2. Poonia M.P., Sharma S.C & Banga T.R, Basic Mechanical Engineering, Khanna Publishing House 2018.
- 3. Rameshbabu V, Basic Civil & Mechanical Engineering, VRB Publishers Private Limited, January 2017.
- 4. Rajput RK, Basic Mechanical Engineering, Laxmi Publications; Third edition, 2015.
- 5. Rajan T.S, Basic Mechanical Engineering, New Age International Pvt. Ltd, 2015.

Web References

- 1. https://nptel.ac.in/courses/112107291/
- 2. https://nptel.ac.in/courses/112/103/112103262/
- 3. https://ocw.mit.edu/courses/mechanical-engineering/2-61-internal-combustion-engines-spring-2017/ lecture-notes/
- 4. https://nptel.ac.in/courses/105102088/
- 5. https://nptel.ac.in/courses/105104101/

Cos Mapping with POs and PSOs

COs				P	rogra	am O	utcoi	nes ((POs))			Pro Oute	gram Spe comes (P	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	1	-	-	1	2	-	-	-	-	3	-	2	2
2	3	2	2	2	2	2	2	-	-	-	-	3	1	2	2
3	3	2	2	2	2	2	2	-	-	-	-	3	1	2	2
4	3	2	2	2	2	1	2	-	-	-	-	3	1	2	2
5	3	2	2	2	2	1	-	-	-	-	-	3	2	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Esgineering College, Madagadipet, Puducherry-605 107.
U20MCT101	THERMODYNAMICS AND HEAT TRANSFER	2	2	0	3	60
Objectives:						
To discuss first	law of thermodynamics with respect to closed and open system	ms				
• To impart the k	nowledge on second law of thermodynamics and entropy					
• To teach the st	udents to understand various modes of heat transfer in steady	and t	ransie	ent co	ndition	
• To discuss con	vective heat transfer in various systems.					
• To describe rac	liation heat transfer for various geometries.					
Course Outcome	es					
On successful con	mpletion of this course, the student will be able to					
CO1 Understand	d the basic concepts associated with the first law of thermodyn	amics	s.(K2)			
CO2 Understand	the basic concepts associated with the second law of thermo	dynar	nics.(K2)		
CO3 Analyze ste	eady state and transient heat conduction problems of real life T	herm	al sys	stems.	.(K4)	
CO4 Understand	d the convective heat transfer problems in various thermal syst	ems.	(K2)			
CO5 Analyze rad	diation heat transfer problems in various thermal systems.(K4)					
UNIT I -BASIC C	ONCEPTS AND FIRST LAW OF THERMODYNAMICS					(12 Hrs)
Thermodynamic sy Law for closed and	stems, concepts of continuum, basic definitions, heat and work open systems.	, zero	oth lav	v, Firs	t law, S	SFEE, First

Т

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Hours

UNIT II - SECOND LAW OF THERMODYNAMICS

Second law of thermodynamics Statements, reversibility, causes of irreversibility, Carnot cycle, reversed Carnot cycles. Thermodynamic Temperature Scale, entropy, Clausius inequality, Entropychange in isothermal and adiabatic processes. Isentropic processes.

UNIT III - CONDUCTION

Introduction of heat transfer - conduction - convection and radiation - Laws - General equation of heat conduction - Derivation in Cartesian - cylindrical and spherical coordinates - One dimensional steady state heat conduction in simple geometries - plane wall - cylinder and sphere - Heat transfer composite walls - composite cylinders and composite spheres - Conduction with Internal Heat Generation - Extended Surfaces - Unsteady Heat Conduction -Lumped Analysis - Semi Infinite and Infinite Solids - Use of Heisler's charts

UNIT IV - CONVECTION

Boundary layer theory – Hydrodynamic and Thermal Boundary Layer- Dimensional Analysis-Flow over a flat– Flow over cylinders -spheres - tube bank - Internal flow through pipes in forced heat transfer - Natural convection in vertical - inclined and horizontal surfaces - Mixed convection.

UNIT V - RADIATION

Radiation heat transfer - Thermal radiation - Laws of radiation - Black body concept - Greay body radiation -Emissive power - Radiation shape factor-radiation heat exchange between surfaces - Electrical Analogy -Radiation Shields-Radiation through gases.

Text book:

- 1. Nag P. K., Engineering Thermodynamics, McGraw Hill Education India Pvt. Ltd, 2017.
- 2. Sachdeva R. C., Fundamentals of Heat and Mass Transfer, New AgeInternationalPublishers, 2017.
- Rajput R K "A text book of Engineering Thermodynamics", S. Chand publishers, 2016

Reference books:

- 1. Moran and Shapairo, Principles of Engineering Thermodynamics, 8th Edition, Wiley, 2015
- 2. Yunus A. Cengel, Heat and Mass Transfer: Fundamentals and Applications, McGraw Hill Education, 2016.
- 3. Frank P. Incropera and David P. Dewitt, Incropera's principles of Heat and MassTransfer, Wiley India Edition, 2018.

(12 Hrs)

(12 Hrs)

(12 Hrs)

(12 Hrs)

- 4. C. P. Kothandaraman and S. Subramanyan, Heat and Mass Transfer Data Book, Fifth Edition, New Age International Publishers, 2018.
- 5. Arora C.P, "Thermodynamics", 25th Reprint, McGraw-Hill, New Delhi, 2013.

Web References

- 1. https://nptel.ac.in/courses/112105266/
- 2. https://nptel.ac.in/courses/112108148/
- 3. https://nptel.ac.in/courses/112/103/112103275/
- 4. https://www.linkedin.com/company/heat-transfer-and-process-design-htpd
- 5. https://www.udemy.com/course/an-introduction-to-heat-transfer/

Cos Mapping with POs and PSOs

COs				Ρ	rogra	am O	utcoi	nes ((POs))			Pro Oute	gram Spe comes (P\$	cific SOs)
	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	2	2	2	2	-	-	-	-	-	-	3	2	2	1
2	3	2	2	2	2	-	-	-	-	-	-	3	2	2	1
3	3	2	3	3	2	-	-	-	-	-	-	3	2	2	1
4	3	2	3	3	-	-	-	-	-	-	-	3	2	2	1
5	3	2	3	3	-	-	-	-	-	-	-	3	2	2	1

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan ka, M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20ESP101	BASIC ELECTRICAL ENGINEERING LAB	L	I	
		0	0	

Course Objectives

- To introduce practical knowledge for the analysis of laws and theorems.
- To devise the methods to evaluate and test the devices and machines.

Course Outcomes

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

- CO1 Implement the network theorems and validate the results through simulation.
- CO2 Apply proper measurement techniques for the calculation of power and calibration of meters.
- $\ensuremath{\text{CO3}}$ Estimate the performance of DC and induction motor by conducting load and no load tests.

List of Experiments

- 1. Verification of Network Theorems.
- 2. To study the phenomenon of resonance in series RLC circuit.
- 3. Measurement of 3-phase power using two wattmeter methods.
- 4. Calibration of a single phase induction type energy meter.
- 5. Load test on single phase transformer.
- 6. Determination of losses in single phase transformer by OC and SC Test.
- 7. Load test on DC shunt motor.
- 8. Load test on single phase induction motor.
- 9. To study the running and reversing of a three phase SCIM.
- 10. Load test on Single phase alternator.

ReferenceBooks

- 1. D P Kothari and I.J Nagarath, "Electrical Machines "Basic Electrical and Electronics Engineering", McGraw Hill Education(India) Private Limited, Third Reprint ,2016
- 2. Sudhakar.A and ShyamMohan.S.P, "Circuits and Networks Analysis and Synthesis", Tata McGraw Hill Publishing Company Ltd., New Delhi, 4th edition, 2010.

Web References

- 1. https://mrcet.com/downloads/digital_notes/HS/BEE%20LAB%20MANUAL%20PRINTING%20COPY.pdf
- 2. https://www.dbit.ac.in/applied-sciences/syllabus/basic-electrical-engineering-lab.pdf
- 3. http://www.nitrr.ac.in/downloads/syl_new/1st%20Yr/BEE%20Lab%20manual.pdf
- 4. https://webstor.srmist.edu.in/web_assets/srm_mainsite/files/2018/18EES101J-basic-electrical-engineering-eee.pdf
- 5. https://www.iare.ac.in/sites/default/files/lab1/BEE%20LAB%20Manual_0.pdf

COs/POs/PSOs Mapping

	CO / PO / PSO MAPPING														
	P01	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3
CO2	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3
CO3	3	3	3	3	3	-	-	-	3	2	2	3	3	3	3

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	ENGINEERING GRAPHICS USING	L	Т	Ρ	С	Hrs	
020237112	AUTOCAD	0	0	2	1	30	
• • • •							

Course Objectives

- To develop graphic skills for communication of concepts, ideas and design of engineering products
- To expose them to standardized technical drawings
- To extend the skill to use software for creating 2D and 3D models
- To draw a simple steel truss.
- To develop the isometric projection of simple objects

Course Outcomes

On successful completion of this course, the student will be able to:

CO1-Familiarize with the fundamentals and standards of engineering graphics(K1,K2)

CO2- Perform freehand sketching of basic geometrical constructions and multiple views of objects **(K2,K3)**

CO3-Visualize the project isometric and perspective sections of simple solids and to be familiar on software packages for drafting and modelling(**K3**)

- CO4 Connect side view associate on front view.(K4)
- CO5 Correlate sectional views of prism, pyramid, cylinder, cone. (K4)
- CO6 Plan 2D multi-view drawings from 3-Dmodel (K5)

List of Experiments

- 1. Study of capabilities of software for Drafting and Modeling Coordinate systems (absolute, relative, polar, etc.) Creation of simple figures like polygon and general multi-line figures.
- 2. Drawing of a Title Block with necessary text and projection symbol.
- 3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
- 4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc., and Dimensioning.
- 5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V block, Base of a mixie, Simple stool, Objects with hole and curves).
- 6. Drawing of a plan of residential building (Two bed rooms, kitchen, hall, etc.)
- 7. Drawing of a simple steel truss.
- 8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
- 9. Drawing isometric projection of simple objects.
- Creation of 3D models of simple objects and obtaining 2D multi-view drawings from 3Dmodel.
 Note: Plotting of drawings must be made for each exercise and attached to the records written by Students.

Reference Books

- 1. James D. Bethune, Engineering Graphics with AutoCAD A Spectrum book 1st Edition, Macromedia Press, Pearson, 2020
- 2. NS Parthasarathy and Vela Murali, Engineering Drawing, Oxford university press, 2015.
- 3. M.B Shah, Engineering Graphics, ITL Education Solutions Limited, Pearson Education Publication, 2011
- 4. Bhatt N.D and Panchal V.M, Engineering Drawing: Plane and Solid Geometry, Charotar Publishing House, 2017.
- 5. Jeyapoovan T, Engineering Drawing and Graphics Using AutoCAD, 7th Edition, Vikas Publishing House Pvt Ltd., New Delhi, 2016
- 6. C M Agrawal, Basant Agrawal, Engineering Graphics, McGraw Hill, 2012
- 7. Dhananjay A. Jolhe, Engineering Drawing: With An Introduction To CAD McGraw Hill, 2016
- 8. James Leach, AutoCAD 2017 Instructor, SDC Publications, 2016.

Web Resources

1.http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/index.php

2.http://www.nptelvideos.in/2012/12/computer-aided-design.html

- 3.https://mech.iitm.ac.in/meiitm/course/cad-in-manufacturing/
- 4.https://autocadtutorials.com

CO/PO/PSO Mapping

COs					F	rogran	n Outco	omes					Prog	Jram Spe outcome	ecific S
	PO1	PO2	PO3	PO4	PO12	PSO1	PSO2	PSO3							
1	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
2	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3
3	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
4	3	1	-	-	3	-	-	-	3	-	-	2	3	3	3
5	3	1	-	-	3	-	-	-	3	-	-	3	3	3	3

Dr.G.Balamuruga Mohan kaıM.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Menakula Vinayagar Esgincering College, Madagadipet, Puducherry-605 107.

U20MCP101



Course Objectives:

- To discuss various properties of liquid fuels.
- To apply convection heat transfer concepts to do experimentation on the heat transfer systems.
- To apply conduction heat transfer concepts to do an analysis on heat transfer equipment.
- To understand the functioning and performance of Air compressor and Blower.
- To describe the principle of parallel flow and counter flow heat exchangers.

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Understand about various fuels and their properties.(K2)
- CO2 Demonstrate the fundamental principles of convective heat transfer in practice (K3)
- CO3 Demonstrate the fundamental principles of conductive heat transfer in real life systems practice (K3)
- **CO4** Analyse and assess the performance of Air compressor and Blower (K4)
- CO5 Model and test heat exchanging system.(K5)

List of Experiments

- 1. Determination of Kinematic Viscosity using Redwood viscometer
- 2. Determination of Flash and fire point using Cleveland apparatus
- 3. Determination of Heat transfer coefficient for heat transfer from cylindrical surface by natural convection
- 4. Determination of Heat transfer coefficient for heat transfer from cylindrical surface by forced convection
- 5. Determination of Heat transfer coefficient for heat transfer from Pin fin by natural convection
- 6. Determination of Heat transfer coefficient for heat transfer from Pin fin by forced convection
- 7. Determination of thermal resistance and conductivity of a composite wall
- 8. Determination of emissivity of a specimen
- 9. Performance test on reciprocating air compressor
- 10. Performance test on air blower
- 11. Performance analysis of Parallel and Counter flow heat exchanger
- 12. Heat transfer studies using a plate type heat exchanger

Reference Books

- 1. Sachdeva R. C. Fundamentals of Heat and Mass Transfer, New Age International (P) Ltd, (2017),
- 2. Holman J. P.Heat Transfer, 9th Edition, McGraw-Hill Publishing Company Limited, 2011),
- 3. Kothandaraman C. P. and Subramanyan.S, Heat and Mass Transfer Data Book, Fifth Edition, New Age International Publishers (2018),
- 4. R.K.Rajput, Thermal Engineering, 10th edition, Lakshmi Publications, 2018.
- 5. Yunus A. Cengel, Robert H. Turner, John M. Cimbala, Fundamentals of Thermal-Fluid Sciences, Indian edition, 2016

COs				Ρ	rogra	am O	utcoi	nes ((POs))			Pro Oute	gram Spe comes (P	cific SOs)
	PO1	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	3	3	3	3	3	-	-	-	3	-	-	3	1	2	2
2	3	3	3	3	3	-	-	-	3	-	-	3	1	2	2
3	3	3	3	3	3	-	-	-	3	-	-	3	1	2	2
4	3	2	2	3	3	-	-	-	3	-	-	3	1	2	2
5	3	2	2	3	3	-	-	-	3	-	-	3	1	2	2

Cos Mapping with POs and PSOs



CERTIFICATION COURSE - I

L T P C Hrs

0 0 4 - 50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U20MCS101

DEMONSTRATION OF WORKSHOP PRACTICES (Common to ECE, CSE, IT, ICE, BME,CCE) LTPCHrs 002-30

Course Objectives

- To have practical exposure to various welding and joining processes.
- To impart skill in fabricating simple components using sheet metal
- To train the students in metal joining processes like soldering in PCB.
- To understand the working procedure of various Conventional Machines.
- To cultivate safety aspects in handling of tools and equipment.

Course Outcomes

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

CO1 - Identify different prototypes in the carpentry trade such as lap joint, Butt joint. (K1)

- CO2 Classify the fabrication of simple sheet metal parts. (K2)
- CO3 Interpret the casting preparation. (K2)
- CO4 Identify the conventional machine operations. (K1)
- CO5 Describe the skills, and modern engineering tools necessary for engineering practice. (K1)

DEMONSTRATION OF EXPERIMENTS

- 1. Welding Exercises
 - a. Introduction to BI Standards and reading of welding drawings.
 - b. Butt Joint
 - c. Lap Joint
 - d. Arc Welding
 - e. Gas Welding
- 2. Sheet Metal Exercises
 - a. Making of Cube
 - b. Making of Cone using development of surface
- 3. Casting
 - a. Green Sand Moulding preparation
- 4. Demonstration of Conventional Machines.
- 5. Bosch Tools Demonstration
 - a. Demonstration of all Bosch tools.

Reference Books

- 1. K.C. John, "Mechanical Workshop Practice", PHI Learning Private Limited, 2010
- 2. KA Navas, "Electronics Lab Manual", Fifth edition, PHI Learning Private Limited, 2015
- 3. S K Hajra, Choudhary and A K Chaoudhary, Workshop Technology I,II,III, by. Media Promoters and Publishers Pvt. Ltd., Bombay
- 4. T Jeyapoovan, Basic Workshop Practice Manual, Vikas Publishing House (P) Ltd., New Delhi
- 5. K Venkata Reddy, KL Narayana, Manual on Workshop Practice, MacMillan India Ltd.

Web References

- 1. https://www.weld.com/
- 2. https://welding.com/
- 3. https://sciencing.com/soldering-desoldering-techniques-8288017.html
- 4. https://nptel.ac.in/courses/112/107/112107084/
- 5. https://nptel.ac.in/courses/112/106/112106153/

COs				P	rogra	am O	utcor	nes (POs)				Prog Outco	ram Sp omes (F	ecific PSOs)
003	PO1 PO2 PO3 PO4					PO6	PO7	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	3	1	-	-	1	-	-	-	3	-	-	3	2	2	2
2	3	1	-	-	1	-	-	-	3	-	-	3	2	2	2
3	3	1	-	-	1	-	-	-	3	-	-	3	2	2	2
4	3	1	-	-	1	-	-	-	3	-	-	3	2	2	2
5	3	1	-	-	1	-	-	-	3	-	-	3	2	2	2

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Menakula Vinayagar Esgineering College, Medagadipet, Puducherry-605 107.

INDUCTION PROGRAM

Duration of the Program	3 Weeks
Induction program	 Physical Activity Creative Arts and Culture Mentoring and Universal Human Values Familiarization with College, Dept./Branch Literary Activity Proficiency Modules Lectures and Workshops by Eminent People Visits in Local Area Extra-Curricular Activities in College

Induction program for students to be offered right at the start of the first year

1. Physical Activity

This would involve a daily routine of physical activity with games and sports. There would be games in the evening or at other suitable times according to the local climate. These would help develop team work besides health. Each student could pick one game and learn it for the duration of the induction program and hopefully, continue with it later.

2. Creative Arts

Every student would chose one skill related to the arts whether visual arts or performing arts. Examples are painting, music, dance, pottery, sculpture etc. The student would pursue it every day for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and also enhance creativity which would, hopefully, flow into engineering design later.

3. Mentoring and Universal Human Values

Mentoring and connecting the students with faculty members is the most important part of student induction. Mentoring takes place in the context and setting of Universal Human Values. It gets the student to explore oneself and experience the joy of learning, prepares one to stand up to peer pressure and take decisions with courage, be aware of relationships and be sensitive to others, understand the role of money in life and experience the feeling of prosperity. Need for character building has been underlined by many thinkers, universal human values provide the base. Methodology of teaching this content is extremely important. It must not be through do's and dont's, but by getting the students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing. The role of group discussions, however, with clarity of thought of the teachers cannot be over emphasized. It is essential for giving exposure, guiding thoughts, and realizing values. The teachers must come from all the departments rather than only one department like HSS or from outside of the Institute. Experiments in this direction at IIT(BHU) are noteworthy and one can learn from them. Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It is to open thinking towards the self. Universal Human Values discussions could even continue for rest of the semester as a normal course, and not stop with the induction program. Besides drawing the attention of the student to larger issues of life, it would build relationships between teachers and students which last for their entire 4-year stay and possibly beyond.

4. Other Activity

Activities that are not there on a daily basis, but are conducted for 3-4 days (typically in the afternoons) and change thereafter.

4.1. Familiarization with College, Department/Branch

The incoming students should be told about the credit and grading system, and about the examinations. They should be informed about how study in college differs from study in school. They should also be taken on a tour of the college and shown important points such as library, canteen, and other facilities. They should be shown their department, and told what it means to get into the branch or department. Describe what role the technology related to their department plays in society and after graduation what role the student would play in society as an engineer in that branch. A lecture by an alumnus of the Dept. would be very helpful in this regard.

They should also be shown the laboratories, workshops and other facilities. The above should be done right in the first two days, and then over the afternoons thereafter, as appropriate.

4.2. Literary Activity

Literary activity would encompass reading a book, writing a summary, debating, enacting a play etc.

4.3. Proficiency Modules

The induction program period can be used to overcome some critical lacunas that students might have, for example, English, computer familiarity etc. These should run like crash courses, so that when normal courses start after the induction program, the student has overcome the lacunas substantially. We hope that problems arising due to lack of English skills, wherein students start lagging behind or failing in several subjects, for no fault of theirs, would, hopefully, become a thing of the past.

4.4. Lectures and Workshops by Eminent People

Lectures by eminent people should be organized, say, once a week. It would give the students exposure to people who are eminent, in industry or engineering, in social service, or in public life. Alumni could be invited as well. Motivational lectures about life, meditation, etc. by Ramakrishna Mission, Art of Living, Vivekanand Kendras, S-VYASA, etc. may be organized. Workshops which rejuvenate or bring relief to students would also be welcome, such as, Art of Living workshops (3 sessions, 9 hours).

4.5. Visits in Local Area

A couple of visits to the local landmarks including historical monuments should be organized. This would familiarize the students with the area together with bonding with each other, like in a picnic. Visits should also be organized to a hospital, orphanage or a village. These would expose them to people in suffering or to different lifestyles. This might also sensitize them to engineering needs in these areas.

4.6. Extra-Curricular Activities in College

The new students should be introduced to the extra-curricular activities at the college/university. They should be shown the facilities and informed about activities related to different clubs etc. This is when selected senior students involved in or leading these activities can give presentations, under faculty supervision.

Dr.G.Balamuruga Mohan karM.Tech, Ph.D. Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

ENGINEERING MATHEMATICS II

MULTIPLE INTEGRALS AND TRANSFORMS

(Common to all branches except CSBS)

Course Objectives

- To develop logical thinking and analytic skills in evaluating multiple integrals.
- To equip themselves familiar with Laplace, transform and solve the differential equations using Laplace transform techniques.
- To enable the students to expand functions into Fourier series using change of intervals.
- To gain good knowledge in application of Fourier transform.
- To inculcate the computational knowledge in Z-transforms.

Course Outcomes

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

CO1 - Understand the concept of double and triple integrals. (K2)

CO2 - Apply Laplace transform and inverse Laplace transform of simple functions. (K3)

CO3 - Convert a periodic function into series form. (K3)

CO4 - Compute Fourier transforms of various functions. (K3)

CO5 - Solve difference equations using Z – transforms. **(K3)**

UNIT I MULTIPLE INTEGRALS

Multiple Integrals, change of order of integration and change of variables in double integrals (Cartesian to polar). Applications: Areas by double integration and volumes by triple integration (Cartesian and polar).

UNIT II LAPLACE TRANSFORMS AND INVERSE LAPLACE TRANSFORMS (12 Hrs)

Definition, Transforms of elementary functions, properties. Transform of derivatives and integrals. Multiplication by t and division by t. Transform of unit step function, transform of periodic functions. Initial and final value theorems, Methods for determining inverse Laplace Transforms, Convolution theorem, Application to differential equations and integral equations. Evaluation of integrals by Laplace transforms.

UNIT III FOURIER SERIES

Dirichlet's conditions – General Fourier series – Expansion of periodic function into Fourier series – Fourier series for odd and even functions – Half-range Fourier cosine and sine series – Change of interval – Related problems.

UNIT IV FOURIER TRANSFORMS

Fourier Integral theorem Fourier transform and its inverse, properties. Fourier sine and cosine transforms their properties, Convolution and Parseval's identity.

UNIT V Z - TRANSFORMS

Difference equations, basic definition, z - transform - definition, Standard z - transforms, Damping rule, Shifting rule, Initial value and final value theorems and problems, Inverse z - transform. Applications of z - transforms to solve difference equations.

Text Books

- 1. Ravish R Singh and Mukul Bhatt, "Engineering Mathematics", Tata McGraw Hill, 1st Edition, New Delhi, 2016.
- 2. P. Sivaramakrishna Das and C. Vijayakumari, "Engineering Mathematics", Pearsons, New Delhi, 2017.
- 3. M.D.Petale, "A text book on Z- Transforms (Engineering Mathematics)", Bames and Noble, New Edition, 2020.

Reference Books

- 1. H.K. Dass, "Advanced Engineering Mathematics", S. Chand & Co. New Delhi, 2019.
- 2. N.P. Bali and Dr. Manish Goyal, "Engineering Mathematics", Lakshmi Publications Pvt. Ltd., New Delhi, 9th Edition, 2015.

(12 Hrs

(12 Hrs)

(12 Hrs)

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U20BST215

(12 Hrs)

- 3. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons, New Delhi, 10th Edition, 2019.
- 4. C. B. Gupta, Shree Ram Singh, M. Kumar, "Engineering Mathematics for semester I & II", Tata McGraw Hill, New Delhi, 2016.
- 5. B.V. Ramana, "Higher Engineering Mathematics", Tata McGraw Hill, New Delhi 2018.

Web References

- 1. https://nptel.ac.in/courses/111105121/
- 2. https://nptel.ac.in/courses/111105035/
- 3. https://nptel.ac.in/courses/111107119/
- 4. https://swayam.gov.in/nd1_noc20_ma17/preview
- 5. https://nptel.ac.in/courses/111/103/111103021/

COs/POs/PSOs Mapping

					Prog	ram O	utcom	es (PC	Ds)				Prog Outce	ram Spo omes (P	ecific 'SOs)
LUS	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	-	-	-	-	-	-	-	1	2	1	-
2	3	2	1	1	-	1	-	-	-	-	-	1	2	1	-
3	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
4	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-
5	3	2	1	1	-	1	-	-	-	-	-	1	1	-	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karM.Tech.Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20EST201

Course Objectives

- To understand the Fundamentals of Computers and introduction to C language.
- To study about the programs using Control structures.
- To understand the programs using looping and arrays.
- To understand the concepts of Functions and Pointers.
- To study about Structure, Union and File Management Operations in C.

Course Outcomes

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

CO1 - Comprehend the basic constructs of C programming. (K2)

CO2 - Illustrate the concepts of sequential, selection and repetition control structures in C program. (K2)

- CO3 Implement simple programs using looping structure and arrays. (K3)
- **CO4** Demonstrate programs using Functions and Pointers. **(K3)**

CO5 - Build programs using Structure, Union and understand the concept of File management Operations.(K3)

UNIT I INTRODUCTION TO C

C programming: Overview of C - Visual Studio code-Constants- Compiling a C Program -Variables and Data Types- Technical Difference between Keywords and Identifiers- - Types of C Qualifiers and format specifies -Operators and Expressions-Operators Precedence-Type conversion-Input-Output Statements.

UNIT II DECISION MAKING

Decision making and branching- Relational operators - Logical operators- if - if else-if else if -nested if. Switch-case.

UNIT III LOOPING AND ARRAYS

Looping: while - do while - for - break - continue - nested loop Arrays: One Dimensional Arrays-Two-Dimensional Arrays-Multi-Dimensional Array-Dynamic arrays-Character Arrays and String-Sorting - Searching.

UNIT IV FUNCTIONS, POINTERS

Functions: Introduction - Definition - Declaration - Categories of Functions - Nesting of Functions, Recursive functions - Passing Arrays to Functions - Strings - String library function. Pointers: Introduction - Declaring Pointer Variables - Initialization of Pointer Variables - Accessing the address of a variable - Accessing a variable thorough Pointer - Chain of Pointers - Pointer Expressions - Pointers and arrays - Pointers and functions – Call by Reference - Pointers and character strings - Array of Pointers - Pointers and Structures.

UNIT V STRUCTURES AND UNIONS, FILE MANAGEMENT

User defined data types: Introduction - Structure: definition - declaration - Arrays of Structures - Nested structures – Passing structures to functions — Union - Enumeration and Typedef. Introduction to File Handling in C, Input and Output operations on a file - Error Handling - Random access to files - command line arguments. Introduction to preprocessor - Macro substitution directives - File inclusion directives - conditional compilation directives - Miscellaneous directives.

Text Books

- 1. E.Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 8th Edition, 2019.
- 2. Herbert Schildt," C: The Complete Reference", McGraw Hill, Fourth Edition, 2014.
- 3. Yashvant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.

Reference Books

1. Ashok N Kamthane, "Computer Programming", Pearson education, Second Impression, 2012.

PROGRAMMING IN C

(Common to CSE, ECE, EEE, IT, ICE, MECH,

CIVIL, BME, MECHTRONICS, CCE)

Hrs С Т Ω 45

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(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

- 2. Vikas Verma, "A Workbook on C ", Cengage Learning, Second Edition, 2012.
- 3. Dr.P. Rizwan Ahmed, "Office Automation", Margham Publications, 2016.
- 4. P.Visu, R.Srinivasan and S.Koteeswaran, "Fundamentals of Computing and Programming", Fourth Edition, Sri Krishna Publications, 2012.
- 5. Pradip Dev, Manas Ghoush, "Programming in C", Second Edition, Oxford University Press, 2011.

Web References

- 1. https://www.programiz.com/c-programming
- 2. https://www.geeksforgeeks.org/c-language-set-1-introduction/
- 3. https://www.tutorialspoint.com/cprogramming
- 4. https://www.assignment2do.wordpress.com/.../solution-programming-in-ansi-c
- 5. https://nptel.ac.in/courses/106/104/106104128/

COs/POs/PSOs Mapping

COs					Progr	am O	utcom	nes (P	Os)				Prog Outo	gram Spe comes (P	cific SOs)
	P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	P011	PO12	PSO1	PSO2	PSO3
1	2	1	-	-	3	-	-	-	-	-	-	-	2	1	-
2	2	1	-	-	3	-	-	-	-	-	-	-	2	1	-
3	3	2	1	1	3	-	-	-	-	-	-	-	2	1	-
4	3	2	1	1	3	-	-	-	-	-	-	-	2	1	-
5	3	2	1	1	3	-	-	-	-	-	-	-	2	1	-

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaı, M.Tech., Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manalula Vinayagar Esgineering College, Medagadipet, Puducherry-605 107.



Course Objectives

- To understand the basics of force and moment, static equilibrium of particles in two and three dimensions. •
- To examine the equilibrium of rigid bodies and components of a moment. •
- To discuss the properties of surfaces and solids.
- To integrate the relationship between the motion of bodies
- To associate the various structural analysis and load on system of rigid bodies.

Course Outcomes

On successful completion of this course, the student will be able to

CO1 - Recognize the basics of equilibrium of particles in 2D and 3D. (K1)

CO2 - Review the requirements of equilibrium of rigid bodies in 2D and 3D. (K2)

CO3 - Compute the center of mass and moment of inertia of surfaces and solids. (K2)

CO4 - Predict displacement, velocity and acceleration of dynamic particles. (K3)

CO5 - Solve for friction force and rigid body dynamics. (K4)

UNIT I BASICS AND STATICS OF PARTICLES

Introduction - Units and Dimensions - Vectorial representation of forces and moments - Coplanar Forces - Laws of Mechanics - Lame's theorem, Parallelogram and triangular Law of forces -Resolution and Composition of forces -Equilibrium of a particle - Principle of transmissibility -Single equivalent force - Free body diagram

UNIT II EQUILIBRIUM OF RIGID BODIES

Types of supports and their reactions -requirements of stable equilibrium -Moments and Couples -Moment of a force about a point and about an axis -Vectorial representation of moments and couples - Scalar components of a moment -Varignon's theorem -Equilibrium of Rigid bodies in two dimensions -Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Equilibrium of Rigid bodies in three dimensions - Examples.

UNIT III PROPERTIES OF SURFACES AND SOLIDS

Determination of centroid of areas, volumes and mass - Pappus and Guldinus theorems - moment of inertia of plane and areas- Parallel axis theorem and perpendicular axis theorem, radius of gyration of area- product of inertia- mass moment of inertia.

UNIT IV DYNAMICS OF PARTICLES AND FRICTION

Displacements, Velocity and acceleration, their relationship - Relative motion - Curvilinear motion - Newton's law -Work Energy Equation of particles -Impulse and Momentum -Impact of elastic bodies.

Friction force - Laws of sliding friction - equilibrium analysis of simple systems with sliding friction -wedge friction- Rolling resistance

UNIT V STRUCTURAL ANALYSIS OF TRUSSES AND RIGID BODY DYNAMICS (12 Hrs)

Trusses: - Definition of a truss - Simple Trusses - Analysis of Trusses - Method of joints- Method of sections. -Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion of simple rigid bodies such as cylinder, disc/wheel and sphere.

Text Books

- 1. F.P.Beer, and Johnston Jr. E.R. "Vector Mechanics for Engineers", McGraw-Hill Education India Pvt Ltd., 11th Edition, 2016.
- 2. J.L. Meriam & L.G. Karidge, Engineering Volume I and Engineering Mechanics: Dynamics, 8th edition, Wiley student edition, 2016.
- 3. R.C, Hibbeller, "Engineering Mechanics", Prentice hall, 14th edition, 2016.

(12 Hrs)

(12 Hrs)

(12 Hrs)

(12 Hrs)

Reference Books

- 1. Arthur P. Boresi and Richard J. Schmidt, "Engineering Mechanics: Statics and Dynamics", Thomson Asia Private Limited, Singapore, 2010.
- 2. D.P.Sharma "Engineering Mechanics", Dorling Kindersley India Pvt. Ltd, New Delhi, 2010
- 3. S.Rajasekaran, Sankarasubramanian, G., Fundamentals of Engineering Mechanics, Vikas Publishing House Pvt., Ltd., 2012.
- 4. S.S.Bhavikatti and K.G. Rajashekarappa, Engineering Mechanics, New Age International(P) Ltd, New Delhi, 7th Edition, 2019.
- 5. Dr. I. SGujral "Engineering Mechanical" second edition, Lakshmi Publication (P).Ltd., 2011

Web References

- 1. http://nptel.iitm.ac.in/video.php?subjectId=112103108
- http://www.nptel.iitm.ac.in/courses/Webcourse-contents/IIT-KANPUR / Engineering mechanics / Table of Contents.html
- 3. https://nptel.ac.in/courses/112/106/112106286/
- 4. https://www.coursera.org/learn/engineering-mechanics-statics
- 5. https://nptel.ac.in/courses/122/104/122104014/

CO/PO Mapping

COs					Р	rogran	n Outco	omes					Prog	ram Spe outcome	ecific s
	PO1	PO2	PO3	PO4	PO12	PSO1	PSO2	PSO3							
1	3	2	2	3	-	-	-	-	-	-	-	1	2	2	3
2	3	2	2	3	-	-	-	-	-	-	-	1	2	2	3
3	3	2	2	3	-	-	-	-	-	-	-	1	2	2	3
4	3	2	2	3	-	-	-	-	-	-	-	1	2	2	3
5	3	2	2	3	-	-	-	-	-	-	-	1	2	2	3

Dr.G.Balamuruga Mohan Kaj.M.Tech., Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20EST249

INTRODUCTION TO ELECTRONICS

ENGINEERING

Course Objectives

- To give the idea about fundamental properties of semiconductors.
- To prepare students to perform the analysis of any Analog electronics circuit.
- To empower students to understand the design and working of FET amplifiers. ٠
- To Demonstrate and Apply Feedback and Oscillator circuits using FET.
- To perform the analysis and design of various digital electronic circuits.

Course Outcomes

After completion of the course, the students are able to

CO1 – Understand the concept of diode in rectifiers, filters circuits. (K2)

CO2 - Identify the BJT in CE, CB and CC circuits. (K2)

- CO3 Understand the characteristics if JFET and special diodes. (K2)
- CO4 Explain the principles of oscillation with various oscillator circuits. (K3)
- CO5 Discuss the various digital circuits and characteristics of ADC. (K2)

UNIT I SEMICONDUCTORS AND RECTIFIERS

Classification of solids based on energy band theory, intrinsic semiconductors, extrinsic semiconductors - P- type and N-type, P- N junction, VI Characteristics of PN junction diode, half and Full wave rectifiers, Zener effect, Zener diode, Zener diode Characteristics, Zener diode as a regulator.

UNIT II TRANSISTOR AND AMPLIFIERS

Bipolar junction transistors - CB, CE, CC configurations and characteristics, Biasing circuits - Fixed bias, Voltage divider bias, CE amplifier, Concept of feedback, Negative feedback, voltage series feedback amplifier, Current series feedback amplifier.

UNIT III FET AND POWER ELECTRONIC DEVICES

FET - Configuration and characteristics, FET amplifier, Characteristics and simple applications of SCR, Diac, Triac and UJT.

UNIT IV SIGNAL GENERATORS AND LINEAR ICS

Positive feedback, Sinusoidal oscillators - RC phase shift, Hartley, Colpitts, Wein bridge oscillators, Operational amplifier - Adder, Inverting and Non-inverting amplifiers, integrator and differentiator, IC 555 based Astable and Monostable Multivibrators.

UNIT V DIGITAL ELECTRONICS

Boolean algebra, Logic Gates, , Half and Full adders, Decoder, Encoder, Multiplexer, Demultiplexer, Flip flops, Digital to Analog converters - R-2R and weighted resistor types, Analog to Digital converters - Successive approximation and Flash types.

Text Books

- Malvino, 'Electronic Principles', McGraw Book Co., 1993. 1
- Grob. B and Schultz. M.E. 'Basic Electronics', Tata Mcgraw Hill, 2003. 2
- 3 Thomas L. Floyd, 'Electronics Devices', Pearson Education, 2002.
- Sedha R.S., "Applied Electronics", S. Chand & Co., 2006. 4

Reference Books

- 1. Mehta V K, "Principles of Electronics", S.Chand & Company Ltd, 1994.
- 2. Millman, Halkias Jacob, Jit Christos and Satyabrata, 'Electronic devices and Circuits', Tata McGraw Hill, 2nd Edition.
- 3. David. A. Bell, "Electric Circuits", Oxford University Press, Seventh impression 2015
- M.S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, Sixth impression 2015

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5. Leonard.S.Bobrow, "Foundations of Electrical Engineering", Asian Edition 2013

Web References

- 1. https://www.electronics-tutorials.ws/
- 2. https://www.makerspaces.com/basic-electronics/
- 3. https://www.tutorialspoint.com/basic_electronics/basic_electronics_pdf_version.htm.
- 4. https://nptel.ac.in/courses/108/107/108107128/
- 5. https://nptel.ac.in/courses/117/103/117103063/

COs/POs/PSOs Mapping

				Program Specific											
COs					Flogi		licom	5 (FU	5)				Outcomes (PSOs)		
	P01	PO2	PSO1	PSO2	PSO3										
1	3	1	2	2	-	-	-	-	-	-	-	-	1	-	-
2	3	1	2	2	-	-	-	-	-	-	-	-	2	-	-
3	3	1	2	2	-	-	-	-	-	-	-	-	2	-	-
4	3	1	2	2	-	-	-	-	-	-	-	-	2	-	-
5	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Т С Hrs L MATERIALS SCIENCE AND METALLURGY U20MCT202 3 0 0 3 45

Course Objectives

- To discuss the fundamental properties and availability of natural engineering materials.
- To discuss the applications of electronic materials and superconducting materials. •
- To deal with the magnetic and dielectric materials and their applications.
- To learn about physical metallurgy, corresponding to important engineering materials.
- To discuss the properties of powder metallurgy techniques and their applications.

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Identify the materials, based on their properties, for various applications. (K2)
- CO2 Compare various properties of electronic and photonic materials. (K4)
- CO3 Select proper electronic and photonic materials for various applications, based on their properties. (K3)
- CO4 Understand the physical metallurgy of materials and the tools used to analyze the metallic. (K2)
- CO5 Apply powder metallurgy principles for various applications. (K3)

UNIT I NATURE OF MATERIALS

Selection process of engineering materials (General aspects) - Chemical and physical properties of materials chemical structure: Micro and macro structure - corrosion resistance - chemical reactivity. Mechanical properties stress, strain, strength, hardness, malleability, ductility, elasticity, plasticity, toughness, thermal stability. (General aspects) Types of deformation: Plastic, viscous. Plastic deformation of single crystal, poly crystalline metals: slip, twinning, dislocations - visco elasticity - creep in metals, amorphous materials.

UNIT II ELECTRONIC AND PHOTONIC MATERIALS

Electronic Materials: Fermi energy and Fermi - Dirac distribution function - Variation of Fermi level with temperature in intrinsic and extrinsic semiconductors - Hall effect - Dilute Magnetic Semiconductors (DMS) and their applications Superconducting Materials: Normal and High temperature superconductivity Applications. Photonic Materials: LED - LCD - Photo conducting materials - Photo detectors - Photonic crystals and applications - Elementary ideas of Nonlinear optical materials and their applications.

UNIT III MAGNETIC AND DIELECTRIC MATERIALS

Magnetic Materials: Classification of magnetic materials based on spin - Hard and soft magnetic materials - Ferrites, garnets and magnetoplumbites - Magnetic bubbles and their applications - Magnetic thin films - Spintronics and devices (Giant magneto resistance, Tunnel magneto resistance and Colossal magneto resistance).

Dielectric Materials: Polarization mechanisms in dielectrics - Frequency and temperature dependence of polarization mechanism - Dielectric loss - Dielectric waveguide and dielectric resonator antenna - Piezoelectric, pyroelectric and ferroelectric materials and their applications.

UNIT IV PHYSICAL METALLURGY AND MATERIALS ENGINEERING

Structure of metals, Phase equilibria, thermodynamics of phase evolution, Construction of equilibrium diagrams, Study of Fe-Fe3C, Cu-Zn, Cu-Sn, Al-Cu and Al-Si ternary diagrams, Diffusion laws, Structure and properties of ceramics, Construction and Principles of Optical and transmission Electron Microscope.

UNIT V POWDER METALLURGY

Introduction and History of PM, Different Powder Production Techniques, Importance of Powder Characterization, Particles Size, Distribution, Surface Analysis, Powder Compaction and Process variables, Theory of sintering etc.

Electro Metallurgy and Corrosion: Principles of Corrosion, Forms of Corrosion, Modern Theory-Principles, Corrosion Prevention, and Corrosion rate measurement, High Temperature Corrosion, High temperature materialsmechanical properties, oxidation resistance.

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

- 1. Thiruvadigal, J. D, Ponnusamy, S, Sudha. D, Krishna mohan M, 'Materials Science', SSS Publication, Chennai, 2015.
- Lakshminarayana A K, Sridhar Idapalapati, M Vasudevan, 'Advances in Materials and Metallurgy', Springer 2018.
- 3. Larry Horath, 'Fundamentals of Materials Science for Technologists: Properties, Testing', Waveland Press 2017

Reference Books

- 1. Darvell B W, 'Materials Science for Dentistry', Woodhead Publishing, 2018.
- 2. June Gunn Lee, 'Computational Materials Science', CRC Press, 2016.
- 3. Guang Yang, Lin Xiao, Lallepak Lamboni, 'Bioinspired Materials Science and Engineering', John Wiley & Sons, 2018.
- 4. Yuriy Poplavko, 'Electronic Materials: Principles and Applied Science', Elsevier, 2018.
- 5. Mihailrimia-Vladu, Eric D. Glowacki, Niyazi S. Sariciftci, 'Green Materials for Electronics', John Wiley & Sons, 2017.
- 6. Raghavan V, 'Materials Science and Engineering', PHI Learning Pvt. Ltd, 2015.

Web References

- 1. https://www.digimat.in/nptel/courses/video/113107078/L01.html
- 2. https://nptel.ac.in/courses/122/102/122102008/
- 3. https://swayam.gov.in/nd1_noc20_mm09/preview
- 4. https://nptel.ac.in/courses/113/102/113102080/
- 5. https://www.linkedin.com/company/material-science

Cos Mapping with POs and PSOs

COs					Prog	ram O	utcon	nes (P	Os)				Prog Outo	gram Spe comes (P	cific SOs)
	PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1													PSO2	PSO3
1	3	3	-	2	2	-	-	-	-	-	-	3	1	2	-
2	3	2	-	2	2	-	-	-	-	-	-	3	1	2	-
3	3	2	-	2	2	-	-	-	-	-	-	3	1	2	-
4	3	2	-	2	2	-	-	-	-	-	-	3	1	2	-
5	3	2	1	2	2	-	-	-	-	-	-	3	1	2	2

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj.M.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Course Objectives:

- To impart knowledge on casting technology and foundry shop
- To familiarize with various metal joining processes
- To discuss the mechanical deformation processes
- To impart knowledge on various non-metallic processes
- To learn about the various methods for processing plastic materials.

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Identify the suitable casting process as required.(K3)
- CO2 Select the required metal joining process.(K3)
- CO3 Understand the differences among various metal deformation processes. (K3)

MANUFACTURING TECHNOLOGY

- CO4 Choose the suitable metal removal process as per the requirement.(K3)
- CO5 Identify the best method for processing plastics.(K3)

UNIT I CASTING PROCESSES

Introduction to Moulding and Casting, Moulding sand: Types, properties, preparation of dry and green sand molding. Pattern making: Pattern materials, types and allowances. Core making: Types of core, core materials, making of cores. Casting methods: Die casting, Centrifugal Castings, Investment Casting and Shell mold Casting. Defects in casting.

Unit II JOINING PROCESSES

Fusion welding processes - Types of Gas Welding, Oxy-Acetylene Welding Equipment - Flame characteristics -Electric-Arc Welding, Electrodes, manual metal arc welding, Carbon Arc Welding, Inert-Gas Shielded Arc Welding, Tungsten Inert-Gas Welding (TIG), Gas Metal-Arc Welding (GMAW), Submerged Arc-Welding (SAW), Resistance Welding and its types and applications-Welding Defects. Soldering and Brazing- welding of nonmetals.

Unit III METAL FORMING PROCESSES

Cold and Hot working: Rolling - Forging - Extrusion - Drawing - Sheet metal forming processes - High Energy Rate Forming Processes: Explosive Forming – Electro Hydraulic Forming – Electro Magnetic Forming.

Unit IV METAL MECHINING PROCESSES

Mechanics of machinery-Chip formation-types of chips, orthogonal & oblique cutting-Tool wear-Tool life -Nomenclature of single point cutting tool & Twist drill bit – Effect of cutting fluids.

Unit V PROCESSING OF PLASTICS AND COMPOSITE MATERIALS

Types of Plastics – Types of Molding: Injection molding – Blow molding – Compression molding – Transfer molding – Thermoforming – Reinforced plastics – Metal Matrix Composites – Ceramic Matrix Composites.

Text Books:

- 1. Rao P N, 'Manufacturing Technology', Volume I & II, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition, 2018.
- 2. Sharma P C, 'A Text Book of Manufacturing I', S Chand & Company Pvt Ltd, 2008.
- 3. Rajput R K, 'A Text Book of Manufacturing Technology', Laxmi Publications, New Delhi, 2nd edition, 2017.

U20MCT203

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

(9 Hrs)

Hrs С т 45

0 3

Reference Books:

- 1. Kaushish J P, 'Manufacturing Processes', Second Edition, PHI Learning Pvt. Ltd, 2013.
- 2. Kalpakjian S, Schmid R, 'Manufacturing Engineering and Technology', Seventh Edition, Pearson Education India Edition, 2013.
- 3. Adithan M, Gupta A B, 'Manufacturing Technology', New Age, Fifth Edition, 2012.
- 4. B S Nagendra Parashar, R K Mittal, 'Elements of Manufacturing Processes', Prentice Hall India Pvt. Ltd, 2003.
- 5. S K Hajra Choudry, 'Workshop Technology', Vol I & II, Media Promoters and Publishers Pvt. Ltd, 2009.

Web References:

- 1. https://nptel.ac.in/courses/112/107/112107219
- 2. https://nptel.ac.in/courses/112/105/112105127/
- 3. https://www.coursera.org/courses?query=manufacturing
- 4. https://www.udemy.com/topic/manufacturing/
- 5. https://www.linkedin.com/company/manufacturing-technology-inc

C	COs					Progr	ram O	utcon	nes (P	Os)				Program Specific Outcomes (PSOs)				
		P01	PO2	PO3	PO4	PO5	PO6	P07	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3		
	1	3	3	3	2	3	-	1	-	-	-	-	3	3	3	3		
	2	3	3	3	2	3	-	1	-	-	-	-	3	3	3	3		
	3	3	3	3	2	3	-	1	-	-	-	-	3	3	3	3		
	4	3	3	3	2	3	-	1	-	-	-	-	3	3	3	3		
	5	3	3	3	2	3	-	1	-	-	-	-	3	3	3	3		

Cos Mapping with POs and PSOs

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kar.M.Tech.Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20ESP202

PROGRAMMING IN C LABORATORY

L	Т	Ρ	С	Hrs
0	0	2	1	30

Course Objectives

- To practice the fundamental programming methodologies in the C programming language.
- To apply logical skills for problem solving using control structures and arrays.
- To design, implement, test and debug programs that use different data types, variables, strings, arrays, pointers and structures.
- To design modular programming and provide recursive solution to problems.
- To understand the miscellaneous aspects of C and comprehension of file operations.

Course Outcomes

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

- CO1 Apply and practice logical formulations to solve simple problems leading to specific applications. (K3)
- CO2 Develop C programs for simple applications making use of basic constructs, arrays and strings. (K3)
- CO3 Develop C programs involving functions, recursion, pointers, and structures. (K3)
- CO4 Design applications using sequential and random access file processing. (K6)
- CO5 Build solutions for online coding challenges. (K3)

LIST OF EXERCISES

- 1. Simple programming exercises to familiarize the basic C language constructs.
- 2. Develop programs using identifiers and operators.
- 3. Develop programs using decision-making and looping constructs.
- 4. Develop programs using functions as mathematical functions.
- 5. Develop programs with user defined functions includes parameter passing.
- 6. Develop program for one dimensional and two dimensional arrays.
- 7. Develop program for sorting and searching elements.
- 8. Develop program to illustrate pointers.
- 9. Develop program with arrays and pointers.
- 10. Develop program for dynamic memory allocation.
- 11. Develop programs for file operations.

Text Books

- 1. Yashwant Kanetkar, "Let us C", BPB Publications, 16th Edition, 2017.
- 2. Archana Kumar, "Computer Basics with Office Automation", Dreamtech Press Wiley Publisher, 2019.
- 3. Reema Thareja, "Fundamentals of Computing & C Programming" Oxford University Press, 2012

Reference Books

- 1. Zed A Shaw," Learn C the Hard Way: Practical Exercises on the Computational Subjects You Keep Avoiding (Like C)", Addison Wesley, 2016.
- 2. Anita Goel and Ajay Mittal, "Computer Fundamentals and programming in C", First edition, Pearson Education ,2011.
- 3. Yashvanth Kanethkar, "Let us C", 13th Edition, BPB Publications, 2008.
- 4. Maureen Sprankle, Jim Hubbard," Problem Solving and Programming Concepts," 9th Edition, Pearson, 2011.
- 5. B.W. Kernighan and D.M. Ritchie, "The C Programming language", 2nd Edition, Pearson Education, 2006.

Web Resources

- 1. https://alison.com/course/introduction-to-c-programming
- 2. https://www.geeksforgeeks.org/c-programming-language/
- 3. http://cad-lab.github.io/cadlab_data/files/1993_prog_in_c.pdf
- 4. https://www.tenouk.com/clabworksheet/clabworksheet.html
- 5. https://fresh2refresh.com/c-programming/

					Program Specific Outcomes (PSOs)										
	P01	PO2	PO12	PSO1	PSO2	PSO3									
CO1	1	1	1	3	2										
CO2	2	3	3	3	3										
CO3	3	2	2	2	2	1	2	-	3	3	2	-	3	3	3
CO4	3 3 3 3 2 1 2 3 - 3 - 2													3	3
CO5	3 3 3 3 2 1 2 3 3 3 3 3													3	3

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan karM.Tech.Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

U20ESP250	BASIC ELECTRONICS ENGINEERING LAB	L 0	Т 0	Р 3	C 1	Hrs 30
Course Objectiv	/es					
1. To Recall the b	pasic Semiconductor Theory related to Diodes					
2. To enable the	student to understand BJT operations.					
3. To enable the	student to understand thyristor operations.					
4. To Design and	I analyse the linear and non-linear applications of opera	ational	ampl	ifiers	;	
5. Implementation	n of combinational circuits for operations in logical arith	metic	opera	tions	S.	
Course Outcom	е					
After completion	of the course, the students are able to					
CO1 - Examine the	e characteristics of Diodes. (K4)					
CO2 - Differentiate	BJT operations in various configuration. (K4)					
CO3 - Deduce the	electrical characteristics SCR, UJT, DIAC and TRIAC.	(K4)				
CO4 - Devise the a	applications of operational amplifiers. (K4)	. ,				
CO5 - Test and im	plement various combinational logic circuits with its trut	h table	e. (K4)		
LIST OF EXPER	IMENTS					

- 1. V-I characteristics of semiconductor diodes.
- 2. Characteristics of BJT in CB configuration.
- 3. Characteristics of BJT in CE configuration.
- 4. Design and testing of biasing circuits for BJT.
- 5. Characteristics of UJT and SCR.
- 6. Characteristics of DIAC and TRIAC.
- 7. Design and realize Inverting and Non-inverting amplifier using IC 741 Op-amp.
- 8. Design and test an op-amp Integrator and Differentiator.
- 9. Design and verify their truth tables of half adder and Full adder using basic gates.
- 10. Design and testing of 4 to 1 multiplexer and de-multiplexer using Logic gates.

References

- 1. M.S. Sukhija, T.K. Nagsarkar, "Basic Electrical and Electronics Engineering", Oxford University Press, Sixth impression 2015.
- 2. Malvino, 'Electronic Principles', McGraw Book Co., 1993.
- 3. Grob. B and Schultz. M.E. 'Basic Electronics', Tata Mcgraw Hill, 2003.
- 4. Thomas L. Floyd, 'Electronics Devices', Pearson Education, 2002.

Web References

- 1. https://www.electronics-tutorials.ws/
- 2. https://www.makerspaces.com/basic-electronics/
- 3. https://www.tutorialspoint.com/basic electronics/basic electronics pdf version.htm
- 4. https://www.electrical4u.com/diode-working-principle-and-types-of-diode/
- 5. https://www.allaboutcircuits.com/video-tutorials/transistors/

COs				Program Specific Outcomes (PSOs)											
	P01	PO2	PO12	PSO1	PSO2	PSO3									
1	3	1	2	-	-	-	-	-	3	-	1	-	2	-	2
2	3	1	2	-	-	-	-	-	3	-	1	-	2	-	2
3	3	1	2	-	-	-	-	-	3	-	1	-	2	-	2
4	3	3	1	-	-	-	-	-	3	-	1	-	2	-	2
5	3	3	1	-	-	-	-	-	3	-	1	-	2	-	2

COs/POs/PSOs Mapping



U20MCP202 MANUFACTURING TECHNOLOGY LAB

Course Objectives

- To study and practice the various operations that can be performed on various types of Lathes.
- To study and practice the various operations that can be performed on different types of Grinding machines
- To study about foundry tools and preparation of sand mould, required for casting operations.
- To study and practice various metal joining processes.
- To discuss and practice sheet metal operations required for various components.

Course Outcomes

On successful completion of this course, the student will be able to

- CO1 Machine parts by performing various types of operations using a lathe. (K3)
- CO2 Perform grinding operations using various types of grinding machines. (K3)
- CO3 Design and prepare moulding with different types of patterns. (K3)
- CO4 Make proper welded joints as per the design requirements. (K3)
- CO5 Perform sheet metal operations as per the shape and size of the components. (K3)

LIST OF EXPERIMENTS

MACHINES

- 1. Plain Turning and Facing
- 2. Taper Turning
- 3. Drilling and Boring
- 4. Square Head Shaping
- 5. Hexagonal Head Shaping
- 6. Plain Surface grinding
- 7. Cylindrical grinding

FOUNDRY

- 8. Preparation of a sand mold using split pattern
- 9. Preparation of a sand mold using solid pattern

WELDING AND SHEET METAL

- 10. Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding
- 11. Gas welding practice Demonstration
- 12. Forming& Bending by sheet metal
- 13. Model making Trays and funnels and different type of joints in sheet metal

Reference Books

- 1. P N Rao, 'Manufacturing Technology Metal Cutting and Machine Tools', Tata McGraw Hill Publishing Company Ltd, NewDelhi, 2008
- 2. Raghavan V, 'Physical Metallurgy Principles and Practice', Prentice Hall India Pvt. Ltd., NewDelhi, 2006.
- 3. Kalpakjain S, Schimd S, 'Manufacturing Engineering and Technology', Pearson Education,7th edition, New Delhi, 2018
- 4. B S Nagendra Parashar, R K Mittal, 'Elements of Manufacturing Processes', Prentice Hall India Pvt. Ltd., 2003.
- 5. S K Hajra Choudry, 'Workshop Technology', Volume I & II, Media Promoters and Publishers Pvt. Ltd, 2009.

Web References

- 1. http://gssl.iitk.ac.in/pssl/
- 2. https://www.coursera.org/courses?query=manufacturing
- 3. https://www.linkedin.com/company/laboratory-for-manufacturing-systems

- 4. https://www.udemy.com/course/non-traditional-manufacturing/
- 5. https://www.coursera.org/lecture/digital-manufacturing-design/introduction

Cos	Mapping	with	POs	and	PSOs
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COs					Progr	am O	utcom	nes (P	Os)				Program Specific Outcomes (PSOs)				
	PO1	PO2	PO3	PO4	PO12	PSO1	PSO2	PSO3									
1	3	3	3	-	3	-	-	-	3	-	-	3	2	1	1		
2	3	3 3 3 - 3 3 3											2	1	1		
3	3	3	3	-	3	-	-	-	3	-	-	3	2	1	1		
4	3	3 3 3 - 3 3 3												1	1		
5	3	3	3	-	3	-	-	-	3	-	-	3	2	1	1		

Correlation Level: 1-Low, 2-Medium, 3- High

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Menakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U20MCC2XX

CERTIFICATION COURSE - II

L T P C Hrs 0 0 4 - 50

Students shall choose an International certification course offered by the reputed organizations like Google, Microsoft, IBM, Texas Instruments, Bentley, Autodesk, Eplan and CISCO, etc. The duration of the course is 40-50 hours specified in the curriculum, which will be offered through Centre of Excellence.

Pass /Fail will be determined on the basis of participation, attendance, performance and completion of the course. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree.

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SKILL DEVELOPMENT COURSE II

(Choose anyone of the below three courses)

LTPC Hrs 0 0 2 30

3. EXCEL FOR STATISTICAL APPROACH

Course Content:

U20MCS202

MODULE I SPREADSHEET ADMINISTRATION

Basic Navigation and Editing - Customizing Excel - Housekeeping - Connecting Workbooks - Sharing and Protecting - Excel Crashes

MODULE II ORIENTATION AND EFFICIENCY

Editing - Viewing - Outline - Cell References

MODULE III DATA HANDLING

Data Validation - Sorting and Filtering - Date and Time Functions - Text Functions - Lookup and Reference Functions - Logical and Informational Functions - Named Ranges - Macros

MODULE IV DATA ANALYSIS

Mathematical Functions - Summarising Data - Pivot Tables - Formula Auditing - What-If Analysis -Modelling Principles - Modelling Techniques

MODULE V PRESENTATION

Cell Formatting - Number Formatting - Conditional Formatting - Graphs and Charts - Review - Page and Print Setup

4. TRAINING ON ARDUINO

Course Content:

MODULE I INTRODUCTION OF ARDUINO AND BASIC PROGRAMMING

Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board. Basic Concepts: Arduino data types, Variables and constants, Operators, Control Statements, Arrays, Functions.

ARDUINO I/O FUNCTIONS AND ARDUINO TIME MODULE II

Pins Configured as INPUT, Pull-up Resistors, Pins Configured as OUTPUT, pinMode() Function, digitalWrite() Function, analogRead() function, Arduino Interrupts. Arduino Time: Incorporating Arduino time, delay() function, delayMicroseconds() function, millis() function, micros() function.

MODULE III ARDUINO DISPLAYS AND ARDUINO SENSORS

Working with Serial Monitor, Line graph via serial monitor, Interfacing a 8 bit LCD to Arduino, Fixed one line static message display, Running message display, Using the LCD Library of Arduino. Arduino Sensors: Arduino - Humidity Sensor, Temperature Sensor, Water Detector, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Magnetic relay switches).

ARDUINO SECONDARY INTEGRATIONS AND INPUT TO THE CONTROLLER MODULE IV

Types of Relay, Controlling Electrical appliances with electromagnetic relays, working of a matrix keypad, Using the keypad library to interface with Arduino, Interfacing Servo motors to Arduino, Interfacing a RF Module. Input to the Controller: Using serial input, Controlling LEDs with keys, Keys as toggle switch, Interfacing a piezo Buzzer, Using a buzzer as an alarm unit

ARDUINO COMMUNICATIONS AND ARDUINO PROJECTS MODULE V

Parallel Communication, Serial Communication Modules, Types of Serial Communications, Arduino UART, GSM/GPRS Arduino Interfacing.

Arduino Projects (It involves designing, developing, coding and implement Arduino project): Intelligent home locking system, Intelligent water level management system, Home automation using RFID, Real time clock-based home automation, Intelligent Automatic Irrigation System.

3. COMPUTER VISION

Course Content:

MODULE I INTRODUCTION TO COMPUTER VISION AND IMAGE FORMATION

Background, requirements and issues, human vision. Image formation: geometry and photometry (brightness and color), quantization, camera calibration.

MODULE II SEGMENTATION, EXTRACTION, VIEW GEOMETRY, OBJECTRECOGNITION

Various methods of image segmentation, edge detection, object proposals, SIFT features. Multi-view Geometry: Shape from stereo and motion, feature matching, surface fitting, Active ranging. Object Recognition: Traditional Methods – HoG / SIFT features, Bayes classifiers, SVM classifiers

MODULE III NEURAL NETWORKS AND DEEP LEARNING

Introduction to Neural Networks: Artificial neural networks, loss functions, back propagation and SGD, Batch Normalization. Object Recognition: Deep Learning Methods, Image classification, object detection and semantic segmentation, adversarial attacks. Various neural network architectures, visualization techniques.

MODULE IV MOTION ANALYSIS AND ACTIVITY RECOGNITION

Motion analysis and Activity Recognition: Motion detection and tracking, Inference of human activity from image sequences

MODULE V CASE STUDIES AND EXAMPLES

Examples: Face recognition, Image grounding, Visual question answering

Dr.G.Balamuruga Mohan kaµM.Tech.,Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manakula Vinayagar Engineering College, Medagadipet, Puducherry-605 107.

U20MCM202

ENVIRONMENTAL SCIENCE

L T P C Hrs 2 0 0 - 30

We as human being are not an entity separate from the environment around us rather we are a constituent seamlessly integrated and co-exist with the environment around us. We are not an entity so separate from the environment that we can think of mastering and controlling it rather we must understand that each and every action of ours reflects on the environment and vice versa. Ancient wisdom drawn from Vedas about environment and its sustenance reflects these ethos. There is a direct application of this wisdom even in modern times. Idea of an activity based course on environment protection is to sensitize the students on the above issues through following two type of activities.

(a) Awareness Activities:

- i. Small group meetings about water management, promotion of recycle use, generation of less waste, avoiding electricity waste
- ii. Slogan making event
- iii. Poster making event
- iv. Cycle rally
- v. Lectures from experts

(b) Actual Activities:

- i. Plantation
- ii. Gifting a tree to see its full growth
- iii. Cleanliness drive
- iv. Drive for segregation of waste
- v. To live some big environmentalist for a week or so to understand his work
- vi. To work in kitchen garden for mess
- vii. To know about the different varieties of plants
- viii. Shutting down the fans and ACs of the campus for an hour or so

Dr.G.Balamuruga Mohan kaj M.Tech, Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sri Manahula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.

Course Objectives

U20EST467

- To gain and explore the knowledge of java programming
- To know the principles of inheritances, packages, interfaces
- To get familiarized to generic programming, multithreading concepts.
- To gain and explore the advanced concepts in Java.

Course Outcomes

After completion of the course, students will be able to

CO1 - Write a maintainable Java Program for a given algorithm and implement the same. **(K3)**

- CO2 Demonstrate the use of inheritance, interface and package in relevant applications.(K2)
- CO3 Create java applications using exception handling, thread and generic programming.(K6)
- CO4 Build java distributed applications using Collections and IO streams.(K3)
- CO5 Develop simple database programs.(K3)

UNIT I INTRODUCTION TO JAVA PROGRAMMING

The History and Evolution of Java - Byte code - Java buzzwords - Data types - Variables - Arrays operators - Control statements - Type conversion and casting. Concepts of classes and objects: Basic Concepts of OOPs - Constructors - Static keyword - Final with data - Access control - This key word - Garbage collection - Nested classes and inner classes - String class.

UNIT II INHERITANCE, PACKAGES AND INTERFACES

Inheritance: Basic concepts - Forms of inheritance - Super key word - Method overriding - Abstract classes- Dynamic method dispatch - The Object class. Packages: Defining, Creating and Accessing - Importing packages. Interfaces: Defining - Implementing - Applying - Variables and extending interfaces

UNIT III EXCEPTION HANDLING, MULTITHREADING

Concepts of Exception handling - Types of exceptions - Creating own exception - Concepts of Multithreading - Creating multiple threads - Synchronization - Inter thread communication -Enumeration - Autoboxing - Generics.

UNIT IV COLLECTIONS, I/O STREAMS

Collections: List -Vector - Stack - Queue - Dequeue -Set - Sorted Set. Input / Output Basics -Streams - Byte streams and Character streams - Reading and Writing Console - Reading and Writing Files.

UNIT V EVENT DRIVEN PROGRAMMING AND JDBC

Events - Delegation event model - Event handling - Adapter classes. AWT: Concepts of components - Font class - Color class and Graphics - Introduction to Swing - Layout management - Swing Components - Java Database Connectivity - Programming Example.

Text Books

- 1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, 11th Edition, 2018.
- 2. Sagayaraj, Denis, Karthik, Gajalakshmi, "JAVA Programming for core and advanced learners", Universities Press Private Limited, 2018
- 3. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh E dit ion, 2006. .

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Reference Books

- Cay S. Horstmann, Gary cornell, Core Java Volume –I Fundamentals, 9thEdition, Prentice Hall, 2013.
- 2. H.M.Dietel and P.J.Dietel, "Java How to Program", Pearson Education/PHI, 11thEdition, , 2017.
- 3. Cay.S.Horstmann and Gary Cornell, "Core Java, Vol 2, Advanced Features", Pearson Education, 8th Edition, 2008.
- 4. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:
- 5. Programming in Java, S. Malhotra and S. Choudary, Oxford Univ. Press.

Web Resources

- 1. http://www.ibm.com/developerworks/java/
- 2. http://docs.oracle.com/javase/tutorial/rmi/.
- 3. IBM's tutorials on Swings, AWT controls and JDBC.
- 4. https://www.edureka.co/blog
- 5. https://www.geeksforgeeks.org COs/POs/PSOs Mapping

COs	s Program Outcomes (POs)													Program Specific Outcomes (PSOs)					
	PO1	PO2	PO3	PO12	PSO1	PSO2	PSO3												
CO1	3	2	3	2	2	1	1	-	2	2	-	-	3	3	3				
CO2	2	2	2	3	2	1	1	-	3	-	-	-	2	2	2				
CO3	3	2	3	2	2	2	1	-	2	-	-	-	3	3	3				
CO4	2	2	2	2	2	1	1	-	2	-	-	-	2	2	3				
CO5	3	2	1	2	2	2	1	-	3	2	-	-	2	3	2				

Dr.G.Balamuruga Mohan kay M.Tech, Ph.D., Professor & Head, Dept. of Mechatronics Engineering Sri Manatula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.
U20ESP468	PROGRAMMING IN JAVA LAB	L O	Т 0	P 2	C 1	Hrs 30
Course Objectives		•	·	-	•	

- To acquire programming skill in core java.
- To learn how to design java program and applications.
- To acquire object oriented skills in java.
- To develop the skill of designing applications.

Course Outcomes

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

- CO1 Apply and practice logical formulations to solve simple problems leading to specific applications. (K3)
- CO2 Demonstrate the use of inheritance, interface and package in relevant applications. (K2)
- CO3 Create java applications using exception handling, thread and generic programming. (K6)
- CO4 Build java distributed applications using Collections and IO streams. (K3)
- CO5 Develop simple database programs. (K3)

List of Exercises

- 1. Develop simple programs using java syntax and semantics.
- 2. Develop a java program that implements class and object.
- 3. Write a java program to demonstrate inheritance.
- 4. Develop a simple real life application program to illustrate the use of Multi Threads.
- 5. Implement simple applications using Collections.
- 6. Develop a simple application and use JDBC to connect to a back-end database.
- 7. Create a student application with Add, Edit, Delete, Show functions using JDBC.
- 8. Create a Bill Application to store sales details using JDBC.
- 9. Create java applications using Exception Handling for error handling.
- 10. Develop a java program that implements the Packages.

Text Books

- 1. E.Balagurusamy. "Programming with java", TMH Publ, 2nd Edition, 2005.
- 2. JAVA How to programming by DIETEL&DIETEL.
- 3. Herbert Schil dt, "The Complete Reference JAVA 2", TMH, Seventh E dit ion, 2006

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- 1. Herbert Schildt, "Java: The Complete Reference", TMH Publishing Company Ltd, New Delhi, ISBN: 9781260440249, 11th Edition, 2018.
- 2. Cay S. Horstmann, Gary cornell, "Core Java Volume –I FundamentalsII", Prentice Hall, 9th Edition, 2013.
- 3. H.M.Dietel and P.J.Dietel,"Java How to Program", Pearson Education/PHI, Sixth Edition, 2010.
- 4. Cay.S.Horstmann and Gary Cornell, "Core Java 2, Vol 2, Advanced Features", Pearson Education, Seventh Edition, 2010.
- 5. Java for Programmers, P.J. Dietel and H.M Dietel, Pearson Education (OR) JAVA:

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- 3. IBM's tutorials on Swings, AWT controls and JDBC.
- 4. https://www.edureka.co/blog
- 5. ttps://www.geeksforgeeks.org.

COs/POs/PSOs Mapping

COs	Program Outcomes (POs)											Program Specific Outcomes (PSOs)			
	P01	PO2	PO3	PO4	PO5	PO6	P07	P08	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	3	2	2	1	1	2	2	2	2	2	3	3	3
CO2	2	2	2	3	2	1	3	-	-	3	-	-	2	2	2
CO3	2	2	3	-	3	2	3	2	2	-	2	2	3	3	3
CO4	2	2	2	3	2	1	3	2	-	2	-	-	2	2	3
CO5	3	2	1	2	3	2	3	-	3	3	3	3	2	3	2

Correlation Level: 1-Low, 2-Medium, 3- High

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NCC / NSS

NCC/NSS training is compulsory for all the Undergraduate students

- 1. The above activities will include Practical/field activities/Extension lectures.
- 2. The above activities shall be carried out outside class hours.
- 3. In the above activities, the student participation shall be for a minimum period of 30 hours.
- 4. The above activities will be monitored by the respective faculty in-charge.
- 5. Pass /Fail will be determined on the basis of participation, attendance, performance and behavior. If a candidate Fails, he/she has to repeat the course in the subsequent years. Pass in this course is mandatory for the award of degree

Dr.G.Balamuruga Mohan karm.Tech.Ph.D., Professor, & Head, Dept. of Mechatronics Engineering Sti Manakula Vinayagar Engineering College, Madagadipet, Puducherry-605 107.