

Sri Krishna College of Engineering and Technology

An Autonomous Institution, Affiliated to Anna University Coimbatore – 641 008



REGULATION 2022 CURRICULUM AND SYLLABI B.E. MECHANICAL ENGINEERING (Students Admitted from the Academic Year 2024 -2025 Onwards)

DEPARTMENT OF MECHANICAL ENGINEERING

SRI KRISHNA COLLEGE OF ENGINEERING AND TECHNOLOGY

An Autonomous Institution Affiliated to Anna University Kuniamuthur, Coimbatore - 641 008

VISION AND MISSION OF THE INSTITUTION

Vision

To Produce Globally Competitive Engineers with High Ethical Values and Social Responsibilities.

Mission

- To impart the highest quality state-of-the-art technical education by providing impetus to innovation, research, and development and empowering students with entrepreneurship skills.
- To instill ethical values, imbibe a sense of social responsibility, and strive for societal well-being.
- To identify the needs of society and offer sustainable solutions through outreach programs.

VISION AND MISSION OF THE DEPARTMENT

Vision

The department aspires to produce experts in Mechanical Engineering with moral values and it envisions to set up centers of excellence in innovative design and testing, composite materials, automation, automotive technology and green fuels.

Mission

- To produce world class mechanical engineering graduates by promoting core technical competency blended with advanced computing skills, creative thinking and desire to upgrade continuously.
- To empower them to the expectation of the industries in our country and abroad.
- To impart the interpersonal skills and make them realize the values of life.

Programme Outcomes (POs):-

At the time of their graduation students of Mechanical Engineering Programme should be in possession of the following Programme Outcomes

1	Engineering knowledge. Apply the knowledge of methometics, estimation
1.	Engineering knowledge: Apply the knowledge of mathematics, science, engineering
	fundamentals, and an engineering specialization to the solution of complex engineering
0	problems.
2.	Problem analysis: Identify, formulate, review research literature, and analyze complex
	engineering problems reaching substantiated conclusions using first principles of
0	mathematics, natural sciences, and engineering sciences.
3.	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
4	considerations.
4.	Conduct investigations of complex problems: Use research-based knowledge and
	research methods including design of experiments, analysis and interpretation of data, and
5.	synthesis of the information to provide valid conclusions.
5.	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.
6.	The engineer and society: Apply reasoning informed by the contextual knowledge to assess
0.	societal, health, safety, legal and cultural issues and the consequent responsibilities relevant
	to the professional engineering practice.
7.	Environment and sustainability: Understand the impact of the professional engineering
1.	solutions in societal and environmental contexts, and demonstrate the knowledge of, and
	need for sustainable development.
8.	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and
0.	norms of the engineering practice.
9.	Individual and team work: Function effectively as an individual, and as a member or leader
	in diverse teams, and in multidisciplinary settings
10.	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.
11.	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.
12.	Life-long learning: Recognize the need for, and have the preparation and ability to engage
	in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSO's):-

At the end of the Programme, Graduate shall have

PSO 1	Design, develop and analyse the engineering components using advanced design softwares.
	design softwares.
PSO 2	Ability to fabricate real time mechanical systems and test its worthiness.
PSO 3	Ability to apply the advancements in mechanical engineering to promote automation.

Programme Educational Objectives (PEOs):-

The following Programme Educational Objectives are designed based on the department mission

PEO 1:	Provide strong foundation in the science and engineering fundamentals necessary to formulate, solve and analyze real time mechanical engineering problems.
PEO 2:	Develop the ability to synthesize data and technical concepts for making decisions in an ethical manner considering the socio-economic scenario.
PEO 3:	Enable to work as part of teams on multidisciplinary projects with good communication and interpersonal skills in the emerging areas like automation, composite materials, automotive technology, green fuels etc.,
PEO 4:	Prepare for successful careers in industry that meet the needs of Indian and multinational companies and to inculcate the qualities of continuous learning and entrepreneurial skills.

Mapping of PO's and PSO's to PEO's

Programme Educational Objectives		Programme Outcomes										Programme Specific Outcomes			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
PEO 1	3	3	3	3		1					2		3	3	2
PEO 2	3	3	3	3		3	3	3					3	3	2
PEO 3	2	2	2	1	3	3	3		3	3	3	1	3	3	3
PEO 4	3	3	2	2	2		1	2	1	3	2	3	3	3	3

3	Strongly agreed	2	Moderately agreed	1	Reasonably agreed
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B.E. MECHANICAL ENGINEERING

REGULATION 2022 (Students Admitted from the Academic Year 2024 - 2025 Onwards) CHOICE BASED CREDIT SYSTEM I – VIII SEMESTER CURRICULUM AND SYLLABI

SEM	ESTER I							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int	Cat.
1.	23MA101	Mathematics I	3/1/0	4	4	-	60/40	BSC
2.	23EE113	Fundamentals of Electrical and Electronics Engineering	2/1/0	3	3	-	60/40	ESC
3.	23TA101	Heritage of Tamils / தமிழர்மரபு	1/0/0	1	1	-	60/40	HSMC
4.	23EN101	Oral and Written Communication Skills	2/0/2	4	3	-	50/50	HSMC
5.	23ME101	Engineering Drawing	1/0/4	5	3	-	50/50	ESC
6.	23CS101	Problem Solving using C++	1/0/4	5	3	-	50/50	ESC
7.	23EE115	Fundamentals of Electrical and Electronics Engineering Laboratory	0/0/2	2	1	-	40/60	ESC
8.	23MC101	Mandatory Course – I (Induction Programme)	3 WEEKS		0	-	0/100	MC
		Total	10/2/12	24	18	-	800	

SEME	ESTER II							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int	Cat.
1.	23ME201	Engineering Mechanics	3/0/0	3	3	-	60/40	PCC
2.	23ME202	Industrial Metallurgy	3/0/0	3	3	-	60/40	BSC
3.	23MA204	Calculus and Fourier Series	3/1/0	4	4	-	60/40	BSC
4.	23TA201	Tamils and Technology / தமிழரும் தொழில்நட்பமும்	1/0/0	1	1	-	60/40	HSMC
5.	23PS101	Physical Science	4/0/0	4	4	-	60/40	BSC
6.	23IT211	Introduction to Python Programming	1/0/4	5	3	-	50/50	ESC
7.	23CD201	Database Management System	1/0/4	5	3	-	50/50	ESC
8.	23PS102	Physical Science Laboratory	0/0/4	4	2	-	40/60	BSC
		Total	16/1/12	29	23	-	800	

SEME	ESTER III							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int.	Cat.
1.	23ME301	Applied Thermodynamics	3/1/0	4	4	-	60/40	PCC
2.	23ME302	Mechanics of Deformable Solids	3/1/0	4	4	-	60/40	PCC
3.	23MA303	Numerical methods	3/1/0	4	4	-	60/40	BSC
4.	23ME303	Manufacturing Practices Workshop	1/0/4	5	3	-	50/50	BSC
5.	23CS311	Fundamentals of Java Programming	1/0/4	5	3	-	50/50	ESC
6.	23ME304	Strength of Materials Laboratory	0/0/2	2	1	-	40/60	PCC
7.	23ME305	Design Thinking and Idea Lab	0/0/2	2	1	-	40/60	ESC
8.	23MCZZZ	Mandatory Course – II	2/0/0	2	0	-	0/100	MC
		Total	13/3/12	28	20	-	800	

SEME	ESTER IV							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int.	Cat.
1.	23ME401	Measurements and Metrology	3/0/0	3	3	-	60/40	PCC
2.	23ME402	Kinematics and Dynamics of Machines	3/1/0	4	4	-	60/40	PCC
3.	23ME403	Fluid Mechanics and Hydraulic Machines	3/1/0	4	4	-	60/40	PCC
4.	23ME404	Heat Transfer and Thermal Machines	3/1/0	4	4	-	60/40	PCC
5.	23GE301	Universal Human Values	3/0/0	3	3	-	60/40	HSMC
6.	23ME405	Manufacturing Technology	3/0/2	5	4	-	50/50	PCC
7.	23ME406	Thermal and Fluid Mechanics Laboratory	0/0/2	2	1	-	40/60	PCC
8.	23ME407	Metrology and Dynamics Laboratory	0/0/2	2	1	-	40/60	PCC
9.	23MCZZZ	Mandatory Course – III	2/0/0	2	0	-	0/100	MC
		Total	20/3/6	29	24	-	900	

SEM	ESTER V							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	0	Ext./ Int.	Cat.
1.	23ME501	Machine Element and System Design	3/1/0	4	4	-	60/40	PCC
2.	23ME502	Data Analytics for Mechanical Engineers	3/0/0	3	3	-	60/40	ESC
3.	23ME503	Vehicle Technology	3/0/0	3	3	-	60/40	PCC
4.	23ME504	Mechatronics, Robotics and Control	3/0/0	3	3	-	60/40	ESC
5.	23MEZZZ	HSS/Management Elective- 1	3/0/0	3	3	-	60/40	HSMC
6.	23ME505	Vehicle Technology Laboratory	0/0/2	2	1	-	40/60	PCC
7.	23ME506	Mechatronics Laboratory	0/0/2	2	1	-	40/60	ESC
8.	23XXZZZ	Open Elective-I	0/0/6 (or) 1/0/4 (or) 3/0/0	6 (or) 5 (or) 3	3	-	40/60 (or) 60/40	OEC
		Total	15/1/10	26	21	-	800	

SEME	ESTER VI							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int.	Cat.
1.	23ME601	Production and Operation Management	3/1/0	4	4	-	60/40	PCC
2.	23ME602	Product Innovation and Entrepreneurship	3/1/0	4	4	-	60/40	PCC
3.	23ME603	Computer Aided Design and Analysis	3/1/0	4	4	-	60/40	PCC
4.	23ME604	Manufacturing Automation and Smart Factory	3/0/0	3	3	-	60/40	PCC
5.	23XXZZZ	Open Elective-II	0/0/6 (or) 1/0/4 (or) 3/0/0	6 (or) 5 (or) 3	3	-	40/60 (or) 60/40	OEC
6.	23ME605	Design and Analysis Laboratory	0/0/2	2	1	-	40/60	PCC
7.	23ME606	Smart Factory Laboratory	0/0/2	2	1	-	40/60	PCC
8.	23ME607	Engineering Project - 1	0/0/2	2	1		40/60	PROJ
		Total	12/3/12	27	21	-	800	

SEM	ESTER VII							
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	ο	Ext./ Int.	Cat.
1.	23ME9ZZ	Professional Elective-I	3/0/0	3	3	-	60/40	PEC
2.	23ME9ZZ	Professional Elective-II	3/0/0	3	3	-	60/40	PEC
3.	23ME9ZZ	Professional Elective-III	3/0/0	3	3	-	60/40	PEC
4.	23ME9ZZ	HSS/Management Elective-2	3/0/0	3	3	-	60/40	HSMC
5.	23MEZZZ	Emerging Elective-I	0/0/6 (or) 1/0/4 (or) 3/0/0	6 (or) 5 (or) 3	3	-	40/60 (or) 60/40	EEC
6.	23ME701	Engineering Project-2 (Design and Analysis)	0/0/10	10	5	-	40/60	PROJ
7.	23ME702	Industrial Internship and Presentation	0/0/2	2	1	-	40/60	PCC
		Total	12/0/18	30	21	-	700	

SEME	SEMESTER VIII										
SL. No.	Course Code	Course	L/T/P	Contact hrs./wk.	С	0	Ext./ Int.	Cat.			
1.	23ME801	Engineering Project-3 (Prototype and Testing)	0/0/24	24	12	-	40/60	PROJ			
		Total	0/0/24	24	12	-	100				

SCHEME OF CREDIT DISTRIBUTION – SUMMARY

SL.	Stroom			Cr	edits/S	Semes	ter			6	0/
No.	Stream				IV	V	VI	VII	VIII	С	%
1	Humanities & Social Sciences Including Management (HSMC)	4	1	-	3	3	-	3	-	14	8.8
2	Basic Sciences (BSC)	4	13	7	-	-	-	-	-	24	15
3	Engineering Sciences (ESC)	10	6	4		7	-	-	-	27	16.9
4	Professional Core (PCC)	-	3	9	21	8	17	1	-	59	36.9
5	Professional Electives (PEC)	-	-	-	-	-	-	9	-	9	5.6
6	Open Electives (OEC) / Emerging Elective Courses (EEC)	-	-	-	-	3	3	3	-	9	5.6
7	Project Work (PROJ)	-	-	-	-	-	1	5	12	18	11.2
8.	Mandatory Course (MC)	-	-	-	-	-	-	-	-	-	-
	Total	18	23	20	24	21	21	21	12	160	100

STRUCTURE FOR UNDERGRADUATE ENGINEERING PROGRAM

S. No.	Course Work - Subject Area	AICTE Suggested Credits	SKCET Credits (168)	
1.	Humanities and Social Sciences (HS), including Management;	12*	14	
2.	Basic Sciences (BS) including Mathematics, Physics, Chemistry, Biology;	29*	24	
3.	Engineering Sciences (ES), including Materials, Workshop, Drawing, Basics of Electrical/Electronics/Mechanical/Computer Engineering, Instrumentation;	27*	27	
4.	Professional Subjects-Core (PC), relevant to the chosen specialization/branch; (May be split into Hard (no choice) and Soft (with choice), if required	58*	59	
5.	Professional Subjects – Electives (PE), relevant to the chosen specialization/ branch;	9*	9	
6.	Open Subjects- Electives (OE), from other technical and/or emerging subject areas;	9*	9	
7.	Project Work, Seminar and/or Internship in Industry or elsewhere.	16*	18	
8.	Mandatory Courses (MC)	Non-credit		
	Total	160*	160	
*Min	or Variations is allowed as per need of the respective disciplines			

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT (14 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23TA101	Heritage of Tamils / தமிழர்மரபு	1/0/0	1	1	HSMC
2.	23EN101	Oral and Written Communication Skills	2/0/2	4	3	HSMC
3.	23TA201	Tamils and Technology / தமிழரும் தொழில்நுட்பமும்	1/0/0	1	1	HSMC
4.	23GE301	Universal Human Values	3/0/0	3	3	HSMC
5.	23MEZZZ	HSS/Management Elective-1	3/0/0	3	3	HSMC
6.	23ME9ZZ	HSS/Management Elective-2	3/0/0	3	3	HSMC

BASIC SCIENCE COURSES (24 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23MA101	Mathematics I	3/1/0	4	4	BSC
2.	23ME202	Industrial Metallurgy	3/0/0	3	3	BSC
3.	23MA204	Calculus and Fourier Series	3/1/0	4	4	BSC
4.	23PS101	Physical Science	4/0/0	4	4	BSC
5.	23PS102	Physical Science Laboratory	0/0/4	4	2	BSC
6.	23MA303	Numerical methods	3/1/0	4	4	BSC
7.	23ME303	Manufacturing Practices Workshop	1/0/4	5	3	BSC

ENGINEERING SCIENCE COURSES (27 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23EE113	Fundamentals of Electrical and Electronics Engineering	2/1/0	3	3	ESC
2.	23ME101	Engineering Drawing	1/0/4	5	3	ESC
3.	23CS101	Problem Solving using C++	1/0/4	5	3	ESC
4.	23EE115	Fundamentals of Electrical and Electronics Engineering Laboratory	0/0/2	2	1	ESC
5.	23IT211	Introduction to Python Programming	1/0/4	5	3	ESC
6.	23CD201	Database Management System	1/0/4	5	3	ESC
7.	23CS311	Fundamentals of Java Programming	1/0/4	5	3	ESC
8.	23ME305	Design Thinking and Idea Lab	0/0/2	2	1	ESC
9.	23ME502	Data Analytics for Mechanical Engineers	3/0/0	3	3	ESC
10.	23ME504	Mechatronics, Robotics and Control	3/0/0	3	3	ESC
11.	23ME506	Mechatronics Laboratory	0/0/2	2	1	ESC

PROFESSIONAL CORE COURSES (59 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23ME201	Engineering Mechanics	3/0/0	3	3	PCC
2.	23ME301	Applied Thermodynamics	3/1/0	4	4	PCC
3.	23ME302	Mechanics of Deformable Solids	3/1/0	4	4	PCC
4.	23ME304	Strength of Materials Laboratory	0/0/2	2	1	PCC
5.	23ME401	Measurements and Metrology	3/0/0	3	3	PCC
6.	23ME402	Kinematics and Dynamics of Machines	3/1/0	4	4	PCC
7.	23ME403	Fluid Mechanics and Hydraulic Machines	3/1/0	4	4	PCC
8.	23ME404	Heat Transfer and Thermal Machines	3/1/0	4	4	PCC
9.	23ME405	Manufacturing Technology	3/0/2	5	4	PCC
10.	23ME406	Thermal and Fluid Mechanics Laboratory	0/0/2	2	1	PCC
11.	23ME407	Metrology and Dynamics Laboratory	0/0/2	2	1	PCC
12.	23ME501	Machine Element and System Design	3/1/0	4	4	PCC
13.	23ME503	Vehicle Technology	3/0/0	3	3	PCC
14.	23ME505	Vehicle Technology Laboratory	0/0/2	2	1	PCC
15.	23ME601	Production and Operation Management	3/1/0	4	4	PCC
16.	23ME602	Product Innovation and Entrepreneurship	3/1/0	4	4	PCC
17.	23ME603	Computer Aided Design and Analysis	3/1/0	4	4	PCC
18.	23ME604	Manufacturing Automation and Smart Factory	3/0/0	3	3	PCC
19.	23ME605	Design and Analysis Laboratory	0/0/2	2	1	PCC
20.	23ME606	Smart Factory Laboratory	0/0/2	2	1	PCC
21	23ME702	Industrial Internship and Presentation	0/0/2	2	1	PCC

PROFESSIONAL ELECTIVE COURSES (9 Credits)

	1	ELECTIVE COURSES (9 Credits)			-	1				
SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.				
		ELECTIVE STREAM I – MODERN MOBILITY	Y SYSTE							
1.	23ME901	Electric and Hybrid Vehicle Technology	3/0/0	3	3	PEC				
2.	23ME902	Autotronics	3/0/0	3	3	PEC				
3.	23ME903	Alternate Energy Source for Automobiles	3/0/0	3	3	PEC				
4.	23ME904	Automotive Component Manufacturing	3/0/0	3	3	PEC				
5.	23ME905	Smart and Intelligent Mobility	3/0/0	3	3	PEC				
6.	23ME906	Drone and UAV Technologies	3/0/0	3	3	PEC				
ELECTIVE STREAM II - DIGITAL AND ROBOTIC SYSTEMS										
1.	23ME907	Digital Manufacturing	3/0/0	3	3	PEC				
2.	23ME908	Modern Robotics	3/0/0	3	3	PEC				
3.	23ME909	Applied Hydraulics and Pneumatics	3/0/0	3	3	PEC				
4.	23ME910	PLC SCADA	3/0/0	3	3	PEC				
5.	23ME911	Immersive Technologies	3/0/0	3	3	PEC				
6.	23ME912	Product Life Cycle Management	3/0/0	3	3	PEC				
	ELECTIVE	STREAM III - ADVANCED MATERIALS AND MA	NUFAC	TURING SYS	STEM	S				
1.	23ME913	Composite and Smart Materials	3/0/0	3	3	PEC				
2.	23ME914	Advanced Manufacturing Techniques	3/0/0	3	3	PEC				
3.	23ME915	Failure Analysis and NDT Techniques	3/0/0	3	3	PEC				
4.	23ME916	Green and Sustainable Manufacturing	3/0/0	3	3	PEC				
5.	23ME917	Additive Manufacturing	3/0/0	3	3	PEC				
6.	23ME918	Design for Manufacturing and Assembly	3/0/0	3	3	PEC				
	ELEC	TIVE STREAM IV - THERMAL SYSTEM AND EN	IERGY T	ECHNOLOG	Ϋ́					
1.	23ME919	Power Plant Engineering	3/0/0	3	3	PEC				
2.	23ME920	Bioenergy Conversion Technologies	3/0/0	3	3	PEC				
3.	23ME921	Gas Dynamics and Jet Propulsion	3/0/0	3	3	PEC				
4.	23ME922	Heating, Ventilation and Air-Conditioning Systems	3/0/0	3	3	PEC				
5.	23ME923	Renewable Energy Technologies	3/0/0	3	3	PEC				
6.	23ME924	Energy Storage Devices and Thermal Management of Batteries	3/0/0	3	3	PEC				
	1 1	ELECTIVE STREAM V - COMPUTATIONAL E	NGINEE	RING		I				
1.	23ME925	Computational Solid Mechanics	3/0/0	3	3	PEC				
2.	23ME926	Computational Fluid Dynamics and Heat transfer	3/0/0	3	3	PEC				
3.	23ME927	Theory on Computation and Visualization	3/0/0	3	3	PEC				
4.	23ME928	Computational Bio-Mechanics	3/0/0	3	3	PEC				
5.	23ME929	CAD and CAE	3/0/0	3	3	PEC				
6.	23ME930	Machine Learning for Intelligent Systems	3/0/0	3	3	PEC				
0.	20112000	ELECTIVE STREAM VI – DIVERSIFIED COUF		_		0				
1.	23ME931	Design Concepts in Engineering	3/0/0	3	3	PEC				
2.	23ME932		3/0/0	3	3	PEC				
3.	23ME932		3/0/0	3	3	PEC				
3. 4.	23ME933		3/0/0	3	3	PEC				
4. 5.	23ME934 23ME935	<u> </u>	3/0/0	3	<u> </u>	PEC				
5. 6.	23ME935 23ME936		3/0/0	3	<u> </u>	PEC				
0.	201015930	Trouder Design and Development	3/0/0	3	3	FEU				

HSS/MANAGEMENT ELECTIVE (6 Credits)

	HUMANITIES AND SOCIAL SCIENCES /MANAGEMENT										
1.	23ME937	Lean Six Sigma	3/0/0	3	3	HSMC					
2.	23ME938	Industrial Layout, Safety and Production Management	3/0/0	3	3	HSMC					
3.	23ME939	Engineering Management and Financial Accounting	3/0/0	3	3	HSMC					
4.	23ME940	Supply Chain Management	3/0/0	3	3	HSMC					
5.	23ME941	Operations Research	3/0/0	3	3	HSMC					
6.	23ME942	Principles of Management and Industrial Psychology	3/0/0	3	3	HSMC					

OPEN ELECTIVE COURSES (Offered to Other Branches)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23ME001	Industrial Safety	3/0/0	3	3	OEC
2.	23ME002	Fundamentals of MEMS/NEMS	3/0/0	3	3	OEC
3.	23ME003	Total Quality Management	3/0/0	3	3	OEC
4.	23ME004	Product Development	3/0/0	3	3	OEC
5.	23ME005	Fundamentals of Additive Manufacturing	3/0/0	3	3	OEC
6.	23ME006	Technology Management	3/0/0	3	3	OEC

EMERGING ELECTIVE COURSES

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23ME007	Expert System and Machine Learning	3/0/0	3	3	EEC
2.	23IT007	NoSQL Data Modeling	3/0/0	3	3	EEC
3.	23CS007	Node JS	3/0/0	3	3	EEC
4.	23CY007	Application Security	3/0/0	3	3	EEC
5.	23CD007	Data Visualization	3/0/0	3	3	EEC
6.	23AD007	AR / VR Programming	3/0/0	3	3	EEC

PROJECT WORK (18 Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23ME606	Engineering Project - 1	0/0/2	2	1	PROJ
2.	23ME701	Engineering Project - 2 (Design and Analysis)	0/0/10	10	5	PROJ
3.	23ME801	Engineering Project - 3 (Prototype and Testing)	0/0/24	24	12	PROJ

MANDATORY COURSES (Non-Credits)

SL. No.	Course Code	Course Title	L/T/P	Contact hrs./Wk.	С	Cat.
1.	23MC101	Induction Program	3 W	EEKS	0	MC
2.	23MC102	Environmental Sciences	2/0/0	2	0	MC
3.	23MC103	Soft Skills	2/0/0	2	0	MC
4.	23MC104	Management Organizational Behavior	2/0/0	2	0	MC

5.	23MC105	General Aptitude	2/0/0	2	0	MC
6.	23MC106	Life Skills and Ethics	2/0/0	2	0	MC
7.	23MC107	Stress Management	2/0/0	2	0	MC
8.	23MC108	Constitution of India	2/0/0	2	0	MC
9.	23MC109	Essence of Indian Traditional Knowledge	2/0/0	2	0	MC
10.	23MC110	Biology	2/0/0	2	0	MC
11.	23MC500	Sports and Yoga	2/0/0	2	0	MC

* Courses conducted either by internal faculty or through MOOCs

ONE CREDIT COURSES (Additional Credits)/ VALUE ADDED COURSES

S.No	Course Code	Course Title	Credits
1.	23VA130	Effective Communication Skills	1
2.	23VA500	Geometric Dimensioning and Tolerancing	1
3.	23VA501	Automotive Interior/Exterior Plastic Parts Design	1
4.	23VA502	Project Management Process	1
5.	23VA503	Quality Management	1
6.	23VA504	Geometric Modeling	1

SERVICE SUBJECTS

SL No		Course	L/T/P	Contact hrs/week	Credit	Ext/Int	Category
1	23ME111	Engineering Graphics	1/0/4	5	3	50/50	ES

SEMESTER WISE CREDIT DISTRIBUTION: -

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	18	23	20	24	21	21	21	12	160

Total Credits: 160

L: Lecture T: Tutorial P: Practical C: Credit O: Outside Class hours Cat.: Category

HSMC : Humanities and Social Sciences including Management **OEC**: Open Elective Courses

EEC :Emerging Elective Courses

BSC : Basic Science Courses

EC :Emerging Courses PROJ : Project Work

ESC : Engineering Science Courses **PCC** : Professional Core Courses

PEC : Professional Elective Courses

- **EES** : Employability Enhancement Skills
- MC : Mandatory Course

Definition of Credit:

L – Lecture	1 Hr. Lecture (L) per week	1 credit
T – Tutorial	1 Hr. Tutorial (T) per week	1 credit
P - Practical/Practice (Project and Industry based Courses)	1 Hr. Practical (P) per week	0.5 credit

Semester – 01

23MA101		MATHEMATICS I	3/1/0/4				
Nature of Co	ourse	Problem Analytical J					
Pre requisite	es	-					
Course Obje	ectives:						
1		ogical notation to define the fundamental data types and struc algorithms and systems.	tures used in				
2	To use th	e concepts of graph theory in practical situations.					
3	To acquir Cryptogra	re thorough knowledge of fundamental notions of proof's and its aphy.	application in				
4	To analys results.	To analyse data pertaining to discrete and continuous random variables to interpret the results.					
5	5 To impart the knowledge of counting principles, to think critically and apply it in real world problems.						
Course Outo	comes (Th	eory)					
Upon compl	etion of th	e course, students shall have ability to					
C101.1	Recall the	e basic concepts of logical laws, structures and probability.	[R]				
C101.2		Understand the concepts of proof techniques, structures and random variables.					
C101.3		e logical and foundational structures of mathematics with an son writing proofs.	[AP]				
C101.4	Apply the	e concepts of graph and number theory in cryptography.	[AP]				
C101.5		Apply the probability concepts in transition from real problem to a [AP]					
Course Con	tonte						

Course Contents:

MODULE I : LOGICAL PROOF'S & FUNCTIONS

Proofs: Definitions - Proof by cases - Proof by contradiction - Logical formulas - Propositions - Truth table - Logical operators - Tautologies and Contradictions – Contrapositive - Equivalences and implications - Predicates - Free and bound variables – Quantifiers - Universe of discourse - **Sets:** Basic sets - Operations on Sets – Law on Sets (without proof) - Cartesian product of sets. **Relations:** Binary relation -Types of relations and their properties - Relational matrix and graph of a relation - Equivalence relations - Partial ordering relation **Functions:** Classifications of functions – Induction - Ordinary induction and Strong induction - Recursive data types - Definition of recursive and structural

MODULE II : NUMBER THEORY & GRAPH THEORY

Number Theory: Divisibility - Greatest common divisor - Euclid's algorithm - Prime numbers - Fundamental theorem of arithmetic - Modular arithmetic - Remainder arithmetic - Multiplicative inverses and cancelling - Relatively prime - Euler's theorem.- Chinese Reminder Theorem **Graph Theory:** Vertices and Degrees - Types of graphs - Handshaking theorem - Adjacency matrices - Walks and paths - Connectivity - Isomorphism - Directed acyclic graphs and scheduling –Matchings - The Stable marriage problem –Forests and trees - Spanning trees - Minimum weight spanning trees – Prim's algorithm - Kruskal's algorithm.

MODULE III : COUNTING & PROBABILITY

Sums and Asymptotics - Sums of Powers - Harmonic Numbers - Asymptotic Notation - The Division Rule - Counting Subsets - Sequences with Repetitions - The Pigeonhole Principle - Events and Probability Spaces - The Four Step Method - Conditional Probability - The Four-Step Method for Conditional Probability - The Law of Total Probability - Baye's theorem - Random Variables – Discrete and continuous random variables - Distribution Functions - Bernoulli Distribution - Uniform Distribution - Binomial Distribution - Great Expectations - Conditional Expectation - Linearity of Expectation - Infinite Sums - Expectations of Products

Total Hours: 60

(20 Hrs)

(20 Hrs)

(20 Hrs)

Text Books:										
1	Trembla				e Mathematical Pub. Co. Ltd, Nev					
2	-	T, "Elementary econd Edition, 2		ber Theory	with Application	s", Elsevi	ier Pu	blications, New		
3		nman, F. Thoma ", 14 th Edition, N			d Albert R. Meye ware, 2018.	er, "Mathe	ematic	s for Computer		
Reference B										
1		Bernard Kolman, Robert C. Busby, Sharan Cutler Ross, "Discrete Mathematical Structures", sixth edition, Pearson Education Pvt Ltd., New Delhi, 2017								
2					itics and its App Eighth Edition, 2		Eight	h Edition, Tata		
3	Thomas	s Koshy, "Discre	te Ma	thematics	with Applications'	', Elsevier	⁻ Publi	cations, 2004.		
4					al Mathematics: Delhi, Fifth Editior		ed Intr	oduction", Fifth		
Web Refere				•	· · · · · · · · · · · · · · · · · · ·					
1	https://c	nlinecourses.np	otel.ac	.in/noc23_	cs109/preview					
2	https://c	https://onlinecourses.nptel.ac.in/noc23_cs120/preview								
3	https://c	nlinecourses.np	otel.ac	.in/noc23	ma77/preview					
4	https://c	nlinecourses.np	otel.ac	.in/noc23_	ma72/preview					
Online Reso	urces:									
1					s/discrete-mather					
2					asses/20/fall21/n		odf			
3					screteMathemati					
4					umberTheory.htm	<u>1</u>				
Assessmen		s & Levels (bas			Taxonomy)			Γ		
		Continuous As	sessi	nent	1	Enc	4			
Formativ Assessme		Summative Assessment		Total	Total Continuous Assessment	Semes	ster	Total		
80		120		200	40	60		100		
	Ass	essment Metho	ods &	Levels (ba	sed on Blooms	' Taxono	my)			
		Formative As	ssess	ment base	ed on Capstone	Model				
Course Ou	itcome	Bloom's Level		Assessment Component			FA (16%) [80 Marks]			
C101	.1	Remember	Quiz				20			
C101	.2	Understand	Presentation				20			
C101.3 – 0	C101.5	Apply	Tuto	orial				20		
C101.3 – 0	C101.5	Apply	Assi	gnment				20		

Bloom's	Leve		S	Sumn		e Asse 120 Ma			(24%)	E	End Semester Examination (60% [100 Marks]					
			CIA1	: [60) Mar	ks]	C	A2 : [60 N	larks]			[100	Wark	s]		
Remer	nber			20)				20			20					
Unders	tand			30)				30					30			
Арр	Apply 50						50					50					
Analy	Analyse -						-					-					
Evalu	Evaluate -					-					-	-					
Crea	Create -							-					-				
		Asse	essm	ent b	ased	on Co	onti	nuous	s and	d End	Sen	neste	r Examina	ation			
				Cont		us Ass [200 N			(40%	%)				F	nd Semeste		
	CA	1:1	00 Ma	arks					С	A 2: 1	100 N	/larks			Examination		
SA 1		FA	A 1 (4	0 Ma	rks)			SA 2 FA				40 Ma	irks)		(60%)		
(60 Marks)		mpor I) Mar	nent - ks)		ompo II 20 Ma			(60 larks)		mpor I 0 Mar			mponent II 0 Marks)	:-	[100 Marks]		
Mapping Outcome					es (C	-		ogran	nme	Outc	ome	s (PO) Prograr				
COs	Ds 1 2 3 4 5 6 7				8	9	10	11	12	1	PSOs 1 2 3						
C101.1	1	1		T			•		•		••	• ~	•	-	`		
C101.2	2	2															
C101.3	3	3															
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C101.4	3	3															

3 Strongly agreed 2 Moderately agreed 1 Reasonably agreed

1 To import the students with a basic understanding of Electrical circuits. 2 To import the working principle of static machine. 3 To understand the rotating Machines working principles and to have a knowledge selection of machine for specific types of applications. 4 To give a comprehensive exposure to Electrical installations. Course Outcomes: [////////////////////////////////////	Nature of CC	Juise	G (Theory analytical)							
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C113.2 Examine the working principle of Static machines. [/] C113.3 Understand the working principle of Rotating machines. [/] C113.4 Utilize the basic components for Electrical installations. [/] C113.5 Interpret the basic devices in Electronics and Instrumentation. [/] Course Contents: 15 Hrs Course Contents: 15 Hrs DC Circuits - Electrical circuit elements (R, L and C) - Voltage and Current Sources - Kirchoff's cur and voltage law - analysis of simple circuits with DC excitation - Mesh and Nodal Analysis. AC Circuits and voltage law - analysis of simple circuits with DC excitation - Mesh and Nodal Analysis. AC Circuits and voltage law - analysis of simple circuits with DC excitation - Mesh and Nodal Analysis. AC Circuits and RC. Three phase balanced circuits - Voltage and Current relations in star and d connections. Module II: Electrical Machines and Installations 15 Hrs Static machines: BH characteristics, construction & working principle of single-phase and three ph transformers. Rotating machines: Generation of rotating magnetic fields, construction and worl principle of DC machines, three-phase induction motor and synchronous motor. Components of Switchgear - Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Domestic wiring, Types of Wires and Cab Earthing. Module II: Fundamentals of Semiconductor Devices and Instrumentation 15 Hrs Semiconductor - PN junction diode - Zener diode - Bipolar Junction Transistor Introduction - Field Eft	Upon compl	etion of the co	urse, students shall have ability to							
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Total Hours 45 Text Books: 1 Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', T 45 1 Pitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', T 45 2 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2 nd edit 2015. 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10 th edition, 2011. 2nd Donald A. Neamen, Electronic Circuit Analysis and Design, 2 nd Edition, reprint, Tata				systems,						
Text Books: 1 Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', TMcGraw Hill, 7 th edition, 2020. 2 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2 nd edit 2015. 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10 th edition, 2011. Donald A. Neamen, Electronic Circuit Analysis and Design, 2 nd Edition, reprint, Tata	FIOXITIILY SE			45						
1 Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', T McGraw Hill, 7 th edition, 2020. 2 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2 nd edit 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10 th edition, 2011. Donald A. Neamen, Electronic Circuit Analysis and Design, 2 nd Edition, reprint, Tata	Text Books:									
1 McGraw Hill, 7 th edition, 2020. 2 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2 nd edit 2015. 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10 th edition, 2011. Donald A. Neamen, Electronic Circuit Analysis and Design, 2 nd Edition reprint, Tata			- Charles Kingsely Jr. Stephen Dillmans 'Electric Machiner	v' Tata						
 Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 2nd edit 2015. 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10th edition, 2011. Donald, A. Neamen, Electronic Circuit Analysis and Design, 2nd Edition reprint, Tata 	1	•		y, rata						
 2015. 3 E. Hughes, "Electrical and Electronics Technology", Pearson, 10th edition, 2011. Donald A. Neamen, Electronic Circuit Analysis and Design, 2nd Edition reprint Tata 				^d edition.						
Donald A Neamen Electronic Circuit Analysis and Design 2 nd Edition reprint Tata	2		, <u> </u>	- ,						
Donald A Neamen Electronic Circuit Analysis and Design 2 nd Edition reprint Tata	3	E. Hughes, "El	ectrical and Electronics Technology", Pearson, 10 th edition, 2011.							
	Λ			Tata Mc						
⁴ Graw Hill, 2013.	4									

Fundamentals of Electrical and Electronics Engineering

(Common to MECH and CIVIL)

G (Theory analytical)

23EE113

Nature of Course

2/1/0/3

Reference	Books:									
1		Charles A.Gross, Thaddeus A.Roppel, "Fundamentals of Electrical Engineering", CRO press, 2012.								
2	D. C. K	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, Revised 1 st edition 2017.								
3		Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, 'Electronic Devices and Circuits', Pearson Education, 6 th edition, 2013.								
Web Refe	rences:									
1	http://n	ptel.ac.in/course.php?disc	ciplineId=108	3						
2		ocw.mit.edu/courses/find- /#cat=engineering&subca		ngineering&spec	=electricpower					
3	https://	nptel.ac.in/video.php?sub	jectId=11710)3063	•					
4	https://	https://onionesquereality.wordpress.com//more-video- lectures-iit-open								
5	https://	https://nptel.iitg.ernet.in/Elec_Comm_Engg//Video-ECE.pdf								
Online Re	sources:									
1	http://w	ww.electrical-knowhow.co	om/							
2	https://	www.edx.org/course/elect	tricity-magne	tism-part-1-ricex-	-phys102-1x-1					
3	https://	www.mooc-list.com/cours	e/fundament	als-electrical-enc	ineering-coursera					
4	https://	nptel.ac.in/course.php								
		Continuous Assessi	ment							
Forma Assess		Summative Assessment	tTotal	Total Continuous Assessment	End Semester Examination	Total				
80)	120	200	40	60	100				

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)								
Formative Assessment based on Capstone Model									
Course Outcome	Bloom's Level	Assessment Component	FA (16%) [80 Marks]						
C113.1	Analyze	Assignment	20						
C113.2	Analyze	Assignment	20						
C113.3	Understand	Simulation	20						
C113.4	Apply	Class Presentation	20						
C113.5	Analyze	Quiz	20						
Assessme	Assessment based on Summative and End Semester Examination								

Assessment based on Summative and End Semester Examination

Bloom's Level	Summative Ass [120 M		End Semester Examination (60%)
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]
Remember	20	20	20
Understand	30	30	30
Apply	20	20	20
Analyse	30	30	30
Evaluate	-	-	-
Create	-	-	-

Assessr	nent	based	d on C	Contir	nuous	and	End S	Seme	ster E	xamin	ation					
Continuous Assessment (40%)												_				
	[200 Marks] CA 1 : 100 Marks CA 2 : 100 Marks												End Semester			
SA 1			1 (40			o	SA	2	Com		(40 M		nont	Examination (60%)		
(60 Marks)		-1		Component - II (20 Marks)		(60 - I - II Marks) - I - II		(60 - I - II Marks) - I - II		(60 Marks)		-1			(00 [100 N	
	1	1	1	1	1	1	1	1	1	1	1	1	1		1	
No. of the CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	
C113.1	3												1			
C113.2	3												1			
C113.3	3		1										1			
C113.4	3		1										1			
C113.5	3		1										1			
1	Reas	sonab	ly Ag	reed	2	N	loder	ately	Agree	ed	3	5	Strongl	y Agree	ed	

23TA101	HERITAGE OF TAMILS / தமிழர்மரபு					
Nature of C	ourse:	C (Theory Concept)				
Pre requisites: NIL						
Course Obj	ectives:					
1	To know v	arious concepts of Tamil Language families.				
2	To know a	bout the essentialities of Heritage.				
3	To underst	tand the Aram concepts of Tamils and the cultural influence.				
Course Out	comes:					
Upon comp	letion of th	ne course, students shall have ability to				
C101.1		but the language families in India, impact of religions and the n of Bharathiyar and Bharathidhasan.	[U]			
C101.2	Observe th	ne growth of sculpture, making of musical instruments and the role of socio and economic lives.	[U]			
C101.3	Understan	d the significance of folklore and martial arts.	[U]			
C101.4	Learn the	sangam literature, sangam age and overseas conquest of Cholas.	[U]			
C101.5	medicine a	d the contribution of Tamils to Indian Freedom Struggle, role of Siddha and print history of Tamil Books.	[U]			

Course Contents:

Language and Literature: Language Families in India - Dravidian Languages – Tamil as a Classical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.

Heritage - Rock Art Paintings to Modern Art – Sculpture: Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils. Folk And Martial Arts: Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils.

Thinai Concept of Tamils - Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas. Contribution of Tamils to Indian national movement and Indian culture: Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.

	Total Hours: 15
Text-cu	m-Reference Books:
1	தமிழகவரலாறு – மக்களும்பண்பாடும் – கே. கே. பிள்ளை(வெளியீடு:
I	தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி [_] வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம்
5	(தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International
Ŭ	Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
'	(Published by: International Institute of Tamil Studies).

8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative	Formative Assessment based on Capstone Model								
Course OutcomeBloom's LevelAssessment ComponentFA (16%) [80 Marks]									
C101.1	Understand	Quiz	20						
C101.2	Understand	Seminar	20						
C101.3	Understand	Seminar	20						
C101.4 Understand Quiz 20									

Assessment based on Summative and End Semester Examination									
Bloom's Level			Summative As [120	sessment (Marks]	24%)	End Semester (60			
		CIA	1: [60 Marks]	CIA2: [60 Marks]	[100 M			
Remembe	r		40		40	4()		
Understan	d		60		60	60)		
Apply			-		-	-			
Analyse	nalyse		-		-	-			
Evaluate			-		-	-			
Create			-						
Assessme	ent based	d on C	ontinuous and	End Semes	ter Examinatio	on			
		(Continuous As	sessment (4	40%)				
			[200	Marks]			End Someotor		
	CA1:1	00 Ma	rks		CA 2 : 100 Ma	End Semester			
SA 1 FA 1 (40 Marks)				FA 2 (4	0 Marks)	Examination			
(60	Compo	nent -	Component -	SA 2	Component -	Component -	(60%) [100 Marks]		
Marks)			II	(60 Marks)	I	II			
Walks	(20 Ma	rks)	(20 Marks)		(20 Marks)	(20 Marks)			

Course Outcome		Programme Outcomes (PO)											P Out	rogram Specifi comes	ime ic (PSO)
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1									1			1			
C101.2								1	1			1			
C101.3								1	1			1			
C101.4									1						
C101.5								1	1						

23EN101		ORAL AND WRITTEN COMMUNICATION SKILLS	2/0/2/3		
Nature of C		Theory Skill Based			
Pre requisit		Basics of English Language			
Course Obj					
1 To empower students to comprehend different aspects of communication using					
	skills.				
2	To high	light the essential aspects of effective oral and written communication ne	ecessary		
	for profe	essional success.			
3	To expa	and the skills of the students in preparing job search artefacts and neg	gotiating		
		e in GDs and interviews.	5		
4	To enab	ble students to communicate contextually in specific, personal and profe	essional		
		ns with courtesy.			
5	To enri	ich students to carry out day-to-day communication at the workpla	ace and		
		e efficient interpersonal communication.			
Course Out	comes:	· · · · · · · · · · · · · · · · · · ·			
Upon comp	letion of t	the course, students shall have ability to			
C101.1	Remem	hber and expand writing skills through guided activities.	R		
C101.2	Apply c	communication skills in a corporate environment.	AP		
0101.0		e and collaborate better with colleagues, building stronger professional			
C101.3	-	rsonal relationships.	AN		
0404.4		echnical writing skills to write letters, emails and prepare technical			
C101.4	docume	•	AP		
C101.5	Analyze and communicate effectively in personal and professional situations. AN				
Course Co					

Course Contents

Reading: Reading techniques -Skimming and scanning - Cloze reading - Reading and understanding technical articles – Reading for detailed comprehension: Email and letters - Reading advertisements - Table completion: Interpreting charts and graphs - Verbal reasoning – Comprehending reviews – Reading and responding to instant messages.

Module II

Writing: Formal letters (Sales letter, calling for quotations, seeking clarification, placing an order, complaint letter, inviting, accepting and declining letters) - Emails - Minutes of meeting - Professional report writing - Proposal writing - Resume / job application letter - Case study.

Module III

Listening: Situational listening - Listening about an experience - Listening about short extracts - Listening an interview - Conversational speaking. Speaking: Conversational speaking - Decipher the picture given and answer the question posed along with it - Decipher the mind map given and speak about it - Listen to the questions posed and answer them appropriately

Lab Co	mponents	
1	Conversational listening	[U]
2	Speaking - Pictography	[AP]
3	Listening about an experience	[U]
4	Listening to short extracts	[U]
5	Writing - Resume Writing, Job application letter	[AP]
6	Mock interview	[AP]
	Total Hours:	60

Text Boo	ks:
1	Jay Sullivan, "Simply Said: Communicating Better at Work and Beyond", Wiley Publication,
	2018.
2	Alred J Gerald, Brusaw T Charles,. Oliu E Walter, "Handbook of Technical Writing",
	Bedford/St. Martin's Boston publication, New York, 2012.
3	Liz Hamp-Lyons and Ben Heasly, "Study Writing : A Course in Written English for Academic
	Purposes", Updated Edition, Cambridge University Press, 2006.
4	Dr.Praveen Sam and K N Shoba - A Course in Technical English by Cambridge University
	press, 2020.
Reference	e Books:
1	Rutherfoord J Andrea, "Basic Communication Skills for Technology", Upper Saddle River,
	N.J. : Prentice Hall, 2001.
2	Singh Hardeep (Author), Kothari (Author), "Written & Oral Technical Communication Skills
	For Engineers/Scientists" - LAMBERT Publications, 2019.
Web Refe	erences:
1	http://www.academiccourses.com/Courses/English/Business-English
2	https://www.liveworksheets.com/worksheets/en/English_as_a_Second_Language_(ESL)
	/Technical_English
Online Re	esources:
1	https://www.coursera.org/specializations/business-english
2	https://www.businessenglishresources.com/learn-english-for-business/student-
	section/practice-exercises-new/

				Assessme	ent				End	
	Theory		-	P	ractical		Tat	Total	Semeste	
Formati ve Assess ment	Summat ive Assess ment	Tot al	Tot al (A)	Formati ve Assess ment	Summat ive Assess ment	Tot al (B)	Tot al (A+ B)	Continu ous Assess ment	r Examina tion	Tot al
80	120	200	100	75	25	100	200	50	50	100

Formative A	ssess	sment bas	sed on Capst	one Model - Theory					
Course Outcome		oom's ₋evel		Assessment Component		FA (10%) [80 Marks]			
C101.1 C101.2	Unc	lerstand	Listening to	Short Extracts		20			
C101.3	Арр	ly	Speaking - I	Speaking - Pictography					
C101.4	Арр	ly	Mock Interv	Mock Interview					
C101.5	Арр	ly	Assignment	Assignment					
Assessment	t base	ed on Sun	mative and	End Semester Examinatior	- Theory				
Bloom's Lev	/el		[120	ssessment (15%)) Marks]	End Semester Examination (25%)				
		CIA1: (60 Marks)	CIA2: (60 Marks)	[100 Marks]				
Remember			20	20	2	20			
Understand			40	40	2	10			
Apply 40			40	40	Z	10			
Analyse	nalyse				-				
Evaluate						-			
Create			-	-		-			

Assessment base	Assessment based on Continuous and End Semester Examination - Practical											
Bloom's Level	Continuous A [100	End Semester Examination (25%)										
	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]									
Remember	20	20	20									
Understand	30	30	30									
Apply	50	50	50									
Analyse	-	-	-									
Evaluate	-	-	-									
Create	-	-	-									

Course Outcomes (CO)		Programme Outcomes (PO)									Programme Specific Outcomes (PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1										3					
C101.2								2		3					
C101.3								2		3	2				
C101.4										3					
C101.5										3		3			

23ME10)1	ENGINEERING DRAWING	1/0/4/3
Nature o	of Course	Practical Application	
Pre Requ	uisites	General Drawing skill	
Course (Objectives:		
1	To develop	skills for communication of concepts, ideas and design of engi	neering products.
2	To expose t	hem to existing national standards related to technical drawing	S.
3	Ability to cre	eate basic geometries using the modelling software.	
Course (Outcomes:		
Upon co	mpletion of t	the course, students shall have ability to	
C101.1	Interpret an	d sketch the basic and intermediate geometries.	[U]
C101.2	Visualize ar	nd sketch the 2D diagram from 3D diagrams.	[A]
C101.3	Imagine the	parametric features of solids.	[A]
C101.4	Envisage th	e sectional and lateral geometrical properties of solids.	[E]
C101.5	Interpret the	e isometric to orthographic projection and vice versa.	[C]
C auraa (Contontos		1

Course Contents:

Concepts and conventions: Drafting instruments, BIS conventions, drawing sheets, general principles of projection: First angle projection - Layout of views. **(Not for examination)**

Manual drafting of the following using mini-drafter

General Plane Curves: Conic curves: ellipse and parabola by eccentricity method. Drawing normal and tangents to these curves, Involutes- Square and Circle, Simple Cycloid. **Orthographic projection**-Conversion of isometric/pictorial into orthographic views.

Projection of solids (Solid axis inclined to any one reference plane): Drawing front and top views of Prisms- Square, Pentagonal, hexagonal and circular prisms. Drawing front and top views of Pyramids - Square, Pentagonal, hexagonal and circular pyramids.

Sectioning of solids- Basic concepts using a simple prism/pyramid in vertical position. **Development of lateral surfaces of solids-** Development of lateral surfaces of Simple Prisms/Pyramids and Truncated Prisms only.

Introduction to CAD: Basics of 2D and 3D modeling, Drafting of simple geometrics: Line, planes and simple 2D drawings.

S.No	List of Experiments	CO)	RBT						
		Марр	ing							
1	Study the Basics of 2D and 3D drawing	C101	.1	[U]						
2	Drafting of title block and Co-ordinate system	C101	.1	[U]						
3	Construction of conic curves (Ellipse, Parabola and Hyperbola) C101.1 [U]									
4	Construction of special curves (Cycloid and Involutes)	C101	.1	[U]						
5	Isometric to orthographic projections	Isometric to orthographic projections C101.2 [A]								
6	Projection of solids (Prism) – inclined to HP / VP C101.3 [A]									
7	Projection of solids (Pyramid) – inclined to HP / VP	C101	.3	[A]						
8	Section of solids (Prism / Pyramid) – inclined to HP / VP	C101	.4	[E]						
9	Development of surfaces (Prism / Pyramid / Truncated Prisms)	C101	.4	[E]						
10	Drafting of simple2D and 3D model	C101	.5	[C]						
	Total	Hours:		75						
Text Bo	oks:									
1	K. V. Natarajan, "A Text Book of Engineering Graphics", Dha 2018.	nalakshr	ni Pu	blishers,						
2	Varghese P.I., "Engineering Drawing", McGraw Hill Education P	vt. Ltd., 3	e-201	9.						

3	Parthasarathy N.S and Veera Murali, "Engineering Drawing", Oxford University Press, 2015.
4	Basant Agarwal and C M Agarwal., "Engineering Drawing", 2e, McGraw Hill Education,
	2019.
Reference Bo	ooks:
1	Bhatt N.D and Panchal, "Engineering Drawing", Charotar Publishing House, 50 th
	Edition, 2014.
2	Venugopal K. and Prabhu Raja V, "Engineering Graphics", New Age Int. (P) Limited, 4 th
	Edition- 2016.
Web Referen	ces:
1	http://nptel.ac.in/courses/112103019/Engineering drawing
2	http://pioneer.netserv.chula.ac.th/~kjirapon/self-practice.html

	Theory			P	ractical		T . (.)	Tatal	End Semester	Tot
Formative Assessme nt	Summative Assessmen t	Tota I	Tota I (A)	Formative Assessment	Summativ e Assessme nt	Total (B)	Total (A+B)	Total Continuous Assessment	Practical Examination	al
80	120	200	100	75	25	100	200	50	50	100

Formative A	ssess	ment ba	sed on Capstone Mod	lel - Theory									
Course Outcome		oom's evel	Asses	sment Component		FA (10%) [80 Marks]							
C101.1	Und	erstand	Assignment			20							
C101.2	Anal	yze	Assignment			20							
C101.3	Anal	vze											
C101.4		uate	Model Making			40							
C101.5	Crea		- Model Making										
Assessmen	t base	d on Su	mmative Assessment	- Theory									
Summative Assessment (15%)Bloom's Level[120 Marks]													
		C	CIA1: (60 Marks)	CI	A2: (60 Marks)								
Remember			10		10								
Understand			20		20								
Apply			40		30								
Analyse			30		30								
Evaluate			-		10								
Create			-		-								
Assessmen	t base	d on Co	ntinuous and End Sen	nester Examination	n - Practical								
Bloom's L	evel		Continuous Assessn [100 Marks]			er Examination 0%)							
			FA: (75 Marks)	SA: (25 Marks)		Marks]							
Remember			30	30		30							
Understand		Ī	30	30	3	30							
Apply			20	20		20							
Analyse			20	20	20								
Evaluate			-	-	-								
Create			-	-		-							

Asses	Assessment based on Continuous and End Semester Examination																
				Co	ontin	uous	Asse	essm	ent (S	50%)					F	nd	
	(10	CA 1 00 Ma							CA 2 Mark	s)				tical Exam Marks)	Sem	Semester Practical	
SA 1			FA 1			SA 2				A 2			FA	SA		ination	
(60M)		onen Marks)		ompor 20 Ma		(60N		Compo (20 Ma			pone Mark		(75M)	(25M)	(5	0%)	
Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Spe Outcomes (PSO)											Specific						
00	-						Ρ	os							PSOs		
CO)S	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C10	1.1	3			1						3			2			
C10	1.2	3			1						3			3	1		
C10	1.3	3		1							3			2			
C10	1.4	3		1		1					3			3	1		
C10	1.5	3									3			2			
		3	Stror	ngly a	greed	d 2	Мо	derat	ely aç	greed	1	Rea	asona	bly agreed	k	•	

23CS10	1	PROBLEM SOLVING USING C++	1/0/4/3
Nature of	of Course	K (Problem Programming)	
Pre requ	uisites	NIL	
Course	Objectives:		
		fundamental programming concepts and methodologies which are C++ programs.	essential to
2	To gain knov	vledge on control structures and functions in C++.	
3	To provide th	ne basic object-oriented programming concepts and apply them in prob	lem solving.
4	To introduce	file streams and operations for storing data permanently.	
5	To know gen	neric programming paradigm.	
Course	Outcomes:		
Upon co	ompletion of	f the course, students shall have ability to	
C101.1		ne fundamental concepts and methodologies required to develop a problems.	[U]
C101.2		program for real-time problems with pointers and objects.	[AP]
C101.3	Apply the solve.	Constructors, destructors, and overloading concepts to solve the	[AP]
C101.4	Develop C	++ programs with Interfaces, Exception and File processing	[AP]
C101.5	Implement	the concepts on file streams, I/O and Lambda Expression.	[AP]

Course Contents:

Module I C++ Programming Fundamentals

C vs C++, Basic of OOPS, the main () function, Header files, Basic Input and Output (I/O) using cin and cout, Variable, Constant. **Operators:** Arithmetic Operators, Assignment Operators, Relational Operators, Logical Operators, Bitwise Operators, Other Operators, Operator Precedence. Control Statements: if, if...else and Nested if...else, switch case, break and continue, Loops - for loop, while loop, do while loop, goto. **Arrays and Strings:** 1D array, 2D array, Strings, String functions. **Function:** Basics, call by value, call by reference & return by reference, Inline function, overloading Functions, inline Functions, Recursive Functions. **Pointers:** Pointer, Dynamic Memory Allocation.

Module II Object Oriented Concepts

Classes and Objects, public, private, protected. **Constructors and destructors**: Overloaded Constructor, Copy Constructor, Shallow Copying Deep Copying. **Overloading:** this' Pointer, structs vs Classes, Friends of a class, Operator Overloading, Inheritance, Overloading vs Overriding, Polymorphism, Virtual Functions, Pure Virtual Functions and Abstract Classes.

Module III Files and Generic Programming

Abstract Classes as Interfaces, Exception, Files, Streams and I/O, STL, Generic Programming, Lambda Expression.

Lab Co	mponent
S.No.	Lab Exercise
1.	Practice of C Programming using Branching and Iterative constructs.
2.	Programs using arrays and strings.
3.	Programs using Functions.
4.	Programs using Structures and Pointers.
5.	Programs using classes and objects.
6.	Programs using constructor and destructor.
7.	Programs using method overloading, operator overloading and polymorphism concepts.
8.	Programs using friend class.

9.	Programs using virtual functions and abstract class.
10.	Programs using inheritance concepts.
11.	Programs using exception handling concept.
12.	Programs using Files.
13.	Mini project
	Total Hours 75 Hours
Text B	ooks:
1.	E Balagurusamy,"Object Oriented Programming With C++", 4th Edition, Tata McGraw-Hill
	Education, 2008.
2.	YashavantP. Kanetkar, "Let us C++", BPB Publications, 2020.
3.	M. Sprankle, "Problem Solving and Programming Concepts", 9th Edition, Pearson Education,
	New Delhi, 2011.
Refere	nce Books:
1.	Herbert Schildt, "The Complete Reference C++", 4th edition,MH, 2015.
2.	John Hubbard, "Schaum's Outline of Programming with C++", MH, 2016.
Web R	eferences:
1.	https://www.geeksforgeeks.org/c-plus-plus/
2.	http://web.stanford.edu/class/cs106l/
Online	Resources:
1.	https://nptel.ac.in/courses/106101208
2.	https://www.hackerrank.com/domains/cpp
3.	https://codeforces.com/blog/entry/74684
4.	https://www.hackerearth.com/practice/notes/tricky-and-fun-programming-in-c/

	Continuous Assessment												
	Theory	Р	Practical		Total	Total	End Semester	Total					
Formative Assessment	Summative Assessment	Total	Total (A)		Summative Assessment		(A+B)	Continuous Assessment	Practical Examination				
80	120	200	100	75	25	100	200	50	50	100			

Formative Assessment based on Capstone Model - Theory											
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]								
C101.1	Understand	Quiz	20								
C101.2 & C101.3	Apply	Assignment	20								
C101.4	Apply	Group Assignment	20								
C101.5	Apply	Case Study	20								

Asses	sment	base	d on	Sumr	nativ	e Ass	ess					ssme	nt (15	5%)				
Bloom	n's Leve	el						oun	ma		20 Ma			, , , ,				
				CI	A1: (6	60 Ma	arks)	CI	42: (60 M	arks)						
Remer	nber			20						20								
Unders	stand				40													
Apply						40								50				
Analys	e					-								-				
Evalua	ite					-								-				
Create	•					-								-				
Asses	sment	base	d on	Conti	nuou	s and	d En	d Ser	nest	ter E	xami	inatio	n - Pr	actic	al			
Bla	oom's L	ovol			Con	tinuo		Asses 0 Mar		ent (25%)			-	Semest aminat			
DIC		.evei		FA: (75 Marks)						A: (25 M	arks)			[100 N	•	0 /0)	
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Unders	stand			30					20					20				
Apply				50					50					50				
Analyse						10					10				1()		
Evalua	ite					-					-			-				
Create						-					-				-			
Asses	sment	base	d on									cal Ex	amin	atior	1	1		
				Co	ntinu	ous /	Asse	essmo	ent (50%)					_		
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)	(20 M	arks) (2	20 Ma	rks))		(20 N	lark	s)	(20	Marks)))			
	ourse															ogran		
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C101.2			3	3	3	2	2				2	1		3				
C101.3			3	3	3	3	3				3	2		3				
	101.5		3	3	3	3	3				2	2		2				
	C101		3	3	3	3	3				3	2		2			1	
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23EE115	Fundamentals of Electrical and Electronics Engineering Labo (Common to MECH and CIVIL)	ratory	0/0/2/1								
Nature of C											
Pre-requisi	tes : Nil										
Course Ob											
1	To learn the safety precautions and troubleshooting in using Electricity.										
-	To estimate the current flow and voltage across the circuit elementsu	nder differer	nt loading								
2	conditions.										
3	To understand the basic components for electrical installations.										
Course Ou Jpon com	comes: Dietion of the course, students shall have ability to										
C115.1	Illustrate Electrical and Electronic components and its specifications.		[U]								
C115.2	Verify the current flow and voltage across the circuit elements using different [A]										
C115.3	analysis method.										
C115.3 C115.4	Measure power and power factor of single and three phase AC circuits.										
C115.4 C115.5	Comprehend the cut-out sections of DC Motor and Induction Motor. Utilize the basic components for electrical installations.										
Course Co			[AP]								
	intents.										
S.No	List of Experiments	CO	RBT								
5.140	List of Experiments	Mapping	КЫ								
1	Demonstration of meters, electrical and electronic components with										
•	specification.	C115.1	[U]								
2	Safety precautions with electrical components.	C115.1	[U]								
3	Troubleshooting of electrical equipment.	C115.1	[A]								
4	Testing of CRO and Electronic components using Multimeter.	C115.2	[A]								
5	Determination of mesh current by Mesh Analysis.	C115.2	[A]								
6	Estimation of Voltage and Current in star and delta connections.	C115.2	[A]								
7	Measurement of power and energy.	C115.3	[A]								
8	Soldering practice - Components devices and Circuits using general										
0	purpose PCB.	C115.5	[A]								
9	Residential house wiring.	C115.4	[A]								
10	Demonstration of cut-out sections of DC Motor and Induction Motor.	C115.3	[U]								
11	Demonstration of components of LT Switch Gears.	C115.5	<u>[U]</u>								
12	Familiarization of digital basic gate ICs.	C115.5	[U]								
12	Total Hours	30	• •								
Fext Books											
1	Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Mach Hill, 7 th edition, 2020.	inery', Tata I	McGraw								
2	Vincent. Del. Toro, "Electrical Engineering Fundamentals", Prentice Hal 2015.	l India, 2 nd e	dition,								
3	E. Hughes, "Electrical and Electronics Technology", Pearson, 10th edition	on, 2011.									
4	Donald .A. Neamen, Electronic Circuit Analysis and Design, 2 nd Edition Graw Hill, 2013.		Мс								
Reference	•										
1	Charles A.Gross, Thaddeus A.Roppel, "Fundamentals of Electrical Eng 2012.	ineering", Cl	RC press								
2	D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, Revise	d 1 st edition	2017.								
3	Theodore F. Bogart, Jeffery S. Beasley and Guilermo Rico, 'Electronic Pearson Education, 6 th edition, 2013.										

Web Ref	erences:	
1	http://nptel.ac.in/course.php?disciplineId=108	
2	https://ocw.mit.edu/courses/find- bytopic/#cat=engineering&subcat=electricalengineering&spec=electricpower	
3	https://nptel.ac.in/video.php?subjectId=117103063	

	Continuous Assessment									
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total					
75	25	100	60	40	100					

Assessment bas	ed on Continuous and End	d Semester Examination	
	Continuous As [100	End Semester Practical	
Bloom's Level	FA (75 Marks)	SA (25 Marks)	Examination (40%) [100 Marks]
Remember	0	0	0
Understand	30	30	30
Apply	30	30	30
Analyse	40	40	40
Evaluate	0	0	0
Create	0	0	0

No. of	PO	PO	PO	PO	PO	PO	PO	PO	PO	PO1	PO1	PO1	PSO	PSO2	PSO3
the CO	1	2	3	4	5	6	7	8	9	0	1	2	1		
C115.1	3	1											3		
C115.2	3	1													
C115.3	3	1													
C115.4	3	2													
C115.5	3	1													
1	Reasonably Agreed		2	Moderately Agreed					3		Strong	y Agree	ed		

23MC101	(FOR	INDUCTION PROGRAMME ALL BRANCHES OF B.E / B.TECH/ M.TECH PROGRAMMES)	1/0/0/0							
Nature of C	ourse	InductionProgramme								
Pre requisi	tes	Nil								
Course Objectives:										
1.	To have broad understanding of society and relationships									
2.	To nurture the character and fulfil one's responsibility as an engineer, a citizen and a human being									
3.	To incorpo	rate meta skills and values								
Course Ou	tcomes:									
Upon comp	oletion of th	he course, students shall have ability to								
C101.1	Explore ac	ademic interest and activities	[AP]							
C101.2	Work for ex	xcellence	[AP]							
C101.3	Promote bonding and give a broader view of life and character [AP]									
Course Co	ntents:									

PHYSICAL ACTIVITY: Research over the past years has shown Yoga to have stress-relieving powers on students, paving the way for improved academic performance with the practice of asanas, meditation and breathing exercises. To prove these words Yoga classes has been planned in this module.(CO mapping: C101.1, C101.2, C101.3)

CREATIVE ARTS (students can select any one of their choice): Cultural development supports students to understand, feel comfortable with, value and appreciate the potential enrichment of cultural diversity. They should challenge discrimination, whether based on cultural or racial difference. Students should experience cultural traditions embedded in arts, crafts, language, literature, theatre, song, music, dance, sport, Science, technology and travel. Students should develop an appreciation of beauty both in experiencing artistic expression and by exploring their own creative powers. To inculcate those skills they are given a chance to exhibit their talents through painting, sculpture, pottery, music, dance, craft making and so on. .(CO mapping: C101.1, C101.2, C101.3)

UNIVERSAL HUMAN VALUES: Moral development involves supporting students to make considered choices around their behaviour and the values that provide a framework for how they choose to live. Moral development is also learning about society's values, understanding the reasons for them, how they are derived and change; and how disagreements are resolved. Students must consider the consequences of personal and societal decisions on the wider community – local and global- and on the environment and future generations. To acquire this the students are exposed to training to enhance their soft skills. .(CO mapping: C101.1, C101.2, C101.3)

LITERARY AND PROFICIENCY MODULES: Social development helps students to work effectively together, developing the inter-personal skills required to relate positively with their peers and people of all ages. Students must also understand how to participate productively in a diverse and plural society and learn about, and how to effectively engage with societal institutions and processes. They should understand that a person may have different roles and responsibilities within society. To reach this the

following aspects are given in the form of Reading, writing, speaking – debate, role play etc.Communication and computer skills. (CO mapping: C101.1, C101.2, C101.3)

LECTURES BY EMINENT PEOPLE: Teaching with Lectures. ... It is essential to see lectures as a means of helping students learn to think about the key concepts of a particular subject, rather than primarily as a means of transferring knowledge from instructor to student. During the induction period students will attend to Guest lectures by subject experts.(CO mapping: C101.1, C101.2, C101.3)

VISIT TO LOCAL AREAS: Traveling is in fact a way of learning to learn. You are out of your comfort zone and so you must learn to be able to adapt to a new learning environment in a very short time. It also helps in your overall learning as well. In the induction period students will be taken to different places near college to learn new things. Eg.Meditationcentre/orphanage/Hospital.(CO mapping: C101.1, C101.2, C101.3)

FAMILIARIZATION TO DEPARTMENT/BRANCH INNOVATION: Hod's of different branches will present about their department followed by department visit to view various facilities available at their department, new innovations from students and faculties etc. (CO mapping: C101.1, C101.2, C101.3)

Cour	Course Articulation Matrix (Lab)														
со	P 0 1	P 0 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	P O 10	P 0 11	P 0 12	PS O 1	PS O 2	PS O 3
1						3	3	3	3	3	3	3			
2						3	3	3	3	3	3	3			
3						3	3	3	3	3	3	3			
Av g						3	3	3	3	3	3	3			
1	Re	asona	bly ag	reed	2	Moderately agreed						3 Strongly agreed			

Semester – 02

NI . 4	23ME201 ENGINEERING MECHANICS 3/0/									
Nature of	f Course	Concepts and Analytical								
Pre-Requ	uisites	Fundamentals of basic mathematics and physics								
Course C	Objectives:	·								
1	To make th	ne students understand the vector and scalar representation of f	forces and							
	moments and the static equilibrium of particles and rigid bodies.									
2	2 To understand the effect of friction on equilibrium, laws of motion, kinematics of motion and									
	their interrelationship.									
3	To make th	ne students understand the properties of surfaces and solids, pro	ediction of							
	behaviour of	f particles and rigid bodies under motion.								
Course C	Dutcomes:									
	mpletion of t	the course, students shall have ability to								
C201.1		Ilustrate the basic concepts of force system	[U]							
C201.2		e resultant force, moment and geometrical properties of 2D, objects	[Ap]							
C201.3	Analyse the	resistance force of objects for impending motion	[A]							
C201.4		he displacement, velocity and acceleration of particles and objects.	[Ap]							
C201.5		he dynamic forces exerted in various mechanisms of planar motion	[Ap]							
	Contents:	les and Rigid Bodies: Force Systems – Basic concepts, Laws of N								
centroid c Moment c theorem, to Mass n Friction: T blocks on Dynamic relationsh	of composite s of inertia of p Moment of in noment of ine Types of frict ly. s of Particle of Particles:	ion, Limiting friction, Laws of friction – Static Friction-simple contac es: Kinematics of Particles: Displacements, Velocity and acceleration (Horizontal only), projectile motion. D'Alembert's principle and its applications; Work-kinetic energy	- Definition, dicular axis ntroduction at friction in ation, their y, Impulse-							
centroid of Moment of theorem, to Mass n Friction: T blocks on Dynamic relationsh Kinetics momentu	of composite s of inertia of p Moment of in noment of ine Types of frict ly. s of Particle nip in linear m of Particles: <u>m</u> .	sections; Centre of Gravity and its implications; Area moment of inertia- lane sections from first principles, Parallel Axis theorem and perpend nertia of standard sections and composite sections (problems only); In ertia. ion, Limiting friction, Laws of friction – Static Friction-simple contact es: Kinematics of Particles: Displacements, Velocity and acceleration notion (Horizontal only), projectile motion.	- Definition, dicular axis ntroduction t friction in ation, their							
centroid c Moment c theorem, to Mass n Friction: blocks on Dynamic relationsh Kinetics momentu	of composite s of inertia of p Moment of in noment of ine Types of frict ly. s of Particle ip in linear m of Particles: m. bks: Beer F.P, a	sections; Centre of Gravity and its implications; Area moment of inertia- lane sections from first principles, Parallel Axis theorem and perpendentia of standard sections and composite sections (problems only); In- ertia. tion, Limiting friction, Laws of friction – Static Friction-simple contact es: Kinematics of Particles: Displacements, Velocity and accelera- notion (Horizontal only), projectile motion. D'Alembert's principle and its applications; Work-kinetic energy	Definition, dicular axis ntroduction at friction in ation, their , Impulse- 45							
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Web Refe	erenc	es:													
1	http:	//npte	el.ac.i	in/cou	urses/	1221	0401	5/							
2	http:	//npte	el.ac.i	in/cou	irses/	1121	0310	9/							
Online Re	esour	ces:													
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Cour															FA
Cour Outco		E	Bloon	n's Lo	evel			Ass	essm	ent C	Comp	onen	t		(16%)
														[80) Marks]
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C201								CIIL							
C201		— A	pply			Tut	orial								20
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				Sum	mativ	ve As	sses	smen	t (24%	6)		Er	d Semest	er Exar	nination
Bloom's	Leve	I				[120	Marl	(s]					(60%)	
			CIA	1 : [6	0 Ma	- rks]		CIA2	: [60	Mark	s]		[100	Marks]	
Remembe	ər			2	0				20					20	
Understar	nd			3	0				30					30	
Apply				2	0				20					20	
Analyse				3	0				30					30	
Evaluate					-				-					-	
Create					-				-					-	
Assessm	ent b	ased									mina	tion			
			C	ontir					(40%))					
	CA 1	· 100) Mar	ks	[4		larks	<u>></u>		: 10) Ma	rks			Semester
				Marks	s)			•) Marl	(S)		nination
SA 1 (60	Com				ponei	nt	SA		Con	pone	· · ·		ponent -	•	60%) Marks]
(00 Marks)		- I			· II		6) Mar		_	- 1			II	[100	iviai koj
,	<u> </u>	larks			/larks					Mark			Marks)		0
Outcome			eΟι	itcon	nes (CO)	with	Pro	grami	ne C	utco	omes	(PO) Pro	grammo	e Specifi
		•,				Р	Os							PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	3		1	-		-	+ •	–	-				2		
C201.2	3	2	2										3	1	
C201.2	3	3	3				+						3	+ ·	
C201.3	3	2	3										3	1	
C201.4	3	2	2										3	1	
0201.0	3		I	<u> </u>	<u> </u>	<u> </u>			<u> </u>		<u> </u>	<u> </u> 			<u></u>
		L	3 S	trong	ly agr	reed	2	Mod	eratel	y agr	eed	1	Reasonabl	y agree	d

23ME202		INDUSTRIAL METALLURGY	3/0/0/3
Nature of C	ourse	Theory concepts	
Pre Requisi	tes	Engineering Physics	
Course Obj	ectives:		
1	To impa	rt knowledge on phase diagrams and use of phase diagrams	
2	To unde	erstand the heat treatments processes and apply the same to modify the	material
	propertie	es.	
3	To impa	rt knowledge on various metals and non-metals and its applications	
4	To dem	onstrate the various material testing methods.	
Course Out	comes:	ž	
Upon comp	letion of	the course, students shall have ability to	
C202.1	Recall	the various metallic and non-metallic materials properties and	[R]
	applicat	ions	
C202.2	Interpre	t the structure mechanisms that contributing properties of materials	[U]
C202.3	Describe	e the alloy, phase diagrams and the use of phase diagrams.	[U]
C202.4	Identify	and executing the heat treatment processes and coatings to modify the	[Ap]
		es of materials.	- • •
C202.5	Impleme	ent the various testing procedures to study the properties of materials.	[Ap]
Course Cor	tents:		

Structure and phase diagrams: Atomic structure – atomic binding - characteristics of covalent bond, ionic bond and metallic bond – Crystal structure - BCC, FCC, HCP - Mechanism of Crystallization-Nucleation and growth –grain and grain size – constitution of alloys - solid solutions - Phase diagrams-cooling curves- phase rule- lever rule – application of phase rule and lever rule in Cu-Ni phase diagram - Iron and carbon phase diagram – phases and reactions in iron-carbon diagram – classification of steel and cast iron – properties and applications- specification of steel.

Heat treatment of steel: Definition – purposes – types - annealing, normalizing, hardening and tempering of steel – hardenability - jominy end quench test - TTT diagram for eutectoid steel – continuous cooling curve and interpretation of final microstructure – austempering and mar tempering - surface modification - case hardening - carburising, nitriding, carbonitriding, flame, induction, electron beam and laser beam hardening- coating - PVD process using plasma -

Materials, Mechanical properties and testing of materials: Effect of alloying elements on steel - stainless steel, HSLA steel, Maraging steel– properties and applications of nickel, magnesium, copper, titanium and aluminium alloys - precipitation hardening – polymers - Thermoplastics and thermosets, properties and applications (ABS, PA, PPO, PEEK, UF, PF and epoxy) –Ceramics - properties and applications of SiC, Al₂O₃ and PSZ – introduction to composites and smart materials (SMA) - mechanical properties of materials - metallography – specimen preparation and optical microscope and scanning electron microscope -- Deformation – slip and twinning - fractures – types of fractures – testing under tension, compression and shear loads - hardness tests – impact test – fatigue test- creep test- corrosion test- wear test – ASTM for above testing methods – Non destructive testing – liquid penetrant test, ultrasonic test and magnetic particle inspection.

	Total Number of Theory Hours 45
Text	Books:
1	William D. Callister Jr., David G. Rethwisch, 'Material Science and Engineering – An
	introduction' 10th edition, Wiley India, 2018.
2	Kenneth G Budinski and Michael K Budinski, "Engineering Materials properties and selection",
	PHI learning private limited, 9 th edition, 2016.
Refer	ence Books:
1	Sidney.H Avner, "Introduction to Physical Metallurgy", McGraw Hill Education, 2 nd edition, 2017.
2	G. E.Dieter, Mechanical Metallurgy, McGraw Hill, 3 rd edition, 2017.

Web Refe				,											
<u>1</u> 2		el.iitm.a													
2	ww	w.scier						allurg	y.ntm	11					
		C	Conti	nuous	s Ass	essm	ent								
Formative Assessment				ve Assessmen			Total Conti			la		End Semester Examination		Total	
80 120								00		40			60		100
Assessme	ent Met	nods 8	Lev	els (b	ased	on B	loom	s' Tax	konoi	my)					
Formative	Asses	sment	base	d on	Caps	tone	Mode	el							
Course Outcome	Bloc	om's Lo	evel				Asse	ssme	nt Co	mpor	nent				A (16% 0 Mark
C202.1	Rem	ember		Quiz	2										20
C202.2	Unde	erstand	1	Assi	gnme	nt									20
C202.3	Unde	erstand		Assi	gnme	nt									20
C202.4 C202.5	— Appl	у		Pres	sentati	on / s	semin	ar							20
Assessme	ent base	ed on S	Sumr	native	e and	End	Seme	ester	Exam	ninatio	n				
Bloom's L	evel				-	Mark	ks]	•			Enc		(609	%)	inatio
		CIA	41 : [60 Ma	arks]		CIA2	: [60	Mark	s]]	100 M	arks]	
Remembe				50 20					20						
Understan	d			50	<u>- 30</u> - 50						40 40				
Apply Analyse				-	- 50				40)					
Evaluate				-					-						
Create				-				-					-		
Assessm	ent bas	ed on								minat	ion				
			Con	tinuo	us As			(40%)						End
	CA 1 :	100 M	arks		[200	wark:	Sj	C.4	2 • 1	00 Ma	arks				mester
SA 1		FA 1 (4		rks)		6	A 2			A 2 (4		ks)		Exar	ninatio
(60	Compo	onent -	Co	mpor	nent -		60	Со	mpor	ent -	Со	mpon	ent -	•	60%)
Marks)	ו (20 M	arks)	C	ll 20 Mai	rks)		arks)	0	ו 20 Mai	rks)	(2	ll 0 Mar	ks)	[100	Mark
Mapping Outcomes	of Cou					with	Prog							mme	Speci
						P	Os							PSC	Ds
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C202.1	3	1	1											2	
C202.2	3	1	1											2	
C202.3		1	2									<u> </u>		2	
C202.4		2	3											2	
C202.5		2	3							1				3	
		Strong	-	reed	2	Mode	rately	adre	ed	1 R	ason	ably a	agreed		

23MA2	204	CA	ALCULUS AND FOURIER SERIES	3/1/0/4					
Nature of	Cours	e	J (Problem analytical)						
Pre requi	sites		-						
Course O	bjectiv	es:							
1 To gain knowledge in integrals, which are needed in engineering applications.									
2									
3			oncepts of differential and Integral calculus which a	re applicable in					
		branches of e							
4	To fa	miliarize with	the concepts of vector calculus needed for p	roblems in all					
		ering discipli							
5	To un	derstand the o	different possible forms of Fourier series.						
Course O	utcom	es: (Theory)							
Upon cor			se, students shall have ability to						
C204.1	Deter	mine the Cur	rvature and Evolutes by applying the techniques	of [R]					
0204.1		entiation.							
C204.2		•	erstanding of integration techniques needed	for [U]					
0204.2			ering disciplines.						
C204.3			gral ideas in solving areas, volumes and other practi	cal [AP]					
0204.0	proble								
C204.4		entiate and in ations.	tegrate a vector-valued functions to solve real wo	rld [AP]					
C204.5	Apply	Fourier serie	s solutions to the engineering problems	[AP]					
Course C	ontent	S							
MODULE	I - DIFI	ERENTIAL A	AND INTEGRAL CALCULUS	(20 Hrs)					
Curvature	, Centr	e, Radius ar	nd Circle of curvature in Cartesian co-ordinates	- Evolutes -					
Envelopes	s – Evo	lute as envelo	ope of normals. Definite integrals: Evaluation of d	efinite integrals					
using Ber	noulli's '	formula - Dou	ble integration in Cartesian coordinates – Area as	double integral					
 Triple in 	tegratio	n in Cartesiar	n coordinates –Volume as triple integral						
MODULE	II - VE	CTOR CALCI	JLUS	(20 Hrs)					
Vector dif	ferentia	l operator – G	Bradient and Directional derivatives – Angle betwee						
- Divergence and Curl - Scalar potential - Equation of the tangent plane and normal line -									
Irrotational and Solenoidal vector fields -Vector integration: Green's theorem in a plane. Gauss									

Irrotational and Solenoidal vector fields –Vector integration: Green's theorem in a plane, Gauss divergence theorem and Stoke's theorem (excluding proofs) - Simple applications involving cubes and rectangular parallelepipeds.

MODULE III – FORIER SERIES

(20 Hrs) Fourier series: Dirichlet's conditions - General Fourier Series : Problems under $(0,2\pi)$ - Problems under (0,2l) - Odd and Even Functions : Problems under ($-\pi$, π) - Problems under (-l,l) - Half range sine series and cosine series - Parseval's Identity.

	Total hours 60
Text Bo	oks:
1.	G.B.Thomas and R.L.Finney, Calculus and Analytic Geometry, 14 th Edition, Pearson, Reprint,2018.
2.	Kreyszig. E, "Advanced Engineering Mathematics" Tenth Edition, John Wiley and Sons (Asia) Limited, Singapore 2020.
3.	Grewal. B.S, "Higher Engineering Mathematics", 44 th edition, Khanna Publications, Delhi, 2021.
Referen	ce Books:
1.	Veerarajan. T, "Engineering Mathematics II", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2018.

2.	Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, 5 th edition, 2018.
3.	N.P.Bali and Dr.ManishGoyal,"A Text book of Engineering Mathematics" 10 th edition, Laxmi publications ltd, 2020.
Web Re	ferences:
1.	https://ocw.mit.edu/courses/18-02sc-multivariable-calculus-fall-2010/
2.	https://archive.nptel.ac.in/courses/111/107/111107108/
3.	https://www.youtube.com/watch?v=jNC0jxb0OxE
Online F	Resources:
1.	https://www.coursera.org/learn/integration-calculus
2.	https://www.coursera.org/learn/vector-calculus-engineers
3.	https://www.coursera.org/learn/differential-equations-engineers

	Continuous Assessment								
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total				
80	120	200	40	60	100				

Assessme	Assessment Methods & Levels (based on Blooms' Taxonomy)									
Formative	Formative Assessment based on Capstone Model									
Course Outcome	-	oom's evel	Assessment Compo	Assessment Component FA (1 [80 Ma						
C204.1	Reme	mber	Quiz		20					
C204.2	Unde	rstand	Seminar		20					
C204.3 – C204.5	Apply		Tutorial		20					
C204.3 – C204.5	Apply		Assignment	Assignment						
Assessme	Assessment based on Summative and End Semester Examination									
Summative Assessment (24%)End Semester ExaminationBloom's Level[120 Marks](60%)										

Bloom's Level	[120 N	larks]	(60%)
	CIA1 : [60 Marks]	CIA2 : [60 Marks]	[100 Marks]
Remember	20	20	20
Understand	30	30	30
Apply	50	50	50
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-

Assessn	Assessment based on Continuous and End Semester Examination										
		[200	Marks]			End					
	CA 1: 100 Ma	arks		CA 2: 100 M	arks	Semester					
	FA 1 (4	0 Marks)		Examination							
SA 1 (60 Marks)	Compone nt - I (20 Marks)	Component - II (20 Marks)	SA 2 (60 Marks)	Compone nt - I (20 Marks)	Component - II (20 Marks)	(60%) (100 Marks]					

Course		Programme Outcomes (PO)								Programme Specific Outcomes (PSO)					
Outcomes (CO)	1	2	3	4	5	6	7	8	9	1 0	1	1 2	1	2	3
C204.1	1	1	1												
C204.2	1	2	1												
C204.3	3	3	2												
C204.4	1	1	2												
C204.5	2	1	2												

23TA201	TAM	llLS AND TECHNOLOGY / தமிழரும் தொழில்நுட்பமும்	1/0/0/1		
Nature of Course: C (Theory Concept)					
Pre requisit	tes:	NIL			
Course Obj	ectives:				
1	To know a	bout weaving, ceramic, design and construction technologies in sanga	ım age.		
2	To know th	ne significance of technologies such as manufacturing, agriculture and i	rrigation.		
3	To underst	tand the development of Scientific Tamils and Tamil Computing.			
Course Out	comes:				
Upon comp	letion of th	he course, students shall have ability to			
C201.1	Describe a	about the weaving industry in sangam age and ceramic technology.	[U]		
C201.2	Observe th	he design of houses, sculptures and construction of temples.	[U]		
C201.3	Relate the	various manufacturing materials and stone types in Silappathikaram.	[U]		
C201.4	Understan period.	d the significance of agriculture and irrigation technology in ancient	[U]		
C201.5	Explain the books.	e growth of scientific Tamil, Tamil computing and digitization of Tamil	[U]		

Course Contents:

Weaving and Ceramic Technology: Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries. **Design and Construction Technology:** Designing and Structural construction House & Designs in household materials during Sangam Age -Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places -Temples of Nayaka Period - Type study (Madurai Meenakshi Temple) - Thirumalai Nayakar Mahal -Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period.

Manufacturing Technology: Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel - Copper and gold - Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads - Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram. **Agriculture and Irrigation Technology:** Dam, Tank, ponds, Sluice, Significance of KumizhiThoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.

Scientific Tamil & Tamil Computing: Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.

Total Hours: 15

Text-cu	m-Reference Books:
1	தமிழகவரலாறு – மக்களும்பண்பாடும் – கே.கே.பிள்ளை(வெளியீடு:
	தமிழ்நாடுபாடநூல்மற்றும்கல்வியியல்பணிகள்கழகம்)
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம் . (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்ககாலநகரநாகரிகம்
3	(தொல்லியல்துறைவெளியீடு)
4	பொருநை – ஆற்றங்கரைநாகரிகம். (தொல்லியல்துறைவெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International
0	Institute of Tamil Studies.
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu)
/	(Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by:
0	International Institute of Tamil Studies.)

9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author).
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu).
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

	Continuous Assessm	nent			
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessmen	t Meth	ods & Le	vels (based or	n Blooms'	Taxonomy)				
Formative A	ssess	sment bas	ed on Capsto	ne Model					
Course Outcome	Bloo	m's Level		Assessn	nt	FA (16%) [80 Marks]			
C201.1	Unde	rstand			Seminar		20		
C201.2	Unde	rstand			Quiz		20		
C201.3	Unde	rstand			Quiz		20		
C201.4 C201.5	Unde	rstand			Seminar		20		
Assessmen	t base	ed on Sum	mative and E	nd Semest	er Examinatio	n			
Bloom's Lev	vel	Si	ummative Ass [120 N		24%)	End Semester Examination (60%)			
		CIA1 :	[60 Marks]	CIA2 :	[60 Marks]	[100 Marks]			
Remember			40		40	40			
Understand			60		60	60			
Apply			-		-	-	-		
Analyse	nalyse		-		-	-			
Evaluate			-		-	-			
Create			-		-	-			
Assessmen	t base				ter Examinatio	n			
		Co	ntinuous Asse	•	10%)				
			[200 Ma	arks]			End Semester		
	CA 1 :	100 Mark			CA 2 : 100 Ma	_	Examination		
	_	FA 1 (40		SA 2	· · · · · · · · · · · · · · · · · · ·	FA 2 (40 Marks)			
SA 1 (60 Marks)	Com	ponent - I	Component - II	(60 Marks)	Component - I	Component - II	(60%) [100 Marks]		
	(20	Marks)	(20 Marks)	iviai r.3)	(20 Marks)	(20 Marks)			

Course Outcome		Programme Outcomes (PO)											P Out	rogram Specif comes	ime ic (PSO)
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1										1		1			
C201.2										1		1			
C201.3										1		1			
C201.4										1		1			
C201.5										1		1			

23PS101	PHYSICAL SCIENCE (Common to I Year B.E. – CIVIL & MECH) 4/0/0/4									
Nature of (2011/20	· E (Theony beand)								
		: E (Theory based)								
Pre requisi		: Fundamental knowledge in applied sciences								
Course Ob										
1		e fundamental concepts of physics and apply this knowledge to both s ering problems.	cientific							
2		he students enrich basic knowledge in various fields such as Os tromagnetism and crystallography.	cillation,							
3		tand the principles and applications of electrochemistry and ytical methods.	earning							
4		e effect of corrosion in materials and the methods for prevention of co e the knowledge of various energy sources and storage devices.	rrosion,							
5	To unders spectrosco	tand the concepts of photophysical and photochemical proce	sses in							
Course Out	tcomes:									
Upon comp	pletion of the	course, students shall have ability to								
C101.1	Understand	the basic concepts of oscillation, laser and Electromagnetic waves.	[U]							
C101.2		electric and magnetic fields, and predict the behaviour of netic waves	[AP]							
C101.3	Estimate th and Unit ce	e Atomic packing, acquire the basic knowledge about Crystal Lattice	[U]							
C101.4		the principle and working of reference electrodes, and acquire the of corrosion control technique and energy sources.	[U]							
C101.5	Let a man a t th	e principle and working of analytical techniques.	[AP]							

Course Contents:

Harmonic oscillations, Laser and Electromagnetic waves: periodic motion – Simple harmonic motion: characteristics of simple harmonic motion – Simple spring-mass system – Resonance **Laser:** Characteristics of laser – Principle of spontaneous emission and stimulated emission – Population inversion – Pumping – Different types of lasers: CO₂– Qualitative industrial applications of lasers: welding, drilling and cutting.

Electromagnetic waves: Concept of Del operator, gradient, divergence and curl operators - Gauss divergence theorem, Stokes theorem. Gauss law of electricity, Gauss law of magnetism, Biot-Savart law and its application: Magnetic field due to Line charge – Ampere's law and its application: magnetic field due to a solenoid, Faraday' law of electromagnetic induction.

Crystallography and Electrochemistry: crystal system – lattice –Bravais lattice, calculation of atomic packing factor for simple cubic, body centered cubic, face centered cubic and hexagonal close packed lattice – Miller indices – Crystal imperfections – Point and line imperfections.

Electrochemistry: Electrochemical cells-electrolytic cell-reversible and irreversible cells - Free energy and emf series, cell potentials, Nernst equation and applications. Oxidation and reduction potentials-standard hydrogen electrode, saturated calomel electrode, glass electrode-pH-measurement.

Corrosion and Energy sources, Spectroscopic techniques: Introduction-types–mechanism of dry and wet corrosion-protective coatings-electroplating of gold-electroless plating of nickel. Energy Sources-Fuel cells (H₂-O₂). Storage Devices-Batteries-Alkaline, Lead acid, Nickel cadmium and Lithium-ion batteries.

Spectroscopic techniques: Spectroscopy-Beer Lambert's law, principle, instrumentation, and applications of electronic spectroscopy (UV-visible), Vibrational and rotational spectroscopy (IR) and Flame emission spectroscopy (FES).

	Total Hours:	60
Text Boo	ks:	
1	Rajendran, V "Engineering Physics" Mc Graw Hill Publications ltd, New Delhi, 2017.	
2	David Halliday, Robert Resnick, Jearl Walker "Fundamentals of Physics", 11th edition	on,
	Wiley, 2018.	
3	Gaur, R.K. and Gupta, S.L., "Engineering Physics", DhanpatRai Publishers, 2017.	
4	Bhattacharya, D.K. and Poonam, T., "Engineering Physics ", Oxford University Pres	SS,
	2017.	
5	Dara S.S, Umare S.S, "Engineering Chemistry", First revised Edition by S. Chand	&
	Company Ltd., New Delhi 2015.	
6	Jain P. C. & Monica Jain., "Engineering Chemistry", 17th Edition, Dhanpat Rai Publishi	ng
	Company (P) Ltd, New Delhi, 2020.	
7	Fundamentals of Molecular Spectroscopy, 4 th Edition by C. N. Banwell Publishi	ng
	McGraw-Hill Book Company (P) Ltd, England, 2001.	
8	Physical Chemistry, 11 th Edition by P. W. Atkins Publishing Oxford University Press ((P)
	Ltd, United Kingdom, 2018.	
Referenc		
1	William T. Silfvast "Laser Fundamentals" Cambridge University Press, 2013	
2	R. Wolfson, "Essential University Physics", Volume 1 & 2. Pearson, 2020.	
3	William D CallisterJr, "Materials Science and Engineering-An Introduction", John Wil	ley
	and Sons Inc., NewYork, tenth edition, 2018.	
4	S.O. Kasap, "Principles of Electronic Materials and Devices", McGraw Hill Education	אכ,
	2017.	
5	David Griffiths 'Introduction to Electrodynamics' 4th Edition, Cambridge University Pre	SS
	2017.	
6	Avadhanulu M.N., Kshirshagar P.G., Arun Murthy TVS "A Text Book of Engineeri	ng
	Physics"S.Chand& Co Ltd, 2018.	
7	Richard P. Feynman. Robert B. Leighton, Matthew Sands "The Feynman Lectures	on
	Physics Vol. II": The New Millennium Edition.2015.	
8	Donald Neamen, "Semiconductor Physics And Devices: Basic Principles" McGraw-H	Hill
	Education, 2011	
9	Perez, Nestor, "Electrochemistry and Corrosion Science", Springer, 2016.	
10	Shikha Agarwal., "Engineering Chemistry and Applications", Cambridge Univers	ity
	press, 2016.	
11	Ghazi A.Karim. "Fuels, Energy and the Environment", CRC Press, Taylor and France	cis
	group, 2012.	

Web Refer	ences:
1	https://www.eatm.in/upload/sritunit_i_laser.pdf
2	http://hyperphysics.phy-astr.gsu.edu/hbase/index.html
3	https://physics.info/
4	https://nptel.ac.in/courses/115101005
5	https://archive.nptel.ac.in/courses/115/106/115106122/
6	https://archive.nptel.ac.in/courses/112/106/112106293/
7	https://www.kth.se//electrochem/welcome-to-the-division-of-applied-electrochemistry
8	www.corrosionsource.com/
9	https://www.sciencedirect.com/book/9780750646253/battery
10	http://www.rnlkwc.ac.in/pdf/study-material/chemistry/Spectroscopy
11	https://ocw.mit.edu/courses/chemistry
12	nptel.ac.in/courses/105106112/1_introduction/5_corrosion.pdf
13.	https://ocw.mit.edu/courses/chemistry

	Continuous Assessn	nent			
Formative Assessment	Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total
80	120	200	40	60	100

Assessment Me	thods & Levels ((based o	n Blooms' Taxonomy)							
Formative Asses	ssment based o	n Capsto	one Model							
Course Outcome	Bloom's Level	Assessment Component								
C101.1	Understand		Assignment -		20					
C101.2	Apply		Quiz – I		20					
C101.3	Understand	d Assignment - II								
C101.4	Understand		Ouiz II	20						
C101.5	Apply		Quiz - II							
Assessment bas	sed on Summati	ve and E	nd Semester Examination	tion						
Bloom's Level	Summa	itive Ass [120 M	essment (24%) arks]	End Semester Ex (60%)	amination					
	CIA1 : [60 M	larks]	CIA2 : [60 Marks]	[100 Mark	(s]					
Remember	30		30	30						
Understand	50		50	50						
Apply	20		20	20						
Analyse	-		-	-						
Evaluate	-		-	-						
Create	-		-	-						

Assessn	Assessment based on Continuous and End Semester Examination										
	Continuous Assessment (40%) [200 Marks]										
	CA 1 : 100 Marks CA 2 : 100 Marks										
SA 1	FA 1 (40) Marks)	SA 2	0 Marks)	Examination (60%)						
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	[100 Marks]					

Course Outcomes				Pro	grar	nme	Out	come	es (P	90)			_	Specific (PSO)	
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C101.1	3	2	2		1							1			
C101.2	3	2	2		1							1			
C101.3	3	2	2	1	1							1			
C101.4	3	2	2		1							1			
C101.5	3	2	2	1	1							1			

23IT211		INTRODUCTION TO PYTHON PROGRAMMING	1/0/4/3							
Nature of	Course	F(Theory Programming)								
Prerequisi	ites	Nil								
Course Ol	bjectives:									
1. To understand and execute Python script using types and expressions.										
2.	To understand the difference between expressions & statements and to understand the									
۷.	concept of ass	concept of assignment semantics.								
3.	To utilize high	To utilize high level data types such as lists and dictionaries.								
4.	To import and utilize a module and to perform read & write operations on files.									
Course Ou	utcomes									
Upon com	pletion of the o	course, students shall have ability to								
C211.1	Demonstrate	programs using simple python statements and	[U]							
0211.1	expressions.		[U]							
C211.2	Build control flo	ow and string concept in python for solving problems.	[AP]							
C211.3	Develop pytho	n programs using functions.	[AP]							
C211.4	Analyze compo	ound data using python lists, tuples and dictionaries.	[A]							
C211.5	Apply python p	Apply python programs using files, exception, modules and packages. [AP]								
	CONTENTO.									

COURSE CONTENTS:

DATA, EXPRESSIONS, STATEMENTS:

Data Types, Variables and Identifiers, Operators and Expression, Conditional Branching Statements, Iterative statements Nested Loops, Break, Continue, Pass statements, Function - definition and function call, arguments, return statements, Lambda Function and Recursive Function.

STRING, LISTS, FUNCTIONS:

Strings – Concatenation, Append, Comparing Strings, Iterating Strings, Strings Modules and Functions, Modules – NumPy, Math, List: Operations, Nested list, Cloning, Methods, Looping, Tuple: Operations, Nested Tuple, Tuple assignments, Checking the index, Dictionary: Operations, looping over and Nested Dictionary, Built in functions and Methods.

FILES, INHERITANCE:

Classes and Objects, Inheritance, Polymorphism, File Handling and Exception Handling.

Laborat	aboratory Component:									
S. No	List of Experiments									
1.	Compute the GCD of two numbers.									
2.	Find the square root of a number (Newton's method).									
3.	Exponentiation (power of a number).									
4.	Find the maximum of a list of numbers.									
5.	Linear search and Binary search.									
6.	First n prime numbers.									
7.	Multiply matrices.									
8.	Programs that take command line arguments (word count).									
9.	Extract the functionality of Book class in Library class.									
10.	File Handling									
	Total Hours 75									
Text Bo	oks:									
	Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2 nd Edition,									
1.	Updated for Python 3, Shroff / O'Reilly Publishers, 2016									
	(http://greenteapress.com/wp/think-python/).									
2.	Tony Gaddis, "Starting out with Python", 4th Edition, Addison Wesley, Pearson, 2017.									

Referen	ce Books:
1.	Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1 st Edition,
	2021.
2.	G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for
	Programmers and Data Scientists",1 st Edition, Notion Press, 2021.
	John V Guttag, "Introduction to Computation and Programming Using Python: With Applications
3.	to Computational Modeling and Understanding Data", 3 rd Edition, MIT Press, 2021.
Web Re	ferences:
1.	http://nptel.ac.in/courses/106106145/
2.	https://www.codecademy.com/learn/learn-python
3.	https://www.coursera.org/learn/python-data-analysis#syllabus
Online I	Resources:
1.	https://www.programiz.com/python-programming
2.	https://www.fullstackpython.com/best-python-resources
3.	https://www.udemy.com/course/easy-way-to-learn-python-for-beginners-2021/
4.	https://stackify.com/learn-python-tutorials/

	Continuous Assessment											
	Theory			F	Practical		End Semester					
Formative Assessment	Summative Assessment	Total	Total (A)	Formative Assessment				Total Continuous Assessment	Practical Examination	Total		
80	120	200	100	75	25	100	200	50	50	100		

Formative Assessme	ent based on Ca	pstone Model - Theory					
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]				
C211.1	Understand	Assignment - 1	20				
C211.2	Apply	Quiz	20				
C211.3	Apply	Assignment - 2	20				
C211.4	Analyze		20				
C211.5	Apply	Case Study	20				
Assessment based of	on Summative A	ssessment - Theory					
		Summative Assessme	ent (15%)				
Bloom's Level		[120 Marks]					
BIOOIII S Level	CIA	1: (60 Marks)	CIA 2: (60 Marks)				
Remember		10	10				
Understand		40	40				
Apply		40	40				
Analyse		10	10				
Evaluate		-	-				
Create		-	-				

	Continuous As [100	End Semester Examination (50%)			
Bloom's Level	FA: (75 Marks)	SA: (25 Marks)	[100 Marks]		
Remember	10	10	10		
Understand	30	30	30		
Apply	40	40	40		
Analyse	20	20	20		
Evaluate	-	-	-		
Create	-	-	-		

Asses	Assessment based on Continuous and End Semester Examination									
	Continuous Assessment (50%)									
	CA 1 (100 Mark	s)		CA 2 (100 Mar	ks)		cal Exam Marks)	End Semester		
	F/	A 1		F	A 2			Practical		
SA 1 (60M)	Component -I (20 Marks)	Component- II (20 Marks)	SA 2 (60M)	Component -I (20 Marks)	Component- II (20 Marks)	FA (75M)	SA (25M)	Examination (50%)		

Course Outcomes		Programme Outcomes (PO)										F Spec	Programme Specific Outcomes (PSO)		
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C211.1	1	2	1	1								2			
C211.2	3	3	3	3	2							2			
C211.3	3	3	3	3								2			
C211.4	3	3	3	3	3							2			
C211.5	3	2	3	3	3							1			

23CD20	1	DATABASE MANAGEMENT SYSTEMS	1/0/4/3						
Nature o	of Course:	D (Theory Application)							
Prerequi	isites:	Nil							
Course	Objectives:								
1	To introduo	ce fundamental concepts of Data Base Management Systems a	and						
	concepts o	of Relational Data Models.							
2	To explain	Relational algebra, Relational calculus and Normalization.							
3	3 To implement different relational model constraints and SQL queries.								
4	To manage Database using transactions, concurrency and query optimization.								
Course	Outcomes:								
Upon coi	mpletion of th	ne course, students shall have ability to:							
C201.1	Discuss the design	e basic concepts and various data models used in database	[U]						
C201.2	Illustrate R	elational algebra, Relational calculus and Normalization.	[AP]						
C201.3	Write SQL	commands and Subqueries with Constraints.	[AP]						
C201.4		Appropriate transactions, views, cursors and triggers to	[AP]						
		e given task.							
C201.5	Analyze database storage structures, query processing and recovery [A] system.								

Course Contents: MODULE I INTRODUCTION

Introduction to DBMS, Characteristics of DBMS, DBMS vs File Systems, need for DBMS, Three Level DBMS Architecture, Data Models – Introduction, Benefits, and Phases, ER Diagrams – Symbols, Components, Relationships, Weak entities, Attributes, Cardinality, Relational Algebra, Domain Relational Calculus, Tuple Relational Calculus, Normalization - 1NF, 2NF, 3NF, BCNF, 4NF

MODULE II CONSTRAINTS AND SQL COMMANDS

DDL Commands - Create, Drop, Alter, Truncate, Rename, Keys - primary Key, Foreign Key DML Commands - Select, Insert, Update, Delete, Any, All, In, Exists, Non Exists, Union, Intersection, Subqueries - nested, correlated, Joins- Inner, Outer, and Equi, Functions - SUM, COUNT, AVG, MIN, MAX, Clauses - Group By, Having By, Embedded SQL, Dynamic SQL, Transaction Concepts – Transaction model – ACID Properties – Serializability –Transactions as SQL statements.

MODULE III QUERIES AND TRANSACTIONS

Creation and Dropping of Views, Creation and Execution of Stored Procedures Cursors and Triggers - Opening, Fetching and Closing, Creation, Insertion, Deletion and Updating Database Applications: Payroll Processing Systems, Railway Reservation Systems, Bank Management System Introduction, Storage media and file structures, B+ Tree Hashing – static and Dynamic, Introduction to Query Processing – Issues in query optimization – Steps in query processing, Concurrency control and transactions, Lock based protocols Recovery System – Failure classification

Lab Experiments:

- 1. Conceptual Database design using E-R DIAGRAM
- 2. Implementation of SQL commands DDL, DML, DCL and TCL
- 3. Queries to demonstrate implementation of Integrity Constraints
- 4. Practice of Inbuilt functions
- 5. Implementation of Join and Nested Queries AND Set operators
- 6. Implementation of virtual tables using Views

7. Practice of Procedural extensions (Proc	edure, Function, Cursors, Triggers)
--	-------------------------------------

- 8. Mini Project (Application Development)
 i) IT Training Group Database
 ii) Blood Donation System

iii) Salary Management System

iv) Traffic Light Information System

Total Hours:

75

Text Bo	oks:
1	Abraham Silberschatz, Henry F Korth, S Sudarshan, "Data base System Concepts", 7 th Edition, McGraw hill, 2020.
2	Vijay Krishna Pallaw, "Database Management Systems", 2 nd Edition Asian Books Private Limited, 2010.
3	Mark L. Gillenson, "Fundamentals of Database Systems", 7 th Edition, Wiley India Pvt. Limited, 2008.
Referen	ice Books:
1	Raghu Ramakrishnan, Johannes Gehrke, Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", McGraw-Hill Education, 2017
2	C. Date, "SQL and Relational Theory", O'Reilly Media, Incorporated, 2011.
Web Re	ferences:
1	http://www.sqlcourse.com/
2	https://www.w3schools.com/sql/
3	https://www.geeksforgeeks.org/dbms/
Online	Resources:
1	https://www.coursera.org/learn/database-management
2	https://www.udemy.com/database-management-system/
3	https://onlinecourses.swayam2.ac.in/cec22_cs18/preview

	Continuous Assessment										
	The	ory		Practical					End		
Formativ e Assessm ent	Sum mativ e Asse ssme nt	Total	Total (A)	Forma tive Asses sment	Summat ive Assess ment	Total (B)	Total (A+B)	Total Continuous Assessmen t	Semester Practical Examinatio n	Total	
80	120	200	100	75	25	100	200	50	50	100	

Formative	Assessment b	ased on Capstone Model - Theory	
Course Outcome	Bloom's Level	Assessment Component	FA (10%) [80 Marks]
C201.1	Understand	Quiz	20
C201.2	Apply	Case Study	20
C201.3, C201.4	Apply	Tutorial	20
C201.5	Analyse	Assignment	20

Assessment base	d on Summative and End S	Semester Examination - Th	eory					
Bloom's Level	Summ	ative Assessment (15%) [120 Marks]						
	CIA1: (60 Marks)	CIA2: (60 N	larks)					
Remember	10 10							
Understand	40	30						
Apply	50	40						
Analyse		20						
Evaluate	-	-						
Create	-	-						
Assessment base	d on Continuous and End S	Compostor Examination D						
	Semester Examination - Pr	actical						
	Continuous Ass [100 M	essment (25%)	actical End Semester Examination					
Bloom's Level —	Continuous Ass	essment (25%)	End Semester					
	Continuous Ass [100 M	essment (25%) arks]	End Semester Examination (50%)					
Bloom's Level —	Continuous Ass [100 M FA: (75 Marks)	essment (25%) arks] SA: (25 Marks)	End Semester Examination (50%) [100 Marks]					
Bloom's Level -	Continuous Ass [100 M FA: (75 Marks) 20	essment (25%) arks] SA: (25 Marks) 10	End Semester Examination (50%) [100 Marks] 10					
Bloom's Level Remember Understand	Continuous Ass [100 M FA: (75 Marks) 20 20	essment (25%) arks] SA: (25 Marks) 10 20	End Semester Examination (50%) [100 Marks] 10 20					
Bloom's Level Remember Understand Apply	Continuous Ass [100 Main FA: (75 Marks) 20 20 40	essment (25%) arks] SA: (25 Marks) 10 20 40	End Semester Examination (50%) [100 Marks] 10 20 40					

Asses	ssment base	d on Continu	ous and	d End Semes	ster Examinat	tion		
		Continu	ous As	sessment (50)%)			
	CA 1 CA 2 (100 Marks) (100 Marks)						ctical am 00 rks)	End Semester
SA 1 (60 M)	FA Compon ent-l (20 Marks)	Compon ent-II (20 Marks)	SA 2 (60 M)	F/ Compon ent-l (20 Marks)	A 2 Compon ent-II (20 Marks)	FA (75 M)	SA (25 M)	Practical Examinat ion (50%)

Course Outcome (CO)				Pro	ogran	nme	Out	com	es (P	90)			Programme Specific Outcomes (PSO)		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C201.1	3	3	2	2								2			
C201.2	3	3	2	2	2				2	2	2	3			
C201.3	3	3	2	2	2				2	2	2	3			
C201.4	3	3	2	2	2				2	2	2	3			
C201.5	3	3	2	2								3			

23PS102	(PHYSICAL SCIENCE LABORATORYL/T/PCommon to I Year B.E. – CIVIL & MECH)0/0/4	
	(12
Nature of C	Course	: E (Skill based)	
Pre requisi		: Basic Applied Science laboratory skills	
Course Ob			
1		hands-on learning experience in measuring the basic parameter etermine the frequency of oscillation.	ers of
2	To carry ou	t experiments to understand the basic laws of magnetism.	
3		hands on training to measure the time constant of RC circuit and cubic crystal structure	lattice
4		and the principles and applications of electrochemistry and lea lytical methods, and explore the knowledge of various energy so e devices.	
5	To understa spectrosco	and the concepts of photo-physical and photochemical process py.	ses in
Course Ou Upon com		e course, students shall have ability to	
C102.1		ne the frequency of oscillation and laser parameters using melde's and diode laser	[E]
C102.2	To determin	ne the magnetic field around a current carrying conductor	[E]
C102.3	To determir crystal struc	ne the time constant of RC circuit and lattice constant of cubic cture	[E]
C102.4		ne the pH, single electrode potential using reference electrodes plating process based on electrolytic cell.	[E]
C102.5	Interpret the	e principle and working of Spectroscopic technique.	[E]
Lab Comp	onents:		
1	Determinati	ion of frequency of transverse and longitudinal wave modes – speriment and characteristics of Simple harmonic motion – lab.	[E]
2	Determinati diode laser	ion of wavelength, particle size and angle of divergence using source.	[E]
3		ion of Magnetic field along the axis of current carrying coil- d Gee method.	[E]
4	Determinati	ion of characteristics of RC circuit to find the time constant	[E]
5	Determinati	ion of lattice constant of cubic crystal structure.	[E]
6		ion of strength of strong acid by pH metry.	[E]
7	Estimation	of dissolved oxygen in waste water using Winkler's method.	[E]
8		ion of single electrode potential of Zinc and Copper by tric method.	[E]
9	Determinati	ion of cathode efficiency of Nickel using electroplating process.	[E]
10	Spectropho	tometry-Estimation of iron in sample water.	[E]
	_	Total Hours:	30

Text Book	:						
1	Anoop S 2018.	Sing Yadav "Applied	d Physics Lat	o Manu	al" Vayu l	Education of India	a Publisher,
2		rni,Manual for Exp	eriments in E	nainee	rina Phys	sics.2015	
3	C. S. Ro	binson, Dr. Ruby [ions Pvt. Ltd., 2016	Das, "A text b		<u> </u>		sics", Laxmi
4	S.L.Gup	ta and V Kumar "F	Practical Phys	sics Vol	ume -II",	Pragati Prakasha	an ., 2023.
5	Method Iron, 200	of Sampling and 1 03, Part-53; First R	Test (Physica Revision.	l and C	Chemical)	for Water and V	Vastewater-
6		of Sampling and T e (2001; Part-50; C	· •		Chemical)	for Water and V	Vastewater:
7		of Sampling and 1 al Oxygen Demand			Chemical)	for Water and V	Vastewater,
8		and Technology L			E-Book. N	IIOS, 2012.	
Reference	es:						
1	Practica	by Das and Prash I, 2016,2 nd Edition	l			-	
2	Publishe	ta and Dr.V.Kuma ers, Revised Edition	n, 2009.	•			
3	S.Chano	adhanulu, A.A.Dan d&Co,2008.	-		-	-	
4	Enginee	C. N., McCarty, P. ering. Fifth Edition,	McGraw-Hill,	Inc., N	lew York.		
5		n Public Health As nd Waste Water, A		al, Stan	dard Met	hods for the Exar	ninations of
6		WEF, APHA, 201 ater (Method: 5210		Method	ds for the	Examination of	Water and
Web Refe	rences:						
1		lab.amrita.edu/					
2		op-iitk.vlabs.ac.in/b	pasics-of-phy	/sics			
3		abs.iitb.ac.in/					
4		/ww.iitg.ac.in/					
5		e1-nitk.vlabs.ac.in/					
6		e1-nitk.vlabs.ac.in/				cal-oxygen/simula	ation.html
7		/ww.youtube.com/v					
8		e1-nitk.vlabs.ac.in/					
9	https://e	e1-nitk.vlabs.ac.in/	/exp/determir	nation-o	of-ph/simu	ulation.html	
		Continuous Asses	ssment				
Formative Assessme	nt	Summative Assessment	Total	Cont	otal inuous	End Semester Examination	Total
75	!	25	100		<u>ssment</u> 60	40	100
/ 0		ment based on Co				-	100
	~33C33	Continuous As					
			Marks]		E	nd SemesterPra	
_		FA	SA			Examination (4	0%)
Bloom's Le	evel	(75 Marks)	(25 Mark	s)		[100 Marks]	
Remember		0	0			0	
Understand		10	10			10	
Apply		30	30			30	
Analyse		30	30			30	
			30			30	
Evaluate		30	30				

COs		POs											PSOs		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C102.1	3	2	1	2					2			1			
C102.2	3	2	1	2					2			1			
C102.3	3	2	1	2					2			1			
C102.4	3	2	1	2					2			1			
C102.5	3	2	1	2					2			1			

Semester – 03

23ME301	APPLIED T	HERMODYNAMICS	3/1/0/4
Nature of C	course Concepts ar	nd Analytical	
Pre-Requis	ites Fundamenta	Is of basic mathematics and physics	
Course Ob	jectives:		
1	To understand the thermodynar	nic laws and their applications.	
2		m, the use of steam tables and Mollier	Chart and
	principles of psychrometry.		
3		npressors with and without intercooling.	
Course Ou			
	pletion of the course, students	shall have ability to	
C301.1		odynamic properties, work, heat and	[U]
C301.2	Apply laws of thermodynamics t	. ,	[Ap]
C301.3	Examine the properties of pur power cycle used in steam power	e substances and analyse the vapour er plants and gas power cycles.	[A]
C301.4	Classify, solve and calculate the and air conditioning systems.	performance of psychrometry processes	[Ap]
C301.5		iprocating and rotary equipment.	[Ap]
Course Co	ntents:	· · · · · · · · ·	
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air	and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficien er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua	s – Kelvin's and Clausius statements of Se irs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G I cycles- Vapor compression refrigeration	econd law theorem analysis as powe on cycles
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i	y: Second law of Thermodynamic and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficien er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for	s – Kelvin's and Clausius statements of Se irs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G	econd law theorem analysis as powe on cycles tric chart sure ratio
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i	y: Second law of Thermodynamic and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficien er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for	 Kelvin's and Clausius statements of Series - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - Ge I cycles- Vapor compression refrigeration of dry and wet air, use of pschyrome dification/ dehumidification, dew point. procating compressors, optimal stage press multistage reciprocating compressors 	econd law theorem analysis as powe on cycles tric chart sure ratio
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i compresso	y: Second law of Thermodynamic y and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficient er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for or (Descriptive): Vane compressor	s – Kelvin's and Clausius statements of Se irs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G l cycles- Vapor compression refrigeration of dry and wet air, use of pschyrome dification/ dehumidification, dew point. procating compressors, optimal stage press multistage reciprocating compressors , Screw compressor and lobe compressors , Screw compressor and lobe compressor	analysis as powe on cycles tric char sure ratio Rotar
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i compresso	y: Second law of Thermodynamic and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficien er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for or (Descriptive): Vane compressor or (Descriptive): Vane compressor	s – Kelvin's and Clausius statements of Se rs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G l cycles- Vapor compression refrigeration of dry and wet air, use of pschyrome dification/ dehumidification, dew point. procating compressors, optimal stage press multistage reciprocating compressors , Screw compressor and lobe compressor and lob	analysis as powe on cycles tric char sure ratio 60
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i compresso	y: Second law of Thermodynamic and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficien er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for or (Descriptive): Vane compressor or (Descriptive): Vane compressor	s – Kelvin's and Clausius statements of Se rs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G I cycles- Vapor compression refrigeration of dry and wet air, use of pschyromed dification/ dehumidification, dew point. procating compressors, optimal stage pression multistage reciprocating compressors , Screw compressor and lobe compressors , Screw compres	econd law theorem analysis as powe on cycles tric chart sure ratio Rotar 60
and Entrop Reversibility Carnot cycle Vapor pow Super- critic cycles, Air refrigerants processes in Reciprocat effect of i compresso Text Books	 y: Second law of Thermodynamic and Irreversibility, Heat reservo e, Reversed Carnot cycle, Efficient er cycles: Rankine cycle with su cal and ultra-super-critical Rankine standard Otto, Diesel and Dua and their properties- Properties nvolving heating/cooling and hum ing compressors: staging of recip ntercooling, minimum work for or (Descriptive): Vane compressor Nag. P.K, "Engineering Thermo Delhi, 2020. Yunus. N.J, Cengel. A and Mid Approach" 9th Edition, McGraw I 	s – Kelvin's and Clausius statements of Se rs - Refrigerator and heat pump, Carnot cy, COP. perheat, reheat and regeneration, exergy e cycle, Flow of steam through nozzle - G l cycles- Vapor compression refrigeration of dry and wet air, use of pschyrome dification/ dehumidification, dew point. procating compressors, optimal stage press multistage reciprocating compressors , Screw compressor and lobe compressors , Screw compressor and lobe compressors , Screw compressor and lobe compressors total Hours: dynamics", 6 th Edition, McGraw Hill Education thael Boles. A, "Thermodynamics- An Er Hill Education, New Delhi, 2019. C. and Van Wylen, G. J., 2003, 6th	econd law theorem analysis as powe on cycles tric chart sure ratio Sure ratio 60 ation, New ngineerin
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		sment Method						ıy)				
		Formative Ass	essmen	t based on	Capston	e Mode	el					
Course Outcom		Bloom's Level	Assessment Component (16% [80 Mai									
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C301.2	^	nalyse	Assiant	Assignment								
C301.3		•	Ű	•								
C301.4		pply		Tutorial								
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				sment (249	/0)	_		Semester				
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		CIA1 : [60 Mai	rksj	CIA2 : [60	-		[10	0 Marks]				
Remember		20		20				20				
Understand		30		30				30				
Apply		30		30				30				
Analyse		20		20				20				
Evaluate		-		-				-				
Create		-		-				-				

Assess	Assessment based on Continuous and End Semester Examination										
	Continuous Assessment (40%)										
		[200	Marks]			Find Compositor					
	CA 1:100 Ma	arks		CA 2 : 100 Ma	arks	End Semester					
64.4	FA 1 (40) Marks)	64.0	FA 2 (4	0 Marks)	Examination (60%)					
(60 Marks)	(60 Component Component (60 Component Component										

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Outcome	יין טי	$\mathbf{c}\mathbf{c}$													
<u> </u>						P	Os							PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C301.1	3	3	2										2		
C301.2	3	2	2										2		
C301.3	3	3	2										1		
C301.4	3	2													
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		3	Str	ongly	/ agre	eed	2	Mode	eratel	y agr	eed	1	Reasonat	oly agreed	

23ME302	MECHANICS OF DEFORMABLE SOLIDS	3/1/0/4
Nature of C		
Pre-Requis		
Course Ob		
1	To familiarize the concepts of stress, strain, principal stresses and principal	planes.
2	To explore the nature of stresses developed in beams due to transverse loa	
3	To evaluate the behavior of columns due to concentrated and eccentric loa	•
4	To compute slope and deflection of beams by various methods.	
5	To examine the stresses and deformations induced in circular shafts, helica and thin shells.	al springs
Course Ou	tcomes:	
Upon com	pletion of the course, students shall have ability to	
C302.1	Identify the strength of various structural elements subjected to axial loading.	[U]
C302.2	Interpret the principal stresses and strain energy theorem.	[AP]
C302.3	Draw the shear force and bending moment diagram for different types of beams and evaluate the effect of transverse loading on beams.	[A]
C302.4	Analyze the stability of columns and stresses in circular shafts.	[A]
C302.5	Evaluate the deflection and slope of beams under flexural loading.	[E]
C302.6	Analyze the stresses and deformations in helical springs and thin shells.	[A]
Course Co	ntents:	
Deformation bars subject on inclined method. St	ram for ductile and brittle materials, Factor of safety, Transverse strain, Poiss n of simple, variable cross-section and composite bars, Thermal stresses, C sted to thermal stresses, Volumetric strain, Elastic moduli and their relations. d planes: Principal stresses and principal planes - Analytical method, Mol rain energy theorem: Virtual work principle, Castigliano's first theorem, I	composite Stresses hr's circle
Deformation bars subject on inclined method. St reciprocal the Transverse	n of simple, variable cross-section and composite bars, Thermal stresses, C sted to thermal stresses, Volumetric strain, Elastic moduli and their relations. d planes: Principal stresses and principal planes - Analytical method, Mol rain energy theorem: Virtual work principle, Castigliano's first theorem, I heorem. e Loading: Beam definition, Various beam types, understanding shear f	Composite Stresses hr's circle Maxwell's force and
Deformation bars subject on inclined method. St reciprocal the Transverse bending me supported, combination Assumption of section n	n of simple, variable cross-section and composite bars, Thermal stresses, C sted to thermal stresses, Volumetric strain, Elastic moduli and their relations. d planes: Principal stresses and principal planes - Analytical method, Mol rain energy theorem: Virtual work principle, Castigliano's first theorem, I heorem. e Loading : Beam definition, Various beam types, understanding shear f oment concepts, Shear force and bending moment diagrams for cantileve and overhanging beams under point loads, uniformly distributed lo ns of these loads, Exploration of the point of contraflexure. Theory of simple ns, Derivation of bending equation, Calculation of bending stresses and dete nodulus for rectangular, circular, I and T sections. Columns: Buckling load b	Somposite Stresses hr's circle Maxwell's force and er, simply bads and bending: rmination
Deformation bars subject on inclined method. St reciprocal the reciprocal the supported, combination Assumption of section manual & Rankine of Polar momouniform sha Deflection beams subj Cylinders	n of simple, variable cross-section and composite bars, Thermal stresses, C ted to thermal stresses, Volumetric strain, Elastic moduli and their relations. d planes: Principal stresses and principal planes - Analytical method, Mol rain energy theorem: Virtual work principle, Castigliano's first theorem, heorem. e Loading: Beam definition, Various beam types, understanding shear for oment concepts, Shear force and bending moment diagrams for cantileve and overhanging beams under point loads, uniformly distributed for no of these loads, Exploration of the point of contraflexure. Theory of simple no, Derivation of bending equation, Calculation of bending stresses and deter nodulus for rectangular, circular, I and T sections. Columns: Buckling load the equations for different end conditions, Columns with eccentric load. Circular Shafts: Torsion stresses and deformation in solid and hollow circul ent of inertia, Torsional rigidity and Polar modulus, Maximum power transm aft and shaft of varying sections. Stress, deflection and stiffness of helica of Beams: Determination of slope and deflection for cantilever and simply s ected to point loads and UDL using Double integration and Macaulay's meth and spherical shells: Axial and hoop stresses in cylinders subjected to eformation of thin cylinders and spherical shells subjected to internal pressu	Stresses Stresses hr's circle Maxwell's force and er, simply bads and bending: force and er, simply bads and bending: force and er, simply bads and bending: force and er, simply bads and bending: force and force and bending: force and force
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23MA303		NUMERICAL METHODS	3/1/0/4
Nature of Co		B (100% Analytical)	
Pre requisite		-	
Course Obje			
1	To stu equati	udy the concept of finding the roots of linear equations an ons	nd nonlinear
2		rn and construct approximate polynomial for the given numeri the intermediate missing values	ical data and
3		d the numerical solutions of large system of differential ecolorities of the given numerical data.	quations and
4		d the solution of ordinary differential equations as most of the ms are characterized in this form.	Engineering
5		dy the concept of mathematical formulation of certain practica of partial differential equations and solving for physical interpreted and solving for physical	
Course Out	comes (Theory)	
Upon compl		the course, students shall have ability to	
C303.1	and si	mber numerical methods to solve algebraic, transcendental multaneous equations	[R]
C303.2		standing the ordinary differential equations generated from rrent scenario to solve by numerical techniques.	[U]
C303.3		numerical methods to find the interpolation of numerical data	[AP]
C303.4	Apply	numerical methods to fit the polynomial.	[AP]
C303.5		numerical methods to solve wave and heat equation with ary conditions	[AP]
Course Con	tents:		
Iteration met Elimination m Jordan m MODULE II Hrs) Interpolation formula - Inter interpolation forward and I	olution T hod- Re nethod -C nethod : INTEF n - Interp prolation formula Backwar	 Algebraic And Transcendental Equations: Newton-Raphsologula - Falsi method. Numerical Solution to system of equations: Jordan method - Gauss Seidel method – Inverse of a material problem of a matrix by power RPOLATION, NUMERIAL DIFFERENTIATION AND INTEGING with equal intervals –Newton's Forward and Backwah with unequal intervals –Newton's Divided difference formula - Numerical Differentiation and integration: Differentiation used intervals - Trapezoidal rule – Simpson's 1/3 and the second /li>	tions: Gauss trix by Gauss method. RATION (20 rd difference – Lagrange's sing Newton d 3/8 rules.
Numerical so Euler's Metho Equation - El - Parabolic E	olution to od – Rui liptic equ quation	RICAL SOLUTION TO PARTIAL DIFFERENTIAL EQUATION of first order ordinary differential equations: Single step method nge- Kutta Method of fourth order. Numerical Solution to Partia uations - Laplace equation - Liebmann's Iteration Process -Poise (one dimensional heat equation) - Bender-Schmidt's Difference fference Scheme - Hyperbolic Equation (one dimensional wav Total Hours	ods: Modified al differential son equation ce Scheme – re equation).
Text Books:	T		
1	Pears	d C.F. and Wheatley, P.O. "Applied Numerical Analysis", on Education Asia, New Delhi.	
2		al B.S. – Numerical methods in Engineering and Science. na Publishers, 2014.	10 th edition,

3			n R.K., Numerical Age International									
Reference Bo	ooks:											
1			eering Mathematics e, 2014	s, 10 th edition , J	ohn Wiley and							
2	S.Chand Co. Ltd.,		thy and K. Guna 2003.	wathy, "Numeri	cal methods",							
Web Referen	ces:											
1	https://nm.mathfor											
2			oper/M448/resource									
3	als/		iosciences/maths/re	eed/01student/nu	umerical_tutori							
4	https://www.youtul	be.com/watcl	n?v=QLIFxllwNL0									
Online Resou	urces:											
1	https://onlinecours	es.nptel.ac.ir	n/noc19_ma21/prev	view								
2			es?query=numerica									
3	https://ocw.mit.edu 2019/	u/courses/18-	335j-introduction-to	o-numerical-meth	nods-spring-							
4	https://www.course	era.org/learn/	numerical-methods	s-engineers								
Assessment	Methods & Levels	(based on E	Blooms' Taxonom	y)								
	Continuous A	ssessment										
			Total	End								
Formative	Summative	Total	Continuous	Semester	Total							
Assessment	Assessment	t Iotai	Assessment	Examination								
80	120	200	40	60	100							
	Assessment Meth	nods & Leve	ls (based on Blooi	ms' Taxonomy)								
		Assessment	based on Capston	ne Model								
Course	Bloom's	A	ssessment Comp	onent	FA (16%)							
Outcome	Level				[80 Marks]							
C303.1	Remember		Quiz		20							
C303.2	Understand		Presentation		20							
C303.3 – C101.5	Apply		Tutorial		20							
C303.3 – C101.5	Apply		Assignment		20							
A	ssessment based											
Bloom's	Summa		sment (24%)		Semester							
Level		[120 Mark			nation (60%)							
	CIA1 : [60 Mai	rks]	CIA2 : [60 Marks] [10	0 Marks]							
Remember	20		20		20							
Understan	30 30 30											
d				50 50 50								
a Apply			50		50							
Apply Analyse			<u>50</u> -		50 -							
Apply			50 - -		- -							

	Assessmer	nt based on Co	ntinuous	and End Seme	ster Examinati	on							
	Continuous Assessment (40%)												
	[200 Marks]												
	CA 1: 100 Marks CA 2: 100 Marks												
SA 1	FA 1 (40) Marks)	SA 2	Examinatio									
(60	Componen	Componen	(60	Componen	Componen	n (60%) [100 Marks]							
Marks	Marks t-I t-II Marks t-I t-II												
)) (20 Marks) (20 Marks)) (20 Marks) (20 Marks)												

<u> </u>		POs												PSOs	•
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C303.1	1	1											1		
C303.2	2	2											1		
C303.3	3	3											2		
C303.4	3	3											2		
C303.5	3	3											2		

23ME303	MANUFACTURING PRACTICES WORKSHO	P	1/0/4/3
Nature of C	course Theory concepts and lab		
Pre-Requisi	ites Nil		
Course Obj	ectives:		
1	To make the students understand the various ma available to produce the desired components		
2	To impart the methodologies to be followed in casting, engineering materials	•	•
3	To enable the students to select a particular manufactive required product based on its process characteristics	cturing proces	ss for the
Course Out			
	bletion of the course, students shall have ability to		
C303.1	Describe the concepts of basic manufacturing processes plastic moulding, welding, and forming processes	like casting,	[U]
C303.2	Select an appropriate casting technique for mak components	ing various	[Ap]
C303.3	Suggest an ideal joining process for an engineering app	lication	[Ap]
C303.4	Apply a suitable metal forming processes or other m processes for making an industrial component		[Ap]
C303.5	Explore the possible defects and its causes in various m processes.	anufacturing	[A]
Course Cor			
shell mouldi casting defe PLASTIC M moulding METAL JO	MOULDING PROCESSES: injection moulding – blow	casting – stir moulding – ding process	rotational
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas wel cesses – Types – friction stir welding process - common wel PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal	casting – stir moulding – ding process ding defects – forging ar operations	rotational ses – Arc nd forging
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations—	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow DINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well DRMING PROCESSES: Hot and cold working processes - Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th	casting – stir moulding – ding process ding defects – forging ar operations	rotational ses – Arc
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations—	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas wel cesses – Types – friction stir welding process - common wel PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal	casting – stir moulding – ding process ding defects – forging ar operations	rotational ses – Arc nd forging
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations—	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments	casting – stir moulding – ding process ding defects – forging ar operations neory Hours	rotational ses – Arc nd forging 15 RBT
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations-	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow DINING PROCESSES: Welding – classification- Gas wel cesses – Types – friction stir welding process - common wel DRMING PROCESSES: Hot and cold working processes - Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1	rotational ses – Arc nd forging 15
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow DINING PROCESSES: Welding – classification- Gas wel cesses – Types – friction stir welding process - common wel DRMING PROCESSES: Hot and cold working processes - Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry	casting – stir moulding – ding process ding defects – forging ar operations neory Hours	rotational ses – Arc nd forging 15 RBT
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1	rotational ses – Arc nd forging <u>15</u> RBT [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No 1 2	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1 C303.2	rotational ses – Arc d forging 15 RBT [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No 1 2 3	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow DINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well DRMING PROCESSES: Hot and cold working processes - Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1 C303.2 C303.2	rotational ses – Arc nd forging 15 RBT [Ap] [Ap] [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No 1 2 3 4	ing – investment casting – centrifugal casting – lost foam acts. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup Making components using stir casting setup Making plastic components using injection moulding Joining of plates in lap and butt joint configuration using	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1 C303.2 C303.2 C303.2	rotational ses – Arc nd forging 15 RBT [Ap] [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No 1 2 3 4 5	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow INING PROCESSES: Welding – classification- Gas wel cesses – Types – friction stir welding process - common wel RMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup Making components using stir casting setup Making plastic components using injection moulding	casting – stir moulding – ding process ding defects – forging ar operations cory Hours CO Mapping C303.1 C303.2 C303.2 C303.2 C303.1	casting - rotational ses – Arc d forging 15 RBT [Ap] [Ap] [Ap] [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- Laboratory S.No 1 2 3 4 5 6	ing – investment casting – centrifugal casting – lost foam acts. MOULDING PROCESSES: injection moulding – blow INING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding processs - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup Making plastic components using sijection moulding Joining of plates in lap and butt joint configuration using arc welding process Welding of aluminum plates using TIG / MIG welding process	casting – stir moulding – ding process ding defects – forging ar operations cory Hours C303.1 C303.2 C303.2 C303.2 C303.3 C303.3	rotational ses – Arc nd forging 15 RBT [Ap] [Ap] [Ap] [Ap] [Ap] [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- 1 2 3 4 5 6 7	ing – investment casting – centrifugal casting – lost foam ects. MOULDING PROCESSES: injection moulding – blow PINING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well RMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup Making plastic components using injection moulding Joining of plates in lap and butt joint configuration using arc welding process Welding of aluminum plates using TIG / MIG welding process Prepare a square tray with the sheet metal forming	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1 C303.2 C303.2 C303.2 C303.1 C303.3	rotational ses – Arc nd forging 15 RBT [Ap] [Ap] [Ap] [Ap] [Ap]
shell mouldi casting defe PLASTIC M moulding METAL JO welding proc METAL FO operations- 1 2 3 4 5 6 7 8	ing – investment casting – centrifugal casting – lost foam acts. MOULDING PROCESSES: injection moulding – blow INING PROCESSES: Welding – classification- Gas well cesses – Types – friction stir welding process - common well PRMING PROCESSES: Hot and cold working processes Rolling – types of rolling - Extrusion – various sheet metal Total Number of Th Components List of Experiments Preparation of solid wooden pattern using carpentry tools Preparation of a sand mould using solid pattern / split pattern Making components using smart foundry setup Making components using stir casting setup Making plastic components using injection moulding Joining of plates in lap and butt joint configuration using arc welding process Welding of aluminum plates using TIG / MIG welding process Joining of plates using friction stir welding process	casting – stir moulding – ding process ding defects – forging ar operations neory Hours CO Mapping C303.1 C303.2 C303.2 C303.2 C303.3 C303.3	rotational ses – Arc nd forging 15 RBT [Ap] [Ap] [Ap] [Ap] [Ap] [Ap] [Ap] [Ap]

Text Books:												
1	Ser					. Schmic			uring Er	ngine	ering	and
	Tec	hnology	, Pear	son E	ducation,	Seventh e	dition,	2018.				
2					uring Te	chnology",	Vol.1	, Fou	rth editio	n, N	1cGrav	v-Hil
		ication, 2	2017.									
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	•				is Assess	ment						
	Th	eory				Practical			Total		End nester	То
					Formativ	Summativ		Total (A+B	Continuo us	-		tal
Formative Assessment		mmative	Tot al	Total	e ∆ssessm	e ∆ssessme	Total (B))	Assessm	-	minati on	
Assessment	Assessment al (A) Assessm Assessme (B) Assessm ent											
80		120	200	100	75	25	100	200	50		50	10
Formative A	sses	ssment	based	d on Ca	apstone I	Nodel - Th	eory					
Course		Bloom	ı'e								FA (1	
Outcome		Leve	-		Α	ssessmen	t Com	poner	nt		[8]	
				-							Mar	
C303.1	L	Jndersta	nd	Quiz							20	3
C303.2	A	Apply		Assi	gnment						20	0
C303.3		Apply		Tech	nical Serr	ninar					20	0
C303.4												
	F	Apply		- Mod	el making						20	0
C303.5	A	Analyze										-
Assessmen	t bas	sed on S	Summ	ative /	Assessme	ent - Theo	ry					
					Sum	mative As	sessm	nent (1	5%)			
Bloom's Lev	vel					[120	Marks	Ì				
				CIA1:	(60 Mark	s)			CIA2: (60	Mar	ks)	
Remember				• • • • •	10				10		,	
Understand					10				10			
Apply					40				40			
Analyse					40				40			
Evaluate					-				-			
Create					-				-			
Assessmen	t bas	sed on C	Contin	nuous	and End	Semester	Exami	natior	- Practic	al		
		.	U U	onunt	ious Asso [100 Mi	essment (2 arksl	1 3 70)				nester	
Bloom's	Leve		E/	\. (75	Marks)		(25 Ma	arke)			on (50 arks]	%)
Remember			Г	4: (75) 1(JA.	(25 IVI 10	ai 15)		10	-	
Understand				10			10			10		
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Apply						30					30			3	0		
Analyse						40					40			4	0		
Evaluate						10					10			10			
Create						-					-			-	-		
Assessm	ent ba	sed	on (Conti	nuou	is and	Enc	d Sei	nest	er E	xam	inati	on				
				Conti	inuou	us Ass	ess	men	t (50	%)							
	C/ (100 l	A 1 Mark	s)					-	A 2 Mark	s)				cal Exam Marks)	_	End Semester	
SA 1			FA 1			SA 2			FA				FA	64	ctical ninati		
(60M)	Comp (20 M		1 [- 2)	Compo II (20 Ma		(60M)		- I	onent arks)		npone II Mark		га (75М)	SA Examin) (25M) on (50%			
Mapping Outcome				•		O) witl							(PO), F	Program	ne Sp	ecific	
00-							Po	S						Р	PSOs		
COs		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C303	.1	3	3	2											3		
C303	.2	3	3	2											3		
C303	.3	3	3	2											3		
C303	.4	3	3	2											3		
C303	.5	3	3	2											3		

2		
3.	To understand and apply package, Interface concepts and java frameworks	<u></u>
4.	To know the fundamental concepts of exceptions, threads with real world example	
	e Outcomes: completion of the course, students shall have ability to:	
C311.		[U]
C311.		[0] [A]
C311.		[AP]
C311.		[AP]
C311.		[AP]
Cours MODU Review Data Stater block MODU Basic Super keywo Definin fundar Built-in	e Contents: JLE I JAVA Basics 5 h v of Object-oriented concepts – History of Java – Java buzzwords – JVM architery ypes – Variables – Scope and life time of variables –Arrays – Operators – Onents – Type conversion and casting –Classes and objects – Methods –Strings– - Access specifier – Command line arguments. JLE II Inheritance, Polymorphism & Packages 5 h concepts – Constructor - Types of inheritance – Member access rules – Usage of th keyword – Method Overloading – Method overriding – Abstract classes –Usage of rd – Defining package – Access protection –Importing packages.	ours cture– Control Static ours is and of final hours ndling ords –
Tempi	Total Hou	urs:15
Labor	atory Component:	
S. No		
1	Basic Java Programs.	
2	Implementation of Student application using Class and Objects	
3	Implement a Java program to perform String operations.	
4	Implement a java program to demonstrate Overloading and Overriding	
5	Implement a java program to demonstrate Inheritance	
6	Implement a java program to demonstrate Abstract Class	
7	Implement a java program using interface	
8	Implement a java program to demonstrate package	
9	Implement a java program to demonstrate Exception Handling	
10	Implement a java program to demonstrate Multithreading	
	Total Hours	5 : 75
Text E	Books:	
1.	Herbert Schildt, "Java: The Complete Reference", 11 th edition, Mc craw Hill, 2020.	
Refer	ence Books:	
1.	Y. Daniel Liang, "Introduction to Java Programming", 9th Edition, Prentice Publications, 2015.	e Hall

FUNDAMENTALS OF JAVA PROGRAMMING

G (Theory Programming)

To analyze different types of constructor, Inheritance and polymorphism.

To gain insight knowledge of OOP concepts.

Nil

1/0/4/3

23CS311

1.

2.

Nature of Course: Prerequisites

Course Objectives:

2.	Paul Deitel, Harvey Deitel, "Java How To Program", 10th Edition, Prentice Hall
	Publications, 2014.
3.	T. Budd, An Introduction to Object Oriented Programming, 3rd edition, Pearson
	Education, India, 2009.
4.	ShagunBakliwal, Hands-on Application Development using Spring Boot, bpb publisher,
	2021.
Web	References:
1.	https://onlinecourses.nptel.ac.in/noc19_cs84/preview
2.	https://www.scientecheasy.com/2018/07/core-java-tutorial.html/
Onlin	ne Resources:
1.	https://www.edx.org/course/java-programming-fundamentals
1.	mups.//www.eux.org/course/java-programming-rundamentals

			Co	ntinuous Ass	sessment				End	
	Theory	-	-	P	ractical	_		Total	Semest	
Form ative Asse ssm ent	Summati ve Assess ment	To tal	To tal (A)	Formativ e Assessm ent	Summa tive Assess ment	Tot al (B)	Tot al (A+ B)	Continuou s Assessme nt	er Practic al Examin ation	Total
80	120	20 0	10 0	75	25	100	200	50	50	100

Formative /	Asses	sment ba	ased on Capstone M	odel - Theory					
Course Outcome		oom's evel	Assess	ment Componen	t	FA (10%) [80 Marks]			
C311.1	Und	erstand	Quiz		20				
C311.2	Appl	у	Quiz			20			
C311.3	Appl		Mini Project			20			
C311.4	Appl					_			
C311.5	Appl		Mini Project			20			
Assessmer	nt base	ed on Su	mmative Assessmer						
			Summa	tive Assessment	: (15%)				
Bloom's Le	vel			[120 Marks]					
		CL	A1: (60 Marks)	CI	A2: (60 Marks))			
Remember			10		10				
Understand			30	30					
Apply			40	40					
Analyse			20	20					
Evaluate			-	-					
Create			-	-					
Assessmer	nt base		Intinuous and End So		tion - Practica	al			
		C	Continuous Assessm	ent (25%)	End Se	emester			
Bloom's Lo	evel		[100 Marks]	<u> </u>		tion (50%)			
		F	A: (75 Marks)	SA: (25 Marks)		Marks]			
Remember			-	-		-			
Understand			10	-	1	0			
Apply			50	60	60 50				
Analyse			40	40	4	10			
Evaluate			-	-		-			
Create			-	-		-			

Asses	ssment base	d on Continu	ous and	d End Semes	ter Examinat	ion		
		Continu	ous As	sessment (50)%)			
	CA 1 (100 Mark				(S)	Ex (1	tical am 00 rks)	End Semester Practical
SA	F/	1	64	F/	A 2			Examinat
5A 1 (60 M)	Compon ent-l (20 Marks)	Compon ent-II (20 Marks)	SA 2 (60 M)	Compon ent-l (20 Marks)	Compon ent-II (20 Marks)	FA (75 M)	SA (25 M)	ion (50%)

Course Outcome				Prog	gram	me (Dutco	omes	Programme Specific Outcomes (PSO)						
(CO)	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C311.1	3	2	3	3	3							2			
C311.2	3	2	2	2	2							2			
C311.3	3	3	3	3	3							3			
C311.4	3	3	3	3	2							3			
C311.5	3	3	3	3	2							3			
C311	3	3	3	3	3							3			
3 Stro	ongly	' agre	ed		2	Μ	odera	ately	agree	ed		1	Reasor	hably agre	eed

23ME3			0/0/2/1
	of Course Practical application		
Pre Req	uisites Industrial Metallurgy		
Course	Objectives:		
1	To study the mechanical properties of materials when subjected loading.	to different t	types of
2	To learn the concept of preparation of the samples to perform characterization.	orm microst	ructura
3	To study the concepts of improving the mechanical properties of m methods such as heat treatment and surface treatment.	naterials by o	differei
Course	Outcomes:		
Jpon co	ompletion of the course, students shall have ability to		
C304.1	Determine the tensile, compression, shear, impact, fatigue and h properties of the materials.	nardness	[A]
C304.2	2 Evaluate the deflection of beams.		[E]
C304.3	B Calculate the stiffness of springs.		[A]
C304.4	Assess the theoretical and experimental strain of mild steel.		[E]
C304.5	Summarize the effect of heat treatment on hardness and resistance of the materials.	l impact	[E]
C304.6	Examine the microstructure of various specimens and the influence sand blasting process.	uence of	[Ap]
Course	Contents:		
S.No	List of Experiments	CO Mapping	RBT
1	Tension test on a mild steel rod to calculate the percentage of elongation, yield, ultimate and breaking stress.	C304.1	[A]
2	Compression test on wood - Compare the compression strength when load applied parallel and perpendicular to grains.	C304.1	[E]
3	Double shear test on Mild steel / Aluminium rods to calculate the shear strength.	C304.1.	[A]
4	Torsion test on mild steel rod to evaluate the modulus of rigidity.	C304.1	[A]
5	Impact test on metal specimen to calculate the impact strength and toughness - Izod and Charpy test.	C304.1	[A]
6	Hardness test on Aluminium, Brass and Mild Steel to evaluate the Brinell and Rockwell Hardness Number - Before and after shot peening process.	C304.1	[E]
7	Fatigue test on a mild steel specimen to calculate the fatigue strength.	C304.1	[A]
8	Deflection test on beams to evaluate the young's modulus of the given beam (Steel & Aluminium).	C304.2	[E]
9	Compression test on open coil helical springs to determine the deflection and stiffness.	C304.3	[A]
10	Compare the theoretical and experimental strain of mild steel using digital strain indicator.	C304.4	[E]
11	 Evaluate the improvement in hardness and impact resistance of steels. a. Unhardened specimen b. Quenched specimen and c. Tempered Specimen 	C304.5	[E]
12	Study of Microstructure of (i) Unhardened sample (ii) Quenched and tempered samples	C304.6	[Ap]

	Study measu									give	n spe	cimei	n by	C304	1.6	[Ap]	
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1	http	<u>ttps://sm-nitk.vlabs.ac.in/</u> ttps://www.vlab.co.in/particij															
2	http	os://v	vww.	vlab.	co.in/	/parti	cipat	ing-ir	nstitu	te-nit	tk-sur	athk	al		T		
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23ME305		DESIGN THINKING AND IDEA LAB	0/0/2/1
Nature of Cou	rse	Practical	
Pre Requisite	S	Nil	
Course Objec	tives:		
1	To Accel	erate development of indigenous products to promote "Mak	e in India"
	campaign		
2		rage aspiring Engineers and Researchers to actualize their id	deas under
	one roof.		
3	To Impart	t multidisciplinary education and research among all stakehole	ders
4	To promo	te experiential learning and entrepreneur skills	
Course Outco	mes:		
Upon complet	ion of the	e course, students shall have ability to	
C305.1		all the skills associated with the tools and inventory distribution of the distributication of the distribution of the distribution of the distrib	[R]
C305.2		e useful mechanical and electronic fabrication processes.	[U]
C305.3	Apply neo with enclo	cessary skills to build useful and standalone system/ project osures.	[Ap]
C305.4		Innovative products which are useful for a student in for an engineering career.	[C]
C305.5		ecessary skills to create print and electronic documentation stem/project.	[E]
Course Conte	nts:		

An Insight to Learning : Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting Remembering Memory : Understanding the Memory process, Problems in retention, Memory enhancement techniques **Emotions: Experience & Expression** Understanding Emotions: Experience & Expression, Assessing Empathy, Application with Peers **Basics of Design Thinking** :Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Concepts & Brainstorming, Stages of Design Thinking Process (explain with examples) – Empathize, Define, Ideate, Prototype, Test

Being Ingenious & Fixing Problem : Understanding Creative thinking process, Understanding Problem Solving, Testing Creative Problem Solving **Process of Product Design :** Process of Engineering Product Design, Design Thinking Approach, Stages of Product Design, Examples of best product designs and functions, Assignment – Engineering Product Design **Prototyping & Testing :** Rapid Prototype Development process, Testing, **Sample Example**, Test Group Marketing **Celebrating the Difference :** Understanding Individual differences & Uniqueness, Group Discussion and Activities to encourage the understanding, acceptance and appreciation of Individual differences

Design Thinking & Customer Centricity : Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design **Feedback**, **Re-Design & Re-Create :** Feedback loop, Focus on User Experience, Address "ergonomic challenges, User focused design, rapid prototyping & testing, final product, Final Presentation – "Solving Practical Engineering **Problem through Innovative Product Design & Creative Solution**"

S.No	List of Experiments	CO Mapping	RBT
1	Schematic and PCB layout design of a suitable circuit, fabrication and testing of the circuit	C305.1	[Ap]
2	Machining of 3D geometry on soft material such as soft wood or modelling wax.	C305.1	[Ap]

1	3	3D sca	anning	g of	comp	outer	mouse	e geo	ometry	/ sur	face.	3D	C30	5 0	[An	1	
	_	printing											030	5.Z	[Ap]	
	4	2D profile cutting of press fit box/casing in acrylic (3 or 6 mm thickness)/ cardboard, MDF (2 mm) board using laser cutter & engraver.											C30	5.3	[Ap]	
	5	designs.										s fit	C30	5.3	[C]		
		5 Familiarity and use of welding equipment.											C30		[C]		
		7 Familiarity and use of normal and wood lathe.											C30		[C]		
				<u> </u>		0	<u> </u>						C30	5.5	[C]		
	9	Design and implementation of a capstone project involving embedded hardware, software and machined or 3D printed enclosure											C30	5.5	[E]		
	Tot														3	0	
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Semester – 04

		MEASUREMENTS AND METROLOGY	3/0/0/3
Nature of C	Course	Theory applications	
Pre Requis	ites	Manufacturing Practices Workshop	
Course Ob	jectives:		
1	To familiar	ize the students with basic and advanced metrology concepts.	
2		e knowledge on the correct procedure to be adopted to mea of the components.	asure the
3		e the students in the measurement of linear dimensions, s, surface roughness, Parameters of threads and gears	angular
4	To expose	e students to force, torque and flow measurement techniques	
5		the techniques for the quality assurance of the products and the cess in terms of resources and time management.	optimality
Course Ou Upon com		ne course, students shall have ability to	
C401.1		he concepts of measurements and study the various al instruments	[U]
C401.2		e principles of linear and angular measurement tools used for applications	[U]
C401.3	Demonstra componen	ate the techniques of form measurement used for industrial ts	[Ap]
C401.4		he force, torque, power, flow based on the industrial	[Ap]
C401.5	Determine	the temperature through appropriate electrical instruments.	[Ap]
C401.6 Course Co	apply to re	measurement systems for process monitoring and control, and eal-world problems in various domains.	[A]

BASICS OF METROLOGY: Introduction to Metrology, Distinction between precision and accuracy. Limits, fits and tolerances, Tolerance grades, Types of fits, Factors considered in selection of instruments. **LINEAR AND ANGULAR MEASUREMENTS:** Linear Measuring Instruments – Evolution – Types – Classification, Limit gauges, Angular measuring instruments – Types, Comparators - Constructional features and operation of mechanical, optical, electrical / electronics and pneumatic comparators, Principle of interferometry, Michelson interferometer, NPL flatness interferometer.

FORM MEASUREMENT: Principles and Methods of straightness – Flatness measurement, Surface Texture Measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications. **ADVANCES IN METROLOGY**: Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications. Special Measuring Equipments - Principles of measurement using Tool Maker's microscope profile projector & 3D coordinate measuring machine. Nanomeasurements: Scanning Electron Microscope-Atomic Force Microscopy- Transmission Electron Microscopy.

INDUSTRIAL MEASUREMENTS: Force, torque, power - Mechanical, Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration. **DESIGN OF EXPERIMENTS AND STATISTICAL ANALYSIS:** DOE techniques; Taguchi orthogonal arrays; Data acquisition, signal processing and conditioning; Error of a system of ideal elements; Error probability density function of a system of non-ideal elements; Error reduction techniques; Quality control and assurance in industry.

Total Number of Theory Hours	45

Text Book	S:
1	R.K Jain, 'Engineering Metrology', 22 nd edition, Khanna Publishers, 2022.
2	E.O Doebelin and Dhanesh Manik, "Measurement Systems", 7th edition, McGraw
	Hill, 2019.
Reference	Books:
1	Alan S Morris, Reza Langari, "Measurement and Instrumentation: Theory and
	Application", Academic Press, 2015.
2	Venkateshan S P, "Mechanical Measurements", John Wiley & Sons, 2015.
3	Madhav S. Phadke, Quality Engineering using Robust Design, Prentice Hall, 1989.
Web Refer	ences:
1	http://www.nplindia.in/research-areas
Online Res	sources:
1	https://nptel.ac.in/courses/112/106/112106138/
2	https://nptel.ac.in/courses/112/103/112103261/

	Continuous Assessment								
Formative Assessme		Summative Assessment	Total	Total Continuous Assessment	End Semester Examination	Total			
80		120	200	40	60	100			

Formative Asse	essment based o	on Capstone	e Model - Theory						
Course Outcome	Bloom's Level		Assessment Component		FA (16%) [80 Marks]				
C401.1	Understand	derstand		20					
C401.2	Understand	Assignme	Assignment -I						
C401.3	Apply	Assignme	ent -II		20				
C401.4	Apply	Case Stu	20						
C401.5	Apply	Quiz							
C401.6	Analyse	Quiz	20						
Assessment ba	ased on Summat	ive and End	Semester Examination	- Theory					
Bloom's Level	Su		ssessment (24%) Marks]	-	Semester nation (60%)				
	CIA1: (6	0 Marks)	CIA2: (60 Marks)	[10	0 Marks]				
Remember	2	20	20		20				
Understand	3	80	30		30				
Apply	4	10	30		30				
Analyse	1	0	20		20				
Evaluate									
Create									

Assessr	Assessment based on Continuous and End Semester Examination											
	Continuous Assessment (40%)											
		[200 N	Marks]			End						
	CA 1 : 100 Ma	arks		CA 2 : 100 Ma	arks	Semester						
SA 1	FA 1 (40) Marks)	SA 2	FA 2 (40) Marks)	Examination						
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60%) [100 Marks]						

	POs												PSOs		
1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
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23ME402	KINEMA	ATICS AND DYNAMICS OF MACHINES	3/1/0/4
Nature of C	ourse	Theory - Analytical	
Pre-Requis	ites	Engineering Mechanics	
Course Ob	jectives:		
1	To understand the	kinematics and rigid- body dynamics of kinematica	ally drive
	machine componen		
2		motion of linked mechanisms in terms of the disp	lacemen
		ation at any point in a rigid link	
3		n linkage mechanisms and cam systems to generate	specifie
	output motion		
4	To understand the k	inematics of gear trains	
Course Ou	tcomes:		
Upon com	pletion of the course	e, students shall have ability to	
C402.1	Illustrate the studer	nt conversant with commonly used mechanism for	[U]
	industrial applicatior		[U]
C402.2	Compute the position	on, velocity, acceleration and equations of motion of	[Ap]
	four bar and single s	lider mechanisms	
C402.3	Construct cam profile	e for various types of followers.	[Ap]
C402.4	Discriminate the gea	ar terminologies.	[Ap]
C402.5	Analyze the kinemat	ics of gear trains	[A]
Course Co	ntents:		
Classification parabolic, seangle and u Gears: Inv conjugate a	on and terminology; D simple harmonic and indercutting; Graphica olute and cycloidal p iction; Spur gear cont r trains: Simple, comp	bar and slider-crank mechanisms. Cams and Fo isplacement, velocity, acceleration diagrams; Uniform cycloidal motions; Derivatives of follower motions, al disc cam profile synthesis for roller and flat face follo profiles; gear parameters; Fundamental law of gea cact ratio and interference; Helical, bevel, worm, rack bound, reverted and epicyclic gear trains – speed ration	velocity Pressure wers. ring and & pinio
		Total Hours:	
Text Books			60
		Machines", 5th Edition, Tata McGraw-Hill, 2019.	60
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	niversity Press, 2023	al. Theory of Machines and Mechanisms. N.p., C	
	niversity Press, 2023 Books:	al. Theory of Machines and Mechanisms. N.p., C	Cambrido
1 R.	niversity Press, 2023 Books: S.Khurmi & J.K.Gupta	al. Theory of Machines and Mechanisms. N.p., C a" Theory of Machines", 14th Edition, S Chand Publicati	Cambridg
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1 R. 2 GI Ea Web Refer 1 ht Online Res	niversity Press, 2023 Books: S.Khurmi & J.K.Gupta nosh. A and Mallick, A. ast-West Pvt. Ltd., New ences: tps://ocw.mit.edu/court ources:	al. Theory of Machines and Mechanisms. N.p., C a" Theory of Machines", 14th Edition, S Chand Publicati K., "Theory of Mechanisms and Machines", 3rd Edition w Delhi, 2020 ses/2-032-dynamics-fall-2004/	Cambridg
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	Continuous	Assessr	nent			End					
Formative Assessment		Summative Assessment		Total Total Continuou Assessme		Semes Examina	ter	Total			
80	120		200	40		60		100			
Assessment Methods & Levels (based on Blooms' Taxonomy) Formative Assessment based on Capstone Model											
	Formative As	sessmer	nt based on	Capston	e Mod	el					
ourse Outcome	Bloom's Level		Assessm	nent Comp	onent	t	(1	FA 6%) [80 arks]			
C402.1	Understand	Jnderstand Out						20			
C402.2	Apply	Quiz			2		20				
C402.3	Apply	Croup	Vacianmont					20			
C402.4	Apply	Group	Assignment					20			
C402.5	Analysis	Individu	al Assignme	ent				40			
Asse	ssment based o	n Summa	ative and E	nd Semes	ter Ex	amination					
Bloom's Level	Summat	ive Asse [120 Ma	ssment (24 rks]	%)	E	End Semester Examination (60%)					
	CIA1 : [60 M	arks]	CIA2 : [60) Marks]		[100 Ma	irks]				
Remember	10		10)		10					
Understand	30		30			30					
Apply	30		30			30					
Analyse	30		30	30							
Evaluate	-		-	-							
Create	-		-			-					

Assessn	Assessment based on Continuous and End Semester Examination																
			(Conti				smen	t (40	%)							
	<u> </u>		4001	Maula		[200	Mari	ksj		~ ^ ^	. 400	Mari	·•	End Semester			
	CA 1 : 100 Marks CA 2 : 100 Marks FA 1 (40 Marks) FA 2 (40 Marks)																
SA 1 (60 Marks)	A 1 60 FA 1 (40 Marks) Component - Component - I (60 Component - I (40 Marks) Component - I (40 Marks) Component - I								Examination (60%) [100 Marks]								
	Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)													Specific			
COs						P	Os							PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
C402.1	3	3	1										2				
C402.2	3	3	2	2									2				
C402.3	3	3	3	2									2				
C402.4	3	3	2	2									2				
C402.5	2.5 3 3 3 2 2																
C402.6	3	3	3	2									2				
	3	Str	ongly	/ agre	eed	2	Mod	eratel	y ag	reed	1	Rea	sonably ag	greed			

23ME403	FLUID MECHANICS AND HYDRAULIC MACHINES	
Nature of		
Pre-Requi		
Course Ol		
1	To learn about the application of mass and momentum conservatio	n laws for flui
0	flows.	
2	To understand the importance of dimensional analysis.	
3	To obtain the velocity and pressure variations in various types of sim	ple flows.
4	To analyse the flow in water pumps and turbines.	
Course Ou		
	pletion of the course, students shall have ability to	
C403.1	Understand the fundamental properties of the fluids	[U]
	Formulate the relationship among the parameters in fluid	
C403.2	phenomenon and to predict the performances of prototype by	[Ap]
	model studies.	
C403.3	Analyse the behaviour of fluids and its application through fluid	[A]
0403.0	kinematics.	
C403.4	Mathematically analyze simple flow situations.	[A]
C403.5	Evaluate the performance of various pumps and turbines	[E]
Dimensiona parameters	sible flow, Bernoulli's equation and its applications - Dimensio ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay	dimensionles er theory.
Dimensiona parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynan efficiencies pumps, wor - Reciproca Heads and	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- coordinates in 3D forms, Velocity and acceleration of fluid particles; Ve d stream function. Laminar and Turbulent Flow: Laminar flow, Plane te flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flor er absorbed i Shear stress i ning pipes an nines, Variou es, Centrifuga tation in pump water turbines
Dimensiona barameters Fluid Kiner of flow, Stra Cartesian of unction and and Couett viscous flow curbulent flo equivalent p Rotodynan efficiencies bumps, wor Reciproca Heads and Francis turb	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Contine coordinates in 3D forms, Velocity and acceleration of fluid particles; Ve d stream function. Laminar and Turbulent Flow: Laminar flow, Plane te flow, Laminar flow through circular pipes, Loss of head and powe v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. mic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangle king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. Total Hours:	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flov er absorbed i Shear stress i ning pipes an nines, Variou es, Centrifuga tation in pump water turbines
Dimensiona parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynan efficiencies pumps, wor Reciproca Heads and Francis turb	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- coordinates in 3D forms, Velocity and acceleration of fluid particles; Ve d stream function. Laminar and Turbulent Flow: Laminar flow, Plane te flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch objee. mic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangle king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S:	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flov er absorbed i Shear stress i ning pipes an hines, Variou es, Centrifuga tation in pump water turbines Pelton whee <u>60</u>
Dimensiona parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynan efficiencies pumps, wor - Reciproca Heads and Francis turb	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- coordinates in 3D forms, Velocity and acceleration of fluid particles; Ve d stream function. Laminar and Turbulent Flow: Laminar flow, Plane e flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. mic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangle king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Pu	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flov er absorbed i Shear stress i ning pipes an hines, Variou es, Centrifuga tation in pump water turbines Pelton whee 60
Dimensiona parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynam efficiencies pumps, wor - Reciproca Heads and Francis turb	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- coordinates in 3D forms, Velocity and acceleration of fluid particles; Vel d stream function. Laminar and Turbulent Flow: Laminar flow, Plane e flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. mic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangle king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Pu R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Ma	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flow er absorbed i Shear stress i ning pipes an hines, Variou es, Centrifuga tation in pump water turbines Pelton whee 60
Dimensional parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynan efficiencies pumps, wor - Reciproca Heads and Francis turb <u>Text Book</u> 1	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua- ain rate, stream line, streak line, path lines and stream tubes - Continu- boordinates in 3D forms, Velocity and acceleration of fluid particles; Vel d stream function. Laminar and Turbulent Flow: Laminar flow, Plane ie flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. nic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangle king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S: S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Pu R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Ma Publication, 2024.	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flow er absorbed i Shear stress i ning pipes an hines, Variou es, Centrifuga tation in pump water turbines Pelton whee <u>60</u>
Dimensional parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynam efficiencies pumps, wor - Reciproca Heads and Francis turb Text Book 1 2	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- boordinates in 3D forms, Velocity and acceleration of fluid particles; Ve d stream function. Laminar and Turbulent Flow: Laminar flow, Plane e flow, Laminar flow through circular pipes, Loss of head and powe v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, bow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. nic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangl king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Pu R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Ma Publication, 2024. S. K. Som, G. Biswas and S. Chakraborty, "Introduction to Fluid Mech Machines, Tata McGraw Hill, 2017.	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flow er absorbed i Shear stress i ning pipes an hines, Variou es, Centrifuga tation in pump water turbines Pelton whee <u>60</u>
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Dimensional parameters Fluid Kiner of flow, Stra Cartesian of function and and Couett viscous flow turbulent flo equivalent p Rotodynan efficiencies pumps, wor - Reciproca Heads and Francis turb Text Book 1 2 3 Reference	ally homogeneous equations, Buckingham π theorem, Calculation of , Similitude and complete similarity, Model scales - Basic boundary lay matics: Different approaches, Reynolds transport theorem, Flow visua ain rate, stream line, streak line, path lines and stream tubes - Continu- coordinates in 3D forms, Velocity and acceleration of fluid particles; Vel d stream function. Laminar and Turbulent Flow: Laminar flow, Plane e flow, Laminar flow through circular pipes, Loss of head and power v - turbulent flow – Reynolds experiment, Frictional losses in pipe flow, ow, Major and minor losses, Darcy's and Chezy's equation, branch bipe. mic Machines: Euler's equation, Theory of Rotodynamic mach , Velocity components at entry and exit of the rotor, Velocity triangl king principle, work done by the impeller and performance curves, Cavit ating pump, working principle. Hydraulic Turbines: Classification of efficiencies, velocity triangles, axial, radial and mixed flow turbines - bine and Kaplan turbines, working and design principles. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Pu R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Ma Publication, 2024. S. K. Som, G. Biswas and S. Chakraborty, "Introduction to Fluid Mech Machines, Tata McGraw Hill, 2017.	dimensionles er theory. alization, Type uity equation i elocity potentia Poiseuille flow er absorbed i Shear stress i hing pipes and hines, Variou es, Centrifuga tation in pump water turbines Pelton whee <u>60</u> ublishing, 2021 chines," Laxmanics and Flui

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	me	echa	anics													
			Con	itinu	ious A	Asses	smer	nt						F	nd	
Formativ	~										Т	otal			nester	Total
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AssessmentIotalIotalContinuous AssessmentExamination801202004060100																
80					120				200			40			60	100
	Α	sse	essmen	t Me	ethod	s & L(evels	(bas	sed	on I	Bloor	ns' l	Гахо	nomy)	
			Form	ativ	e Ass	essm	ent b	ased	l on	Ca	pstor	ne M	odel			
															-	•
CourseBloom'sAssessment Component (Choose and map components from the list - Quiz Assignment Case StudyFA (16%)																
Outcom	е		Le	evel											•	•
	Outcome Level Quiz, Assignment, Case Study, [80 Marks] Seminar, Group Assignment)															
C403.1 Understand Quiz 20																
C403.2 Apply																
C403.3																
	C403.4 Analyze															
C403.5		_	Evalua			Assi	gnme	nt							4	0
		200	sment k		nd on	Sumr	nativ	0 200		nd 9	omo	etor	Eva	minati	on	
	A3:	563			mativ						eme	3161			emester	
Bloom's L			3	um					24	/0)						2
Bloom's Lo	eve	-	0144	. 10		120 M			001	Man	4-1		EX		tion (60°	/o)
Damaanahan		_	CIA1		0 Mar	KS		42 :		war	KSJ				Marks]	
Remember					0				10						10	
Understand					0				10						20	
Apply					0				20						20	
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			Con	tinu	ious A			nt (40)%)							
						0 Mar	ks]								Er	nd
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SA 1			FA 1 ((40 I	Marks	5)		e	A 2		FA :	2 (40	Ma	rks)	Exami	nation
(60	Co	mp	onent -		Com	poner	nt -		A 2 60		<u> </u>	mpo	non		(60	%)
Marks)			I .			II		•	arks	•		40 M			[100 N	larks]
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60		2	20			20			60			4	0		10	0
Mapping of	Co	urs	e Outco	ome	s (CO) with	Prog	gram	me	Out	tcom	es (F	PO) F	Progra	amme Sp	pecific
Outcomes	(PS	0)														
						POs	5								PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12		1	2	3
C403.1	3	1	1													3
C403.2	3	3	2					1			1	1	-			2
C403.3	3	1	1													2
C403.4	3	3	2					İ			1					2
C403.5	3	3	2				-				1	1				2
	Str	onc	ly agree	ed	2	Mod	erate	ly ag	ree	d	1	Rea	ason	ably a	greed	

23ME404	HEAT	FRANSFER AND THERMAL MACHINES	3/1/0/4						
Nature of C	ourse	Theory analytical.							
Pre-Requisi	ites	Thermal Engineering, Engineering Thermodynamics.							
Course Objectives:									
1 To impart a solid foundation in heat transfer, exposing students to the three basic modes namely conduction, convection and radiation.									
2		dents to apply laws of heat and mass transfer in er evelop governing equations, solution procedures.	ngineering						
3	To provide a brief in and design of heat	nsight on boiling and condensation heat transfer, and th exchangers.	e analysis						
Course Out	comes:								
Upon comp	letion of the cours	e, students shall have ability to							
C404.1	Compute heat tran systems and exten	sfer and temperature distribution in simple, composite ded surfaces.	[Ap]						
C404.2	Interpret and analy	ze forced and free convection heat transfer.	[A]						
C404.3	Appraise the performethods.	ormance of heat exchangers using LMTD and NTU	[A]						
C404.4	Classify and appra	ise the different modes of mass transfer.	[A]						
C404.5	Assess the radiativ	e properties of a surface.	[E]						
Course Cor	tente	•							

Course Contents:

Introduction and Conduction Heat Transfer: Three modes of heat transfer, Examples of equipment (like air conditioner and air cooler) involving heat transfer; Derivation of heat conduction equation in Cartesian, cylindrical and spherical geometry. Steady 1D solution for conduction heat transfer, Concept of conduction and film resistances, Critical insulation thickness, Lumped system approximation and Biot number; Heat transfer through pin fins, 2D conduction solutions for steady and unsteady heat transfer.

Convection Heat Transfer and Heat Exchangers: Basic equations; Boundary layers; Forced convection; External and internal flows; Natural convective heat transfer; Dimensionless parameters for forced and free convection heat transfer; Correlations for forced and free convection; Approximate solutions to laminar boundary layer equations for internal and external flow; Estimating heat transfer rates in laminar and turbulent flow situations using appropriate correlations for free and forced convection.- Pool boiling, Flow boiling; Film and drop wise condensation, Function, classification and configuration of heat exchangers, Evaluation of mean temperature difference, Heat exchanger effectiveness, Analysis, design using LMTD , NTU methods and selection of heat exchangers.

Radiation Heat Transfer and Mass transfer: Interaction of radiation with materials; Definitions of radiative properties; Stefan Boltzmann's law; Black and grey body radiation; Calculation of radiation heat transfer between surfaces using radiative properties; View factors and the radiosity method; Examples for two-body enclosures; Radiation shield. Analogy between heat and mass transfer, Mass diffusion, Fick's Law, Steady and transient mass diffusion, Simultaneous heat and mass transfer.

	Total Hours:	60
Text Books	:	
1	Sachdeva R C, "Fundamentals of Engineering Heat and Mass Transfer", International, 2019.	New Age
2	Kothandaraman C.P "Fundamentals of Heat and Mass Transfer", International, New Delhi, 2018.	New Age

Reference I	Books:											
1		A.Cengel, Afstin J tions", McGraw Hil				ransfei	⁻ – F	undamenta	ls and			
2		ra, F. P. and De W				Heat a	nd M	ass Transfe	er", 8th			
0		John Wiley and S				10						
3 Web Refere	•	K, "Heat and Mass	Iransi	ier", MicGrav	w-Hill, 201	19.						
1		archive.nptel.ac.in/	COURSA	c/112/108/1	1121081/0	۵/						
2		www.accessscienc										
Online Res			0.0011	oontonyarti		00						
1		onlinecourses.npte	l.ac.in/	noc22 ch6	5/preview							
2		archive.nptel.ac.in/				7/						
	<u> </u>	Continuous As										
-					Tota	al	•	End	T . (.)			
Forma		Summative Assessmer	-	Total	Continuous			emester mination	Total			
Assessment			n		Assess	ment	ΕXd					
80		120		200	40		60 100					
	Asse	ssment Methods						ıy)				
		Formative Asses	ssmen	t based on	Capston	e Mode	91	FA				
Course	e	Bloom's Level		Assessme	nt Compo	nent		ГА (16%)				
Outcom	ne			A33635ine	in comp	Jinem	₀) rks]					
C504.1	I A	Apply	Quiz			20						
C504.2	<u>2</u> A	nalyze	Assig	nment		20						
C504.3,C5		nalyze		p Assignme	20							
C504.5		valuate		Tutorial 20								
	Assess	ment based on S				ter Exa						
		Summative		•	%)			Semester				
Bloom's L	evel	-	20 Mar	-		E		nation (60%	%)			
		CIA1 : [60 Marks	s]	CIA2 : [60	_		[10	0 Marks]				
Remember		10		10				10				
Understand		10		10				10				
Apply		30		20				20				
Analyse		30		30		30						
Evaluate		20		30			30					
Evaluate												

Assessm	nent based on	Continuous an	d End Ser	nester Examir	nation									
	Continuous Assessment (40%) [200 Marks]													
	CA 1 : 100 Marks CA 2 : 100 Marks													
SA 1	FA 1 (40) Marks)	SA 2	FA 2 (4	Semester Examination									
(60	Component	Component	(60	Componen	Component	(60%)								
(00 Marks)	- 1	- 11	Marks)	t - I	- 11	[100 Marks]								
iviai ksj	(20 Marks)	(20 Marks)	iviai ksj	(20 Marks)	(20 Marks)									

	Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)														cific	
COs														PSOs		
COS	1	1 2 3 4 5 6 7 8 9 10 11 12 1													3	
C404.1	2	2	3											3		
C404.2	3	3	3													
C404.3	3	3	2	2					1					3		
C404.4	3	3	2						1							
C404.5	3	3	3	3					1					3		
		3	Strong	gly ag	reed	2	Mode	rately	/ agre	ed 1	Reas	sonably	agre	ed		

23GE3	01 UNIVERSAL HUMAN VALUES (Common to all branches)	3/0/	0/3
Nature of	Course Descriptive		
Pre-Requ	isites Interpersonal Communication and Value Sciences		
Course O	bjectives:		
1	Development of a holistic perspective based on self-exploration about the	emselves	(humar
	being), family, society and nature/existence.		
2	Understanding (or developing clarity) of the harmony in the human bein	ig, family,	society
	and nature/existence.		-
3	Strengthening of self-reflection.		
4	Development of commitment and courage to act.		
5	Helping the students to appreciate the essential complementarily between	en 'VALUI	ES' and
	'SKILLS, to ensure sustained happiness and prosperity, which are the c	ore aspira	itions of
	all human beings.		
6	Highlighting plausible implications of such a Holistic understanding in		
	human conduct, trustful and mutually fulfilling human behavior and m	nutually er	nriching
	interaction with Nature.		
	utcomes:		
	npletion of the course, students shall have ability to		
C301.1	Understand and take responsibilities in life and handle problems		
	sustainable solutions while keeping human relationships and human	nature in	[U]
	mind.		
C301.2	Apply responsibilities towards their commitments (human values,	human	[AP]
	relationship and human society).		
C301.3	Apply what they have learnt to their own self indifferent day-to-day settin	gs in real	[AP]
	life, atleast a beginning would be made in this direction.		
C301.4	Analyze ethical and unethical practices, and formulate strategies to ac	tualize a:	[AN]
	harmonious environment wherever they work.		
C301.5	Understand the harmony in nature and existence, and work out mu	tually on	[U]
	fulfilling participation in nature.		
Course C			
	: Course Introduction - Need, Basic Guidelines, Content and Pron. N, Understanding Harmony in the Human Being-Harmony in Myself!	ocess for 15 Hoເ	
Solf avalu	ation of the students. Dro test of LIHV/ Durnage and motivation for t		
	ation of the students- Pre-test of UHV- Purpose and motivation for t n-Its content and process- A look at basic Human Aspirations. Understa		
	erity correctly-Understanding the needs of Self('I') and 'Body'-Understan		
	ent of 'l'(being the doer, seer and enjoyer)-Understanding the characteris		
	harmony in 'I' - Understanding theharmony of I' with the Body- Social a		
	ent - Water Conservation-Soil Pollution - Physical Health and related activity		
•	ersons- Literary activities.	2001	
	······································		
Module 2	: Understanding Harmony in the Family and Society- Harmony in	Human-	Humar
	hip, Understanding Harmony in the Nature and Existence- Who		
Coexister			
		15 Ho	urs
Understar	ding values in human relationship - Understanding the harmony in the soci	ety (socie	ty being
	ion of family): - Visualizing a universal harmonious order in society-U		
	in NatureUnderstanding Existence as Coexistence of mutually Interact		
	space. Holistic perception of harmony at all levels of existence-		
	nips-Homesickness- Managing peer pressure-Projects-Socially responsib	le enginee	ers-Visi
to local ar	eas (orphanages, special children)- Physicalactivities(games).		

Module 3: Implications of the above Holistic Understanding of Harmony on Professional Ethics 15 Hours

Natural acceptance of human values- Definitiveness of Ethical Human Conduct- Basis for Humanistic Education-Humanistic Constitution and Humanistic Universal Order-Competence in professional ethics-Case studies of typical holistic technologies, management models and eco-friendly production systems - Strategy for transition from the present state to Universal Human Order-Sum up: Self-evaluation of the students-Post test of UHV.

Total	Hours:	45
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Text Books	s:										
1		man Values and I	Professional	Ethics by F	R R Gaur, R S	angal	l, G P Bagar	ia, Ex	cel Books,		
		w Delhi, 2010		"I lune on \/s	duce" Ceriu		lication" la	inun	2010		
2		ni Setia, Priyan	ka Sharma,	Human va	alues, Geniu	s Pup	Dication, Ja	lipur,	2019.		
Reference		man Values, A.N	Tripathi N	ow Ago Intl	Publichore	Now	Dolbi 2004				
2		e Story of My Exp		U							
3		ia Wins Freedom				Narai	nchanu Ga				
Web Refer	_				77200.						
1	1	os://examupdates	s.in/professio	onal-ethics-	and-human-	/alues	<u>s/</u>				
2	http	://hvpe1.blogspo	ot.com/2016/	/06/notes-h	uman-values	-and-	professiona	l.htm	1		
3	http	os://www.yourmo	rals.org/sch	wartz.2006.	.basic%20hu	man%	620values.p	odf			
Online Res	sour	ces:									
1	http	os://nptel.ac.in/co	ourses/109/1	04/109104	068/						
2		os://medium.com ool-f4593b4944		/the-12-imp	oortant-life-sk	ills-i-v	wish-id-learr	ned-ir	ז-		
3	http	os://www.thebala	ncecareers.	com/life-ski	lls-list-and-ex	ampl	es-4147222	2			
		Continuo	ous Assess	ment			End				
	Formative Assessment Summ		ssessment	Total	Total Continuo Assessme	Semester Examination		Total			
80		120)	200 40					100		
Assessme	nt N	lethods & Leve	ls (based or	n Blooms'	Taxonomy)						
Formative	Ass	sessment based	l on Capsto	ne Model							
Course Outcome	•	Bloom's Level		Assessm	ent Compon	ent			A (16%)) Marks]		
C301.1		Understand	Online Qu	iz					20		
C301.2		Apply	Group Ass	ignment					20		
C301.3		Apply	Presentatio	n					20		
C301.4		Analyse	Flesentatio								
C301.5		Understand	Seminar						20		
Assessme	nt b	ased on Summ	ative and E	nd Semest	er Examinat	ion					
Bloom's		Summ	ative Asses [120 Mar		%)	Enc	d Semester (60		mination		
Level		CIA1 : [60 N	larks]	CIA2 : [6	0 Marks]		(60%) [100 Marks]				
Remember	Remember 10				0		1	0			
Understand		10			20		2				
Apply		40		Z	40						
Analyse		40		3	30						
Evoluato											
Evaluate		-			-		-				

Assessme	nt based on C	con	tinı	iou	s a	nd	End	d Se	eme	ste	r Exa	minat	tion		-		
	Continuous Assessment (40%) [200 Marks] CA 1 : 100 Marks CA 2 : 100 Marks														End		
	CA 1 : 100 Marks											nester nination					
SA 1	FA 1 (4	40 Marks)						67	າ		F	A 2 (4	0 Ma	rks)		iniation 60%)	
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)			SA 2 (60 Marks)				-1			omponent - II 0 Marks)	[100 Marks]				
Course Ou	itcomes (CO)			Ρ	rog	jran	nm							•	mme Specific omes (PSO)		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
Ca	301.1						3										
Ca	301.2						3			3							
Ca	301.3						3		3								
C3	C301.4						3	3	3			2					
Ca	C301.5																

23ME4	105	MANUFACTURING TECHNOLOGY	3/	0/2/5
Nature o	of Course	Theory concepts and lab		
Pre Req	uisites	Manufacturing practices workshop		
	Objectives			
1		stand the concepts of manufacturing processes		
2		t the methodologies to be followed in material removal a	nd material a	addition
-	process		na material t	
3		stand the working of standard machine tools, special pur	nose machir	hes and
5		chining processes		
Course	Outcomes			
		of the course, students shall have ability to		F1 13
C405.1		end the basic terms related to various manufacturing proc		[U]
C405.2		a suitable material removal processes and machine	e tools for	[Ap]
-		n industrial component		
C4053	Apply CN	C concepts and create part programming to generate corr	nponents	[Ap]
C405.4		various processes used for machining hard materials		[U]
C405.5		he manufacturing techniques to process the resin, part	ticulates or	[Ap]
		as per requirement of components		
Course	Contents:			
CONVEN	ITIONAL I	MANUFACTURING PROCESSES: CUTTING TOOLS - si	ingle and mu	Itipoint.
		life - orthogonal cutting - various force components - M		
		g and grinding machines - WORK HOLDING DEVICES -		
		ents – OPERATIONS – turning, milling, drilling and finishin		
	ΓΙΟΝ – typ		goporatione	Or in
-				
Turning of SPECIAI – abrasiv machinin preparati involved extrusion process,	center and L MANUFA ve jet mac ig, laser an ion, compa in additive process	ogramming formats - G and M codes - Manual part pro- machining centre. ACTURING PROCESSES: UNCONVENTIONAL MACHIN chining, ultrasonic machining, electric discharge machini ad electron beam machining – POWDER METALLURGY F action and sintering- ADDITIVE MANUFACTURING PR e manufacturing – vat polymerization process type – s type – FDM, powder bed fusion process types – select laser melting process and electron beam melting process	NING PROC ng, electroch PROCESS – OCESSES stereolithogra ctive laser s	ESSES hemical powder - steps aphic - intering
	, and the second	5		
		Total Number of The	ory Hours	45
Laborate	ory Comp		,	- *
SI.No	, •) mapping	RBT
1	Measurer		C405.2	Ap.
2			C405.2	<u>Ap.</u>
3			C405.2 C405.2	
				Ap.
4			C405.2	Ap.
5			C405.2	Ap.
6		0 1 0	C405.2	Ap.
		rinding process		
7			C405.3	Ap.
	execute u	using CNC turning centre		лμ.

8	Write part pp					pera	ation a	and C	405.3	Ap.		
	perform using									<i></i>		
9	Fabrication of manufacturin	•		ng stereolith	nographic ac	dditiv	e	C	405.5	Ap.		
10	Preparing 3D			ing extrusio	n based FD	М		С	405.5	Ap.		
11	Study on effe								405.5	Ap.		
12	Modelling of					eal-li	ife ob	ject C	405.5	Ap.		
	of unknown d	imen	sion	in reverse e	0					-		
Taxt Dag					lotal	Nur	nber	of Laborato	ry Hours	30		
Text Boo 1	Amitabha Gh Pvt. Ltd. 2010		and A	.K. Mallick,	Manufactur	ing S	Scienc	e. Affiliated	East-West P	ress		
2	Serope Kalpa edition. 2018		, "Ma	anufacturing	Engineering	g and	d Tec	hnology", Pe	arson India,	7th		
3	Rao, P.N. "M Hill Education			•	ogy - Metal	Cutt	ing a	nd Machine	Tools," McG	raw –		
Reference	e Books:	.,0		, _0.0.								
1	Hajra Choudł Ltd., 2014.	nury,	"Eler	nents of Wo	rkshop Tecł	nnolc	ogy", ∖	/ol. I & II, Me	edia Promoto	rs Pvt		
2	HMT - "Produ	iction	Тес	hnology", M	cGraw-Hill E	Educ	ation,	2017.				
Web Ref												
1	https://nptel.a	c.in/o	cours	es/1121051	27/							
2	www.sme.org	1										
-	esources:											
1	https://archive											
2	https://archive					SEM2	2/noc1	<u>6-me17/</u>				
3	https://www.n				-				Γ	1		
		Co	ontin	uous Asse	ssment							
	Theory			Pr	actical			Total	End			
Formative assessme nt	e Summative e assessmen t	Tot al	Tot al (A)	Formative assessme nt	assessme e a			Continuou s Assessme nt	Semester Examinatio n	Tot al		
80	120	200	100	75	25	100	200	50	50	100		
Assessm	nent Methods	& Lo	evels	(based on	Blooms' T	axor	nomy					
Formativ	ve Assessme	nt ba	sed	on Capstor	ne Model -T	heor	ry					
Course	BIOOM	s Le	vel		Assessment Component							
Outcom									20			
C405.1	Understa	nd		Quiz								
C405.1 C405.2	2 Apply	nd		Quiz Assignme	ent				20			
C405.1	2 Apply	nd			ent							
C405.1 C405.2	2 Apply 3 Apply 4 Understa			Assignme	ent tion / semina	ar						

Bloom	's Level	Sui		Assessmen 20 Marks]	F		emester ition (35%)			
Bioom	S LEVEI	CIA1 : [6	0 Marks]	CIA2	: [60 Marks]		[100 Marks]			
Remen	nber	2	0				10			
Unders	tand	3	0		50			30		
Apply		5	0		30			60		
Analyse	÷	-			-			-		
Evaluat	e	-			-			-		
Create		-			-			-		
Assess	sment based	on continue	ous and	End Semest	er Examinati	on-Prac	ctical			
Bloom	's Level	Cor		Assessmen 00 Marks]	t (25%)	F		emester ition (15%)		
2.001	0 2010	FA : [75	Marks]	SA:			Marks]			
Remem	nber	-			-			-		
Unders	tand	-			-			-		
Apply		10)0		100		1	00		
Analyse	Э	-			-			-		
Evaluat	e	-					-			
Create		-			-					
Asses	sment based					tion				
		Continu	ious Ass [200 M	essment (40 arks]	%)			End Semeste		
	CA 1 : 100 M	arks		CA 2 : 100 M	arks	exam	tical (100 rks)	r Examina ion (50%		
	FA 1 (40) Marks)		FA 2 (40) Marks)			Theory		
SA 1 (60 Mark s)	Compon ent - I (20 Marks)	Compon ent - II (20 Marks)	SA 2 (60 Mark s)	Compon ent - I (20 Marks)	Compon ent - II (20 Marks)	FA (75 M)	SA (25 M)	examinat ion (35%) practical examinat ion (15%)		

Outcomes	(P	<u>SO)</u>															
CO 2							P	os						PSOs			
COs		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C405.1		3	1	2											1		
C405.2		3	2	3											3		
C405.3		3	2	3											3		
C405.4		3	2	3											3		
C405.5		3	2	3											3		
	3	St	Strongly agreed 2 Moderately agreed 1 Reasonably agr											/ agreed			

23ME406	;	THERMAL AND FLUID MECHANICS LABORAT	ORY	0/0/2
Nature of C	ourse	Practical		<u>I</u>
Pre Requis	ites	Fluid Mechanics and Hydraulic Machines, Heat Machines	Transfer and	Thern
Course Ob	jectives:			
1	engines.	nd the properties of fluids & working principle of		
2	character			
3	Analyze a	and compare the efficiency and characteristics of diff	ferent pumps.	
4	thermal s	te effectively as part of multi-disciplinary teams sp ciences	pecializing in	fluid a
Course Ou				
Upon comp		the course, students shall have ability to		
C406.1	through p	the coefficient of discharge and friction factor of ipes using an apparatus		[/
C406.2	condition	-		ĮA
C406.3	character		-	
C406.4	unsteady	heat transfer and temperature distribution in -state heat conduction and extended surfaces	-	
C406.5		test and calculate the properties of fuels and lubricar		[A
C406.6	of air cor	solve and calculate the psychrometric processes an aditioning systems	d performanc	e [A
Course Co	ntents:			
S.No		List of Experiments	CO Mapping	RBT
1	Determina and Ventu	ation of the Coefficient of discharge of Orifice meter urimeter	C406.1	[Ap]
2		ation of the rate of flow using Rotameter and the result with orifice and venturimeter.	C406.1	[Ap]
3	Calculatio	n of friction factor for a given set of pipes	C406.1	[A]
4		a test on centrifugal pump and determine the nce characteristics	C406.2	[A]
5	Determina	ation of the performance characteristics of Pelton	C406.2	
5	turbine		0.00012	[A]
6	turbine Determina Francis T	ation of the performance characteristics of a urbine	C406.2	[A] [A]
	turbine Determina Francis T Determina Turbine	ation of the performance characteristics of a urbine ation of the performance characteristics of a Kaplan		
6	turbine Determina Francis T Determina Turbine Determina	ation of the performance characteristics of a urbine	C406.2	[A]
6 7	turbine Determina Francis T Determina Turbine Determina two slab g	ation of the performance characteristics of a urbine ation of the performance characteristics of a Kaplan ation of Thermal Conductivity of given specimen by guarded hot plate method. ation of Viscosity, flash point and fire point of	C406.2 C406.2	[A] [A]
6 7 8	turbine Determina Francis T Determina Turbine Determina two slab g Determina engine oil Performan TV1 engi	ation of the performance characteristics of a urbine ation of the performance characteristics of a Kaplan ation of Thermal Conductivity of given specimen by guarded hot plate method. ation of Viscosity, flash point and fire point of	C406.2 C406.2 C406.4	[A] [A] [E]
6 7 8 9	turbine Determina Francis T Determina Turbine Determina two slab o Determina engine oil Performan TV1 engi mode).	ation of the performance characteristics of a urbine ation of the performance characteristics of a Kaplan ation of Thermal Conductivity of given specimen by guarded hot plate method. ation of Viscosity, flash point and fire point of the and combustion test on computerized Kirloskar ne with eddy current dynamometer. (In diesel	C406.2 C406.2 C406.4 C406.5	[A] [A] [E] [E]
6 7 8 9 10	turbine Determina Francis T Determina Turbine Determina two slab o Determina engine oil Performan TV1 engi mode). Determina convectio	ation of the performance characteristics of a urbine ation of the performance characteristics of a Kaplan ation of Thermal Conductivity of given specimen by guarded hot plate method. ation of Viscosity, flash point and fire point of nce and combustion test on computerized Kirloskar ne with eddy current dynamometer. (In diesel	C406.2 C406.2 C406.4 C406.5 C406.3	[A] [A] [E] [E] [A]

										Тс	otal Ho	ours:	3	0
Reference														
1						ics and hy	/draulic	Machir	nes", L	.axmi I	Publica	ations	(P) L	_td.,
0				enth e			ata MaC			liahara	Call	tal NI		
2	2022	2.			-	eering", T								
3						istion Eng	ine; Tata	a McGi	raw Hi	ll Publ	lishers	Co. L	_td., N	lew
	Delh	ni, Fou	irth ed	ition,2	017.	<u> </u>								
4						nkundwar		A cou	rse i	n The	ermal	Engi	neerii	ng",
Web Ref				5. pvt i	ia, 512	kth edition	, 2019.							
1			nitk.vla	bs.ac.	in									
2	http:/	/nptel	.ac.in/	course	s/112	2104033/								
3	http:/	/nptel	.ac.in/	course	es/112	2105128/								
			Contir	nuous	Asses	sment								
Forma Assess			Summ Assess			Total	Con	Fotal tinuou essmer		Examinatio	End Semester Examination		То	otal
75	5		2	5		100		60			40		1	00
Α	ssess	ment	based	d on C	ontin	uous and	End Se	emeste	er Exa	minat	ion		1	
Bloom's	s Leve		Co	ontinu		\ssessme) Marks]	nt (60%)	E		emest Examii	natio		al
		-		FA			SA				(40 [°]	-		
				Marks)		(25	Marks)				[100 N			
Rememb				10			10				1(-		
Understa	na			10 30			10 30				10 30	-		
Apply Analyse				40			40				<u> </u>			
Evaluate				10			10				1(
Create				-			-				-	-		
Mapping Outcome			Outco	omes	(CO)	with Prog	Iramme	Outco	omes	(PO) F	Progra	imme	Spe	cific
						POs							PSOs	5
COs	1	2	3	4	5	6 7	8	9	10	11	12	1	2	3
C406.1	3	3	3	2								1		
C406.2	3	3	3	2				1	1	1	1	1		
C406.3	3	3	3	1								1		
C406.4	3	3	3	3								3		
C406.5	3	3	3	3				1				1		t
C406.6	3	3	3	1				1			1	3		
		3	Strong	gly agr	eed	2 Mode	erately a	greed	1	Reaso	onably	agree	ed	

23ME4	07	METROLOGY AND DYNAMICS LABORATORY		0/0/2/1
Nature	of Course	Practical application		
Pre Re	quisites	Manufacturing Practices Workshop		
		Engineering mechanics		
	<u></u>	Mechanics of Deformable Solids		
<u>Course</u>	• Objectives			
1	instrum		•	ieasurin
2	To deve	elop programs for applications using Lab View software	Э.	
3		ble the students to understand the principles of static for	orce analysi	s and
		c force analysis of mechanisms.	<u> </u>	
4		ide an insight regarding the undesirable effects of unl	balance in re	otors and
5	engines	duce the concept of vibratory systems and damping m	othodo	
-			ethous.	
	e Outcomes	: of the course, students shall have ability to		
C407.		the experiments to check linear and angular measure	ements.	[Ap]
C407.		programs for various applications using Lab View sol		[A]
C407.		ine the forces acting on machines and mechanisms		[Ap]
0.011		Is, and engines.		1, 161
C407.		ine the gyroscopic couple on motorized gyrosc	ope both	[A]
		nentally and analytically.		
C407.		e the various types of vibrations and to impart kno		[E]
		ing natural frequency and forces caused due to unb	balance in	
C407.	6 Porform	static and dynamic balancing calculations for rotatin	a parts of	[A]
6407.	machin		y parts or	[A]
Course	e Contents:			
S.No		List of Experiments	СО	RBT
5.140	4	Jsing analysis and simulation softwares)	Mapping	
1		e various physical parameters of the given workpiece	C407.1	[Ap]
1		r and angle measuring instruments	0407.1	[74]
2		e tolerance of the manufactured component using	C407.1	[Ap]
	-	I and optical comparator.		
	Study of Vi	rtual instrumentation for simple applications.		
3	Simulate th	e basic arithmetic and logic operations using VI.	C407.2	[A]
4	Measure th	e Real time temperature Using DAQ	C407.2	[A]
5	Determinat bifilar susp	ion the moment of inertia of turn table apparatus and	C407.4	[Ap]
6		ion of gyroscopic couple using motorized gyroscope.	C407.4	[A]
7		ion of transmissibility ratio using vibrating table.	C407.5	[E]
8		ion of transverse frequency of beam.	C407.5	[E]
		of rotating masses and reciprocating masses.	C407.6	[A]
Q	,	ion of Natural frequency of Free longitudinal Vibration	C407.0 C407.5	[A]
9	Derenningi	ion of Critical speed of Shaft	C407.5 C407.5	[A]
10	Determinat			
10 11				
10	Fabrication	of model utilizing the applications of three bar, four nisms, gear trains etc.,	C407.5	[A]

			st edition, Khanna Pu		
			ual Instrumentation u	ising Labview",	Mcgraw Hi
Ratta	n S.S., "Theory o	of Machines", 5	h edition, Tata McGra	aw-Hill Publishir	ng Compan
					0 1
		ry of Machines	', CBS Publishers and	d Distributors, 2	013.
erence	es:	•			
https:/	//nptel.ac.in/cours	ses/112/106/11	2106180/		
https:/	//nptel.ac.in/cours	ses/112106179	<u>/</u>		
	Continuous	s Assessment		End	
tive ment	Summative Assessment	Total	Total Continuous Assessment	Semester Examination	TOTAL
	25	100	60	40	100
nent ba	ased on Continu	ous and End	Semester Examinati	on	
,	Contin		. ,	End Semest	
5	FA (75 Marks)	SA (25 Marks)	(40	
er	30		30	3	0
nd	30		30	3	0
	20		20	2	0
	20		20	2	0
	-		-	-	
			_	-	
	Educa Rattai Ltd., N Thom erence https:/ https:/ https:/ https:/ s	Education; 2nd edition, Rattan S.S., "Theory of Ltd., New Delhi, 2019. Thomas Bevan, "Theore erences: https://nptel.ac.in/cours https://nptel.ac.in/cours Continuous tive Summative Assessment 25 nent based on Continu 's FA (75 Marks er 30 nd 30 20	Education; 2nd edition, 2017. Rattan S.S., "Theory of Machines", 54 Ltd., New Delhi, 2019. Thomas Bevan, "Theory of Machines" erences: https://nptel.ac.in/courses/112/106/11 https://nptel.ac.in/courses/112/106/17 Continuous Assessment tive ment Summative Assessment Total 25 100 nent based on Continuous and End Continuous Assessment 's FA (75 Marks) er 30 nd 30 20 20	Education; 2nd edition, 2017. Rattan S.S., "Theory of Machines", 5th edition, Tata McGra Ltd., New Delhi, 2019. Thomas Bevan, "Theory of Machines", CBS Publishers and erences: https://nptel.ac.in/courses/112/106/112106180/ https://nptel.ac.in/courses/112/106/112106180/ https://nptel.ac.in/courses/112/106/179/ Continuous Assessment tive ment Summative Assessment Total Total Continuous Assessment 125 100 60 nent based on Continuous and End Semester Examinati Continuous Assessment (60%) Same (25 Marks) rs FA (75 Marks) 30 30 nd 30 30 30	Rattan S.S., "Theory of Machines", 5th edition, Tata McGraw-Hill Publishin Ltd., New Delhi, 2019. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 2 erences: https://nptel.ac.in/courses/112/106/112106180/ https://nptel.ac.in/courses/112/106/179/ Continuous Assessment End Kive ment Summative Assessment Total Total Continuous Assessment End 125 100 60 40 60 40 nent based on Continuous and End Semester Examination End Semester Examination rs Continuous Assessment (60%) [100 Marks] End Semester rs FA (75 Marks) SA (25 Marks) [100 M er 30 30 30 30 and 30 20 20 20 20

Outcomes	(100)														
<u> </u>						P	os							PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C407.1	3	3	2											2	
C407.2	3	3	2		3								3	2	
C407.3	3	3	3										1		
C407.4	3	3	3										1		
C407.5	3	3	3										2		
C407.6	3	3	3										2		
	3 St	rongl	y agr	eed	2	Mode	ratel	y agr	reed	1	Rea	isona	bly agree	əd	

Professional Elective

R2022 (AY: 2023-2024)

23ME90	1	ELECTRIC AND HYBRID VEHICLE TECHNOLOGY	3/0/0/3
Nature o	of Course	Theory Skill based	
Pre-Req	uisites	NIL	
Course	Objectives:		
1	To enable and hybrid	the students to understand the working of different configuration vehicles.	ons of electric
2	To expose industries.	e the students to the recent propulsion technologies used in	n automotive
3	To enable system.	the students to realize the technical characteristics of en	ergy storage
Course	Outcomes:		
Upon co		f the course, students shall have ability to	
C901.1		he need, concept and types of EV/HEV.	[U]
C901.2		basic components of hybrid and electric vehicles.	[U]
C901.3	Choose su	itable electric propulsion and control systems for EV/HEV.	[Ap]
C901.4	Evaluate th	ne performance of electric vehicles.	[A]
C901.5		oper energy storage systems for vehicle applications.	[Ap]
Course	Contents:		
Electric V	Vehicle (HE Types of F	eles. Types of Electric Vehicles: Battery Electric Vehicle (EV), plug-in hybrid electric vehicle, fuel cell electric vehicle, so Hybrid Vehicle: Hybridization – micro hybrid, mild hybrid, f	olar powere
Electric V vehicle. advantag Electric drives, p of electri consump DC/DC	Vehicle (HE Types of H ges, disadva Vehicle Pro ermanent m c vehicle, pe otion. Hybri converter, tr	V), plug-in hybrid electric vehicle, fuel cell electric vehicle, so	blar powere ully hybrid luction moto onfiguration ons – energ or, controlle
Electric Vehicle. advantage Electric drives, p of electric consump DC/DC of series hy energy set based based	Vehicle (HE Types of H ges, disadva Vehicle Pro ermanent m c vehicle, pe otion. Hybri converter, tr /brids, and p storage sys atteries, batter charge, stat smart batter energy stora ensor – EP	 V), plug-in hybrid electric vehicle, fuel cell electric vehicle, so hybrid Vehicle: Hybridization – micro hybrid, mild hybrid, funtages & its applications. opulsion Systems: Types of EV motors - DC motor drives, inclusion agnetic brushless DC motor drives, hub motor drive system, cerformance of electric vehicle – tractive effort in driving conditionation d Electric Vehicle Drive Trains: IC engine, electric motor ansmission unit, batteries. Drive train Configuration: Parabover-split hybrids – control strategies. Stems: batteries – lead acid batteries, nickel-based batteries, ery charging techniques, battery characterization – capacity, dise of discharge, depth of discharge, technical characteristics, y management system. Fuel cell-based energy storage, hybrid ge devices. Control Systems for EV/HEV: Electronics powers? motor, suspension system – semi trailing arm type, trainative suspension system, and regenerative braking system for 	blar powered ully hybrid luction moto onfiguration ons – energ or, controlled allel hybrids and lithium scharge rate battery pac oridization of er steering ling arm, a EV/HEV.
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C901.4	3			3												
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		3	Str	ongly	agre	ed	2	Mode	ratel	y agr	eed	1	Reasor	nably	/ agree	ed

23ME90	2	AUTOTRONICS	3/0/0/3
Nature o	of Course	Theory	
Pre-Req		Vehicle Technology	
	Objectives:		
1	To enable t	the students to understand the evolution of electronics in automob	iles and
	impart then	n the basics of charging and starting system	
2		he knowledge on ignition and injection systems	
3	To acquai	nt students with various sensors and actuators for controllin	ng engine
	parameters	3	
	Outcomes:		
Upon co		the course, students shall have ability to	1
C902.1		basic electrical and electronics systems used in automotive	[U]
	electronics.		
C902.2		e different types of batteries used in the automotives.	[U]
C902.3		suitable sensors for various applications used in automotives.	[Ap]
C902.4		principles and applications of vehicle control and safety systems	[R]
		e automotives.	
C902.5	Design and Contents:	d develop the components for automotives.	[C]
working of battery a testings - motor - ty ignition s	of charging c nd lithium-ba - battery cha /pes of starte ystem - batte	ns: Introduction to electrical systems in automobiles - charging sircuit diagram - alternators - regulator - battery - types of batteries - ased batteries - construction and working principle - battery rating arging methods, starting system - working of starter circuit diagrar er drive - bendix drive - over running clutch type. Ignition System ery coil ignition system and its components - electronic ignition sy Lighting System - Circuits and various components.	- lead aci g - batter n - starte - Types o /stem an
working of battery a testings - motor - ty ignition s its com	of charging c nd lithium-ba - battery cha /pes of starte ystem - batte ponents. L	Fircuit diagram - alternators - regulator - battery - types of batteries - ased batteries - construction and working principle - battery rating arging methods, starting system - working of starter circuit diagrar er drive - bendix drive - over running clutch type. Ignition System ery coil ignition system and its components - electronic ignition system	- lead aci g - batter n - starte - Types c /stem an
working of battery a testings - motor - ty ignition s its com systems/ Sensors - working oxygen s sensors Types of and cont the engir	of charging c nd lithium-ba - battery cha /pes of starte ystem - batte ponents. L accessories , Actuators g principle of sensor - man - vehicle spe actuators - i rol. Engine n ne managem	Fircuit diagram - alternators - regulator - battery - types of batteries - ased batteries - construction and working principle - battery rating arging methods, starting system - working of starter circuit diagram er drive - bendix drive - over running clutch type. Ignition System ery coil ignition system and its components - electronic ignition sy Lighting System - Circuits and various components.	- lead acie g - batter n - starte - Types o /stem and Auxiliar e sensor n sensor mperature ctuators GR) valve Js used i
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working o battery a testings - motor - ty ignition s its com systems/ Sensors - working oxygen s sensors Types of and cont the engir generation Vehicle o suspensi steering cruise co vehicles Technolo	of charging c nd lithium-ba - battery cha /pes of starte ystem - battery ponents. L accessories , Actuators g principle of sensor - man - vehicle spe actuators - i rol. Engine n the managem on - OBD II c Control and on system - control – elec ontrol system - object dete ogical develo	 arcuit diagram - alternators - regulator - battery - types of batteries - ased batteries - construction and working principle - battery rating arging methods, starting system - working of starter circuit diagram er drive - bendix drive - over running clutch type. Ignition System ery coil ignition system and its components - electronic ignition system - Circuits and various components. in automobiles. and Engine Management System: Sensors - types of automotive f various sensors - crankshaft position sensors - throttle position field pressure sensor - mass air flow sensor - engine coolant tere eed sensors - exhaust gas oxygen sensors - knock sensors. Actidle speed actuator - unit injector - Exhaust Gas Recirculation (Ethernanagement system - block diagram and working principle - ECL tent - On Board Diagnosis (OBD) -Purpose of On Board Diagnost concept - SAE J2012 standard diagnostic trouble code (DTC). Safety Systems: Automatic Transmission System - electronic clutt electronic suspension system - traction control system - electro ctronic differential - Advanced Driver Assistance Systems (ADAS) - anti-lock braking system - vehicle and artificial intelligence - au ection - collision warning and avoidance systems - airbags. Case 	 lead acie batter starte Types c stem and Auxiliar e sensor mperature ctuators GR) valve Js used in ic second ch - active nic powe adaptive
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Reference	ce Books	6:						
1	Robert Vieweg	Bosch Gmbh, "Bo .2013	sch Autor	motive Elec	tric and Electro	nics" 5th edi	ition S	oringer-
2		lollembeak, "Autor	notive Ele	ectricitv and	Electronics" C	endade Lea	rnina.	2017.
3		enton, "Electric ar						
Web Ref		•						
1		www.udemy.com/	course/ba	asics-of-aut	omotive-electro	nics/		
2		archive.nptel.ac.ir				·····		
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1		www.youtube.con	n/watch?v	/=BOP8aL0	JzhDc			
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C902	2.2	Understand	Case stu	udy				20
C902	2.3	Apply						
C902	2.4							
	Z.4	Remember	Project v	work / Vehic	cle fabrication			40
C902		Remember Create	Project v	work / Vehio	cle fabrication		,	40
	2.5	Create essment based o	n Summa	ative and E	nd Semester E	Examination		40
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Assessr	ment based on	Continuous an	d End Sem	ester Examination	
	C	ontinuous Ass	essment (4	0%)	
		[200 M	arks]		End
	CA 1 : 100 Ma	arks		CA 2 : 100 Marks	Semester
SA 1	FA 1 (40) Marks)	SA 2	FA 2 (40 Marks)	Examination
(60 Marks)	Component - I (20 Marks)	Component - II (20 Marks)	(60 Marks)	Component - I (40 Marks)	(60%) [100 Marks]

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Outcom	., .	~~,													
<u> </u>						P	Os							PSOs	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C902.1	3	3										3			
C902.2	3	3													
C902.3	3	3	3			3			2			3		2	3
C902.4	3	3					3								
C902.5	3	3	3						3		2			3	3
		3	Stro	ongly	agre	ed	2	Mode	ratel	y agr	eed	1	Reasona	bly agreed	

23ME90	3 4	ALTERNATE ENERGY SOURCE FOR AUTOMOBILES	3/0/0/3
Nature o	f Course	Theory technology	
Pre-Requ	uisites	Engineering Thermodynamics, Thermal Engineering, Vehicle Te	chnology
Course (Objectives:		
1	To expose	the students to the available alternate energy resources.	
2	To provide	e insights about new energy sources like CNG, Renewable	oils, and
	Hydrogen.		
3		ze the ways of utilizing the energy resources in conventional vehic	les.
	Outcomes:		
		the course, students shall have ability to	FL 13
C903.1		need, availability and difficulty in using alternate fuels.	[U]
C903.2		operties of alternate fuels and know the standards followed.	[A]
C903.3	alternate fu	e performance and emission characteristics of engines using lels.	[A]
C903.4	Discover th	e developments in hybrid energy and fuel cells.	[Ap]
C903.5		e technology behind developing of electric, hybrid and fuel cell	[A]
<u>Course (</u>	vehicles.		
, 0		IG. Alcohols: Properties of engine fuel, alcohols andgasoline stion characteristics and Emission characteristics in SI and CI eng	
Performa Natural modificat LPG in S Renewal in engine Electric, limitation	Gas, LPG, ions required and CI er ble Oils: Est s. Renewab Hybrid, Fu s, specificati patteries, hy		ine. properties, CNG and aspects. Tybrid oils ntage and and power
Performa Natural modificat LPG in S Renewal in engine Electric, limitations density b powered	Gas, LPG, ions required and CI er ble Oils: Est s. Renewab Hybrid, Fu s, specificati batteries, hy vehicle.	stion characteristics and Emission characteristics in SI and CI eng Hydrogen and Biogas: CNG vehicles, availability of CNG, p d to use in engines, performance and emission characteristics of ngines, hydrogen storage and handling, performance and safety erification, Performance and emission characteristics in engines. H le Fuel Standard (RFS) Iel Cell and Solar Cars: Layout of an electric vehicle, advar ons, system components, electronic control system, high energy a	ine. properties, CNG and aspects. Tybrid oils tage and and power
Performa Natural modificat LPG in S Renewal in engine Electric, limitations density k powered Text Boc	Gas, LPG, ions required and CI er ble Oils: Est s. Renewab Hybrid, Fu s, specificati patteries, hy vehicle.	stion characteristics and Emission characteristics in SI and CI eng Hydrogen and Biogas: CNG vehicles, availability of CNG, p d to use in engines, performance and emission characteristics of ngines, hydrogen storage and handling, performance and safety erification, Performance and emission characteristics in engines. He le Fuel Standard (RFS) nel Cell and Solar Cars: Layout of an electric vehicle, advar ons, system components, electronic control system, high energy a brid vehicle, series and parallel hybrid vehicle, fuel cell vehic Total Hours:	ine. properties, CNG and aspects. Tybrid oils and power les, solar 45
Performa Natural modificat LPG in S Renewal in engine Electric, limitations density b powered	Gas, LPG, ions required and CI er ble Oils: Est s. Renewab Hybrid, Fu s, specificati patteries, hy vehicle.	stion characteristics and Emission characteristics in SI and CI eng Hydrogen and Biogas: CNG vehicles, availability of CNG, p d to use in engines, performance and emission characteristics of ngines, hydrogen storage and handling, performance and safety erification, Performance and emission characteristics in engines. He le Fuel Standard (RFS) nel Cell and Solar Cars: Layout of an electric vehicle, advar ons, system components, electronic control system, high energy a brid vehicle, series and parallel hybrid vehicle, fuel cell vehic Total Hours: , "Biodiesel- Production and Properties"- RSC Publishing - ISI	ine. properties, CNG and aspects. Tybrid oils and power les, solar 45
Performa Natural modificat LPG in S Renewal in engine Electric, limitation density k powered Text Boc	Gas, LPG, ions required of and CI er ble Oils: Est s. Renewab Hybrid, Fu s, specificati batteries, hy vehicle. bks: Amit Sarin 84973-470 Sunggyu L	stion characteristics and Emission characteristics in SI and CI eng Hydrogen and Biogas: CNG vehicles, availability of CNG, p d to use in engines, performance and emission characteristics of ngines, hydrogen storage and handling, performance and safety erification, Performance and emission characteristics in engines. He le Fuel Standard (RFS) nel Cell and Solar Cars: Layout of an electric vehicle, advar ons, system components, electronic control system, high energy a brid vehicle, series and parallel hybrid vehicle, fuel cell vehic Total Hours: , "Biodiesel- Production and Properties"- RSC Publishing - ISI -7, 2019. ee, James G. Speight, Sudarshan K. Loyalku- "Handbook ofAltern	ine. properties, CNG and aspects. Tybrid oils and power les, solar 45 3N:978-1-
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			Co	ontinu	ious	Ass	essr	nent	t					End			
Formative Assessment			Summativ Assessme						Total	Tot Contin Assess		uous	ous Semes		ter	Total	
80			120						200			40		60		100	
		Asse	ssm	ent M	etho	ds 8	k Lev	/els	els (based on Blooms' Taxonomy)								
Formative Assessment based on Capstone Model																	
Course Outcome			Bloom's Level				Assessment Componen							: (1		FA 6%) Varks]	
C903.1			Understand			Qu	Quiz									20	
C903.2 C903.3			Analyze				Assignment						20			20	
C903.4			Apply				Case Study							20		20	
C903.5			Analyze				Group Assignment							20			
	As	sess	smen	t bas	ed o	n Su	Imm	ative	and	End S	Seme	ster I	Examiı	nation			
Bloom's Level								Assessment (24%) 0 Marks]					End Semester Examination (60%)				
			CIA1 : [60 Marks]										[100 Marks]			/ • /	
Remember			20				10						20				
Understand			30				40						30				
Apply			40				40						20				
Analyse			10				10						30				
Evaluate			-										-				
Create			-										-				
Assess	nent b	ased								ter Ex	amir	natior	<u> </u>				
Continuous Assessment (40%) [200 Marks]																	
	CA 1	: 100	Mar	ks	•		-		CA 2 :	100	Mark	s			End Semester Examination		
0.4.4		FA 1	(40 N	/larks	;)		SA 2		FA		2 (40 Marks)			EX			
SA 1 (60	Comp	one · I					t (60						omponent - II		(60%) [100 Marks]		
Marks)	(20 N	larks	5)	(20 M	arks) 1	Mark		⁵⁾ (20 Marks)								
Mapping							vith	Proc						ogram	nme S	pecific	
Outcom																	
							Os							PSOs			
COs	1	2	3	4	5	6	7	8	9	10	11	12	1		2	3	
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C903.2	2	3					3										
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Nature of Course Theory Pre-Requisites Vehicle Technology, Manufacturing Technology. Course Objectives: To impart knowledge on various processes involved in the manufacturing of automotive components. 2 To address the underlying concepts and methods behind automobile engin component manufacturing. 3 To understand the fundamentals of modern manufacturing methods in automotivindustry. Course Outcomes: Upon completion of the course, students shall have ability to C904.2 Enscribe the various manufacturing process for manufacturing utansmission system components. R C904.3 Select the relevant heat and surface treatment methods for engine and transmission Components. AP C904.4 Outline the automotive body components manufacturing of automobile components like chassis, wheel, brake and tyres AP C904.5 Choose a suitable material and process for manufacturing of automobile components: Casting of engine block - conventional and expendable pattern, casting of cylinder heads, cylinder liners, crankshaft, connecting rod and gudgeon pins-forging and casting machining and piston ring manufacturing. Upset forging of valves - heat treatment and surfact improvement. Engine bearing manufacturing. Precticion forging of valves - heat treatment and surfact improvement. Engine bearing of sport, helical, and bevel gears, hypoid gears, heat treatmer and surfact improvement. Engine bearing of sport, helical, and bevel gears, hypoid gears, heat treatmer and infishin	23ME904	AUTOMOTIVE COMPONENT MANUFACTURING	3/0/0/3				
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Reference Books:			ing Co, 2019				
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Kalpakjian, "Manufacturing Engineering and Technology", Publisher: Pearson, 2013.
 Sanjay K Mazumdar, "Composites Manufacturing", CRC Press, NY, 2014.

Web References	5:									
1 https://v	/ww.youtube.com/	/watch?v=	=hs7bABMt	OMI&t=71s						
2 https://v	/ww.youtube.com/	/watch?v=	=H_RgFXjg-	- <u>5s</u>						
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1 https://v	/ww.youtube.com/	/watch?v=	=hs7bABMt	OMI&t=41s						
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80	120		200	40	60		100			
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	Formative As	ssessme	nt based o	n Capstone Mo	odel					
Course OutcomeBloom's LevelAssessment ComponentFA (16% [80 Mar										
C904.1	Remember	Assignn	nent				20			
C904.2	Understand	Quiz					20			
C904.3										
C904.4	Apply	Semina	r, case stud	У			40			
C904.5										
Ass	essment based o	on Summ	ative and E	End Semester E	Examinatio	n				
	Summative A	Assessm	ent (24%)[1	20 Marks]		Semes				
Bloom's Level	CIA1 : [60 Ma	rks]	CIA2 : [0	60 Marks]	Examina [100	ation (<u>Mark</u>	. ,			
Remember	30			30		30				
Understand	40		4	40		30				
Apply	30			30		40				
Analyse	-			-		-				
Evaluate	-			-		-				
Create	-			-		-				

Assessm	nent based on Co	ntinuous and End S	Semester E	xamination								
	Continuous Assessment (40%)[200 Marks] End											
	CA 1 : 100 M	arks	CA 2	2 : 100 Marks	Semester							
SA 1	FA 1 (4)	0 Marks)	SA 2	FA 2 (40 Marks)	Examination							
(60	Component - I	Component - II	(60	Component - I	(60%)							
Marks)	(20 Marks)	(20 Marks)	Marks)	(40 Marks)	[100 Marks]							

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COs	1	2	3	4	5	6	7 8 9 10 11 12					12	1	2	3	
C904.1	3	3	2											2		
C904.2	3	3	1											2		
C904.3	3	3	2											3		
C904.4	3	2	1											3		
C904.5	3	3	1	3										3		
		3														

	5	SMART AND INTELLIGENT MOBILITY	3/0/0/3	
Nature of	Course	Theory		
Pre-Requ	lisites	Vehicle Technology		
Course C	bjectives:			
1	To understa	and the basics of autonomous and connected vehicle		
2	To elaborat	te various technologies used in autonomous vehicle		
3	To underst	tand the impact of automating various driving functions, conne	ecting the	
	automobile	to sources of information that assist the task	-	
Course C	Outcomes:			
Upon cor	npletion of	the course, students shall have ability to		
C905.1	Summarize	e the concept of fully autonomous vehicles.	U	
C905.2	Recall the	concept of remote sensing and the types of sensor technology	R	
0905.2	needed to i	implement remote sensing.	Γ	
C905.3	Apply the te	echnologies of cyber physical control systems to avoid collision in	Ар	
0905.5	autonomous venicies.			
C905.4	Apply vario	us decision and control technologies in intelligent vehicles.	Ар	
C905.5	Analyze the	e concept of the connected vehicle and its role in automated	۸	
0905.5	vehicles.		A	
Course C	contents:			
Technolo	ogies for Sm	hicles, vehicle-to-vehicle technology and applications, vehicle-to ructure applications, challenges and issues. nart Mobility: Overview of technologies in autonomous cars, basic ms, ultrasonic sonar systems, lidar sensor technology and systems	s of rada	
Technolo technolog systems, surroundin Intelligen system m control of	bgies for Sm by and system overview of overview of ngs sensing bt Vehicle I odel for ada f distance a	ructure applications, challenges and issues.	s of rada s, camera rd contro /, role o chniques ms. Fuzzy	
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23ME906		DRONE AND UAV TECHNOLOGIES	
Nature of	Course	Theory	
Pre-Requi	isites	Fundamentals of Electrical and Electronics Engineering	
Course O	bjectives:		
1	To understa	and the basics concepts, fabrication and programming of drone.	
2	To impart tl	he knowledge of a flying and operation of drone	
3 .	To understa	and the applications of drones in various industries	
Course O	utcomes:		
Upon com	npletion of	the course, students shall have ability to	
C906.1	Recall the v	various types of drones and its components.	[U]
C906.2	Select appr	ropriate sensors required and operating principles of the drones.	[Ap]
C906.3	Describe va	arious testing methods and applications for drones.	[Ap]
C906.4	Execute the	e drone control systems and programming.	[U]
		development of a drones for specific applications.	[C]
Course Co	<u> </u>		
Viatorial S		elopment and Control Systems: Aerodynamics effects of dror	
Winglets E planning a Autopilot s Drone Te	Design Con and naviga systems - To esting Met	Design and Fabrication for Balancing of Gliders, Aspect Ratio figuration, Controls Deflection and Mixing. Basic flight maneuve ation. Drone Control Systems – Transmitter, Remote control elemetry systems - Methods of drone programming. hods and Applications – Thrust Calculation, Weight Calcul	, Tail an rs - Fligh systems ation, Co
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	Continuous	Assessm	ent			End			
Formative Assessment	Summa Assess		Total	Total Continuc Assessm	ous	End Semest Examina		Total	
80	120		200	40		60		100	
As	ssessment Metho	ods & Lev	els (based	on Bloom	is' Ta	xonomy)			
	Formative A	ssessmei	nt based o	n Capston	e Mo	del			
Course Outcome	Bloom's Level		Assessm	ent Compo	onen	t	(1	FA 6%) Marks]	
C906.1	Understand	Assignm	nent					20	
C906.2	Apply	_				20			
C906.3	Apply								
C906.4	Understand	Project v	work / Dron	e fabricatio	n			40	
C906.5	Create								
Assessment base	ed on Summative	and End S	Semester E	xamination					
Bloom's Level	Summati	ve Asses [120 Marl	sment (24% ks]	%)	End	nd Semester Examinatio (60%)			
	CIA1 : [60 Ma	arks]	CIA2 : [60	Marks]		[100 Ma	arks]		
Remember	30		30		20				
Understand	30		30		30				
Apply	40 30								
Analyse	-		10			10			
Evaluate	-		-			-			
Create									

Assessn	nent based on Cor	ntinuous and End S	Semester E	xamination								
Continuous Assessment (40%) [200 Marks]												
	CA 1 : 100 M	arks	CA	2 : 100 Marks	Semester Examination							
SA 1	FA 1 (4	0 Marks)	SA 2	FA 2 (40 Marks)	(60%)							
(60 Marks)	Component - I (40 Marks)	[100 Marks]										

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO) PSOs Pos COs C906.1 C906.2 C906.3 C906.4 C906.5 3 Strongly agreed 2 Moderately agreed 1 Reasonably agreed

23ME907	7	DIGITAL MANUFACTURING	3/0/0/3					
Nature of	Course	Theory						
Pre-Requ	isites	Manufacturing Technology						
Course C	bjectives:							
1	To study the	e various aspects of digital manufacturing and understand the imp	ortance of					
	digital man	ufacturing in product lifecycle management and supply chain man	agement.					
2	To elaborat	te the significance of digital twin.						
3	To formulat	te smart manufacturing systems in the digital work environment.						
Course C	utcomes:							
Upon cor	npletion of	the course, students shall have ability to						
C907.1	Describe th	ne fundamental concepts of digital manufacturing.	U					
C907.2	Select tools and technologies used in implementation of digital U manufacturing.							
C907.3		al technologies in various manufacturing and process industry.	Ар					
		d optimize various practical manufacturing process through digital	A					
C907.4	twin. Implement digital environment in product life cycle and supply chain							
C907.5	•		Ар					
Course C	manageme	fill.						
IoT and I manufacte physical Manufacte Digital Tw digital twi risk. case cycle, dig Overview	ndustry 4.0 uring proces systems - uring. Augm vin: Digital n implemen study. Digit ital technolo of digital su	cyber security. D: Industry 4.0 – internet of things – industrial internet of things, in sses, intelligent machining – cloud computing – big data analytic collaborative robots. Artificial Intelligence and Machine Le mented Reality and Virtual Reality in Manufacturing. Case Study. twin concept, digital twin in manufacturing, digital twin platform entation and guidelines, business advantages of digital twin, challe tal Product Life Cycle & Supply Chain Management: Phases of ogies in product life cycle, collaborative product development, ca upply chain – effective digital transformation - scope & challenge	cosystem, enges and digital life ase study.					
supply ch	ain – case s		45					
Tarif	l	Total Hours:	45					
Text Boo 1	Kaushik Ku	umar, Divya Zindani, J. Paulo Davim, 'Digital Manufacturing and As 0, Taylor & Francis Ld., 2020.	ssembly in					
2	Zude Zhou	u, Shane (Shengquan) Xie and Dejun Chen, Fundamentals ring Science, Springer-Verlag London Limited, 2018.	of Digital					
Referenc								
1		g and Andrew YehChing Nee, Collaborative Design and Planning	for Digital					
	Manufactur	ring, Springer-Verlag London Limited, 2019.	•					
2	Manufactur	eh Chris Nee, Fei Tao, and Meng Zhang, "Digital Twin Driv ring", Elsevier Science., United States, 2019.						
3	•	lag and Emre Cevikcan, "Industry 4.0: Managing the Digital Transf eries in Advanced Manufacturing., Switzerland, 2017	ormation",					
Web Refe								
1	https://www							
	manutactu	w.plm.automation.siemens.com/global/en/our-story/glossary/digita uring/13157	<u>al-</u>					
2		w.pim.automation.siemens.com/global/en/our-story/glossary/digita iring/13157 w.twi-global.com/technical-knowledge/faqs/what-is-digital-manufa						

Online F																
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			Fo	ormat	ive A	sses	ssme	ent ba	ased	on C	apst	one l	Model			
Cou Outc			Bloo	m's L	.evel			As	sess	men	t Con	npon	ent	FA 6%) ∕larks]		
C90	7.1		Und	dersta	and	•									-	
C90				dersta		As	signi	ment							2	20
C90	7.3			Apply			ase S	study								20
C90		\square		nalys		Qu										20
C90				Apply			ase S								2	20
	Α	sses	sme								Sem		r Examina			
_				Sun	nmati			ssme	nt (2	4%)		E	nd Semes			nation
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			С	ontin					(40%	6)						
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Marks)	(20	Mark	s)		 Mark	s)	Mar	ks)	(20	Mar	ks)	(20	Marks)			
Mapping Outcom	j of C	ours		•			with	Prog				•	(PO) Prog	gramr	ne S	pecific
						P	Os							PSC)s	
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	1	2	3
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	_													-		
C907.4	3	3	3		3							3		_	2	3
C907.5	3	3	3		3							3			2	3
		3	Str	ongly	agre	ed	2	Mode	eratel	y agr	eed	1	Reasona	bly ag	reed	

23ME90	8	MODERN ROBOTICS	3/0/0/3
Nature	of Course	Concept and Theory	
Pre-Re	equisites	Engineering Mechanics, Kinematics and Dynamics of Machines	
Course (Objectives:		
1	To introduc	e the history of robotics and robot anatomy.	
2	To impart k	nowledge on robot end effectors, arm and their design.	
3	To understa	and the simulation of robot kinematics.	
4	To study th	e mobile robots and its manipulation.	
5	To study th	e application of robots in various sectors.	
	Outcomes: mpletion of	the course, students shall have ability to	
C908.1	Discuss the	e definition, history of robotics and robot anatomy.	R
C908.2		he types of robotic manipulators and gripper configuration based ics and dynamics of robot.	U
C908.3	Develop the	e simulation of robot kinematics.	Ар
C908.4	Analyze the robots.	e drive mechanism and power transmission methods used in	А
C908.5	Describe th	ne mobile robot and the application of robots in various sectors.	U
Course (Contents:		
Robot: D	efinition, hist	ROBOT, SIMULATION OF ROBOT KINEMATICS ory of robotics, robot anatomy, co-ordinate systems, types and clas and degrees of freedom of rigid bodies and robots, configurati	

configuration space and degrees of freedom of rigid bodies and robots, configuration space topology and representation; configuration and velocity constraints; task space and workspace, rigid-body motions, rotation matrices, angular velocities, and exponential coordinates of rotation, homogeneous transformation matrices. robot kinematics, forward and inverse kinematics (two three four degrees of freedom), homogeneous transformation matrices.

ROBOT DRIVES, CONTROLS AND POWER TRANSMISSION

Robot drive mechanisms – hydraulic – pneumatic and electric, mechanical transmission methods. electronic and pneumatic manipulators - construction of manipulators. Different types of controllers-proportional, integral, differential, PID controllers. Classification of end effectors - drive system for grippers - mechanical-adhesive-vacuum-magnetic-grippers, active and passive grippers.

MOBILE ROBOTS AND APPLICATIONS OF ROBOTS

Mobile robot, Wheeled Mobile Robots: Kinematic models of omnidirectional and non-holonomic wheeled mobile robots, controllability, motion planning, feedback control of non-holonomic wheeled mobile robots; odometry for wheeled mobile robots; and mobile manipulation. Reference trajectory generation, feed forward control. applications of robots: industrial robots, service robots, domestic and house hold robots, medical robots, military robots, agricultural robots, space robots, aerial robotics role of robots in inspection, assembly, material handling, underwater, space and healthcare.

	I otal Hours: 45
Text Bo	oks:
1	Julian Evans, "Modern Robotics: Mechanics, Systems and Control", Larsen and Keller Education, 2019
2	Mikell P. Groover, Mitchell Weiss, "Industrial Robotics, Technology, Programming and Applications ", McGraw Hill Education, 2nd Edition, 2018.
Referen	ce Books:
1	Jared Kroff, "Modern Robotics: Designs, Systems and Control", Willford Press, 2019.
2	Chenguang Yang, Hongbin Ma, Mengyin Fu, "Advanced Technologies in Modern Robotic Applications", Springer, 2018.

3			son, "Moder ion, 2006.	n Robo	tics:	Building	g Versat	ile Macł	nines",	Facts on	File Inc;
4	Francis	6 X. G	overs, "Artifon, 2018.	ficial Int	tellige	ence fo	or Robo	tics", Pa	ackt Pu	ublishing	Limited;
Web Re	ferences		, _0.01								
1			botics.org/								
2			ootbooks.co	m/aene	ral-ro	botics-	links.htm	า			
	Resource										
1	https://	/www.e	dx.org/cours	se/robot	ics-c	olumbia	ax-csmm	n-103x			
2			dx.org/cours								
3			dx.org/cours								
		Co	ontinuous A	ssessr	nent				-	- a al	
	mative ssment		Summati Assessm		T	「otal	To Contir Asses	nuous	Sen	End nester nination	Total
	80		120			200	4	-		60	100
	As		ent Method							iy)	
		Fo	rmative As	sessme	ent ba	ased or	n Capst	one Mo	del		
Cou Outc		Bloor	n's Level		As	sessm	ent Con	nponen	t		FA (16%) Marks]
C90	8.1	Reme	mber	Quiz							20
C90	8.2	Under	stand	Assignr	ment						20
C90	8.3	Apply		Assignr	ment						20
C90		Analys		Semina	ar						20
C90		Under									20
	Asse	essmer	nt based on								
Bloom's	s Level		Summative	e Asses 120 Mai		ent (24%	6)	End		ter Exan 60%)	nination
		CIA	1 : [60 Mar	ks]	CIA	2 : [60	Marks]		[10) Marks]	
Rememb	ber		40			20				20	
Understa	and		40			20				30	
Apply			20			30				30	
Analyse			-			30				20	
Evaluate)		-			-				-	
Create			-			-				-	
Assessi	nent bas		Continuous				er Exam	ination			
		Co	ontinuous A [200	Assessr 0 Marks		(40%)				End S	emester
	CA 1:1						100 Ma				ination
SA 1			Marks)	SA	2		FA 2 (40)%)
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ina Koj	(20 Ma	rks)	(20 Marks)	man		(20 N	larks)	(20 Ma	arks)		

Outcome	, i j C,	00,													
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COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C908.1	3	2	2		3										3
C908.2	3	3	2									2			
C908.3	3	3	2									2			
C908.4	3	2	3		3									2	3
C908.5	3	1	1		2							2		2	3
		3	Str	ongly	agre	ed	2	Mode	eratel	y agr	eed	1	Reasonat	ly agreed	

23ME90	9	APPLIED HYDRAULICS AND PNEUMATICS	3/0/0/3
Nature o	f Course	Theory Application	
Pre-Req	uisites	Fluid Mechanics and Hydraulic Machines	
Course	Objectives:		
1	To introduc	e the working of fluid power components and their needs.	
2		the students to understand the operation of various fluid power cir	
3	To enable t for automat	the students to understand the concepts like synchronizing and s tion.	equencing
4	To prepare	the students to design electro-pneumatic circuit and ladder diagra	ams.
5	To allow stu	udents to design and simulate the circuits.	
Upon co		the course, students shall have ability to	
C909.1		fundamentals of hydraulic and pneumatic systems	[U]
C909.2		components and control elements required for hydraulic and systems as per the application.	[Ap]
C909.3		ne scenario and provide suitable solution to the problems ulic and pneumatic systems.	[A]
C909.4	Design cus	tomized circuits in hydraulic systems for various industrialneeds	[C]
C909.5	Design cus industrial n	stomized circuits in pneumatic and servo systems for various eeds.	[C]
Course	Contents:		
		s and Fundamentals: Introduction to fluid power, advantages of fl	uid powe

Fluid power systems and Fundamentals: Introduction to fluid power, advantages of fluid power, application of fluid power system. Types of fluid power systems, properties of hydraulic fluids, general types of fluids, fluid power symbols. properties of air - perfect gas laws. fluid power - ANSI symbol. **Hydraulic System and Components**: Sources of hydraulic power- pumping theory pump classification, gear pump, vane pump, piston pump. Construction and working of pumps, pump performance, variable displacement pumps. Fluid power actuators, linear hydraulic actuators, types of hydraulic cylinders, single acting, double acting special cylinders like tandem, rod less, telescopic, cushioning mechanism. Construction of double acting cylinder, rotary actuators, fluid motors, gear, vane and piston motors.

Design of Hydraulic Circuits: Construction of control components, directional control valve, 3/2 way valve, 4/2 way valve, shuttle valve, check valve, pressure control valve, pressure reducing valve, sequence valve, flow control valve, fixed and adjustable, electrical control solenoid valves, relays, ladder diagram. Accumulators and intensifiers, types of accumulators, accumulator's circuits, sizing of accumulators, intensifier, applications of intensifier, intensifier circuit, control of single, double hydraulic, regenerative, sequencing, synchronizing, continuous reciprocation, speed control, fail-safe circuit, control of hydraulic motor.

Pneumatic System and Components: Pneumatic components, properties of air, compressors, filter, regulator, lubricator unit, air control valves, quick exhaust valves, and pneumatic actuators. control of single, double pneumatic, sequencing, semi-automatic, automatic, speed control, synchronizing circuit, pneumatic motor, pneumo-hydraulic circuit, sequential circuit design for simple applications using cascade method and KV map method **Design of Fluid Power Circuits**: Servo systems, hydro mechanical servo systems, electro hydraulic servo system and proportional valves, introduction to electro hydraulic pneumatic logic circuits, ladder diagrams, PLC and SCADA applications in fluid power control. Fluid power circuits, failure and troubleshooting.

	Total Hours:	45
Text Boo	oks:	
1	Ilango Sivaraman, "Introduction to Hydraulics and Pneumatics", PHI Learnin	g, 2019.
2	Jagadeesha T, "Hydraulics and Pneumatics systems", Wiley Publications, 2	019.
		-

Reference	Bo	oks:															
1 /	Anth	ony	Espo	sito,	"Fluid	Pov	ver w	ith Ap	oplica	ations	", Pe	arsor	n Educatio	n, 2019.			
													lics and Pr		"		
					; Thirc												
Web Refer																	
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Assess	smei	nt		AS	sessr	nen	t			A	sses	smer	nt Exam	ination			
80)				120				200		4	0	(60	100		
		Ass	essm	nent	Metho	ods (& Le	vels (base	ed on	Blo	oms'	Taxonom	y)			
			Fo	rmat	ive A	sses	ssme	ent ba	sed	on C	apste	one M	Iodel				
Cours	Δ														FA		
Outcon			Bloor	n's l	_evel			As	sess	ment	Con	npon	ent		6%)		
	-													-	Marks]		
C909.			Jndei		d	_	signr								20 20		
C909.2			Apply			Gr	Group Assignment										
C909.3		/	Analy	ze		4			_								
C909.4			Creat	<u>م</u>		Mi	Mini project/ Simulation of circuits 40										
C909.	C909.5 Create																
	A	sses	sme								Sem	-					
		_		Sun	nmati				nt (2	4%)		Er	nd Semes		ination		
Bloom's L	_eve					-	<u>) Mai</u>						•	60%)			
			CIA		<u>60 Ma</u>	irks]		CIA		<u>0 Ma</u>	rks]		[100) Marks]			
Remember					20					0				10			
Understand	d				40					0				30			
Apply					40					0				30			
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SA 1		CA			D Mar	ke)			6	A 2			0 Marks)	Exami	nation		
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COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
C909.1	3	3	2	2	Ŭ	•	•		Ŭ				1	-	3		
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C909.2 C909.3	3	3	3	2									2		3		
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C909.4				-											-		
C909.5	3	2	3	3							3	<u> </u>	2	<u> </u>	3		
		3	Str	ongly	/ agre	ed	2	Mode	eratel	y agr	eed	1	Reasonat	oly agreed			

23ME91	0	PLC SCADA	3/0/0/3
Nature o	of Course	Theory Application	
Pre-Req	uisites	Fundamentals of Electrical and Electronics Engineering	
Course (Objectives:		
1		quainted with the building blocks of PLC & SCADA, character	istics and
	taxonomy c	of industrial automation and control levels.	
2	To study th	e value creation for an industry through PLC & SCADA.	
3	To gain kno	owledge on the real time application of PLC & SCADA.	
Course (Outcomes:		
Upon co	mpletion of	the course, students shall have ability to	
C910.1	Recall the r	main components used in the world of PLC &SCADA.	[R]
C910.2	Describe th	ne applications of PLC and SCADA systems along with their	
C910.2	design, inst	allation, and operation.	[U]
C910.3	Programmi	ng and configuring PLC and SCADA systems, using industry-	[Ap]
0910.5	standard pr	ogramming languages and software tools.	[~P]
C910.4	Integrate P	PLC and SCADA systems with other automation systems and	
0910.4	devices, su	ch as sensors, actuators, and controllers.	[Ap]
C910.5	Design PLC	C and SCADA based systems for real time applications.	[A]
Course (Contents:		

INTRODUCTION

Basic Of electronics, electrical, instrumentation-understanding for automation & control systemjob opportunity for PLC / SCADA- history of PLC / SCADA-basic components of automationhardware / software classification of automation. **Introduction to PLC Systems-** Basic principles and architecture of PLCs- introduction to PLC- need of PLC in designing -advantages and limitations of PLCs-types of PLC systems.

PLC (PROGRAMMABLE LOGIC CONTROLLER)

Automation concept and basic design-PLC programming-introduction of ladder logic- basic ladder logic symbols and operations-ladder logic programming rules and techniques- ladder logic programming examples and exercises-introduction of SFC- introduction of instruction list -creating & editing ladder logic program-different types of sensors-sinking, sourcing, NPN, PNP NO/ NC concept. **Troubleshooting and maintenance -** Fault identification and diagnosis - component replacement and repair - maintenance practices and procedures - **Design and implementation of simple PLC systems -** Process control and automation-monitoring and reporting systems - safety systems.

SCADA (Supervisory Control and Data Acquisition)

Introduction to SCADA systems- Basic principles and architecture of SCADA systemsadvantages and limitations of SCADA systems- types of SCADA systems. SCADA software tools- Introduction to industry - standard SCADA software tools - SCADA system configuration and design- HMI design and configuration. Alarm management-Basic principles of alarm management- alarm design and configuration. Design and implementation of simple SCADA systems-Process control and automation.

	Total Hours:	45
Text Bo	oks:	
1	Stephen P Tubbs, "Programmable Logic Controller (Plc) Tutorial, Siemens S 200", 2007.	Simatic S7-
2	Kevin Collins, "PLC Programming for Industrial Automation", 2016.	
3	Ronald L. Krutz and Russell Dean Vines, "Industrial Automation and Cont Security Principles", 2022.	rol System

Referen	ce Book	s:									
1			ella, "Program	mable	Logi	c Contr	ollers", 2	2016.			
2			, "SCADA: Be								
3		A Boy	er, "SCADA: S					ta Acqui	isition", I	Fourth Ec	lition 4 th
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2	https://	www.	plcacademy.c	om/							
3	https://	/www.	coursera.org/l	ecture/	/elect	rical-pc	wer-dist	ribution	/introduc	ction-to-so	cada-
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23ME91	1	IMMERSIVE TECHNOLOGIES	3	/0/0/3
Nature of	f Course	Theory		
Pre-Requ	uisites	-		
Course C	Objectives:			
1		and various immersive technologies via VR, AR and MR.		
2		oftware related to immersive technologies.		
3		and the logic of developing AR applications, VR and unreal eng		
		Upon completion of the course, students shall have ability	to	
C911.1		he fundamentals of immersive technologies.		U
C911.2	technology		/e	А
C911.3	Use the fea	atures of unity and unreal engine.		A
C911.4		oout haptics in immersive technologies.		U
C911.5		g the applications related to AR/VR systems.		С
	Contents:	IMMERSIVE TECHNOLOGIES Introduction on virtual reality -		
SOFTWA		 v – extended reality – VR devices – AR devices – applications. 6 - Intro to unity – unity editor workspace – intro to C# and vi 		
		ty – intro to unreal engine – UE4 Editor workspace – intro ramming in Ue4.	to bl	lueprint
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23ME91	2	PRODUCT LIFECYCLE MANAGEMENT	3/0/0/3
Nature o	f Course	Theory	
Pre requ	isites	-	
Course (Objectives:		
1	To acqui	re knowledge on the principles, best practices, current advancem ons of Product Life cycle Management.	nents and
2		all the aspects of a product's life cycle from "design phase" to "e	end of life
3	product of	erstand and experience effective integration of PLM technolo development process that provides competitive advantage to ind sectors to deliver innovative products.	
Course (Outcomes:		
Upon co	mpletion of	the course, students shall have ability to	
C912.1	Familiari	ze with the fundamentals of the product lifecycle and thus the capability to apply them.	[R]
C912.2		e methods and technologies for adopting PLM strategies.	[R]
C912.3	developm		[A]
C912.4	problems		[Ap]
C912.5		gital manufacturing framework in product development process iness considerations.	[Ap]
Course (Contents:		
Extended Architect	d Enterprise, ures Of PDN	Torporate Challenges; E-Commerce -B To B, B ToC Forms of E , Product Data Management -CIM Data, PDM Functions, Defin A Systems, Information Flow Model In Product Development, En Manufacturing Bill Of Materials.	nition And
Validation	nent process n and analy	OPMENT PROCESS & METHODOLOGIES: Integrated s Conceive – Specification, Concept design, Design - Detailed	
Compute	nodels, Valu r Aided De	vsis, Concurrent engineering - work structuring and team Dep Definition of concepts - Fundamental issues - Role of Process ch le engineering in product design. Introduction to product desi ge esign, DFM, DFA, Ergonomics in product design, Product I Sustainable design.	ployment hains and gn tools
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	Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)														
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23ME913	3	COMPOSITE AND SMART MATERIALS	3/0/0/3
Nature o	f Course	Theory Application	
Pre-Req		Metallurgy and Materials Testing	
Course (Objectives:		
1	Introduce t	he concepts of modern composite materials and equip the stud	lents wit
	knowledge	on fabrication and testing of composites.	
2	To enable	them to understand the different types of composite mater	ials, the
		and applications.	
3	To underst	and the fundamentals of smart materials.	
Course (Dutcomes:		
Upon co	mpletion of	the course, students shall have ability to	
C913.1	Recall the t	types of composite materials and their characteristic features.	[R]
C913.2	Identify the	suitable technique for manufacturing different types of composite	ri 13
	materials.		[U]
C913.3	Predict the	e advances in composite materials and their applications in	۲۸1
		, aerospace and industrial sectors.	[Ap]
C913.4		ne mechanical properties of composites.	[Ap]
C913.5		ne principle concepts of smart materials, characteristics and its	
	application		[Ap]
Course (Contents:	-	
hermopla PMC. PI moulding pultrusion Metal ma Types of MMC – F	astic-various MC manufa , compression , filament with atrix compo- reinforcement owder metal	sites: Understand the concepts of MMC, types of metal matrix conts used in MMC, merits, demerits and applications of MMC. Proc Ilurgy process - diffusion bonding, stir casting – squeeze casting, f	cations (ses, ba mouldin mposite essing (riction s
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23ME91	4	ADVANCED MANUFACTURING TECHNIQUES	3/0/0/3
Nature o	of Course	Theory	
Pre-Req	uisites	Manufacturing Technology II (with lab)	
Course	Objectives:		
1	processes.		
2	To encoura processes.	age the students for developing the models of micro and nano	machining
3	To select a	n appropriate surface modification technique depending on the ne	ed.
	Outcomes:		
Upon co		the course, students shall have the ability to	-
C914.1	Recognize process pa	the fundamental micro and nano machining processes and their rameters.	[R]
C914.2		he appropriate machining process based on tool-workpiece and source of energy for the end product.	[A]
C914.3		ne advanced finishing processes.	[Ap]
C914.4		ne process of surface cleaning techniques, coating methods and nhancement methods.	[U]
C914.5		use an appropriate deposition technique for various materials.	[Ap]
	Contents:		
approach process magneto equipme scale su etching - Surface	 A – Co pred Abrasive rheological nts, effect of rface harden surface micr engineering 	g processes: General methods of preparation – bottom up, cipitation – ultrasonication – mechanical milling – Advanced flow machining, chemo-mechanical polishing, magnetic abrasive finishing, magneto rheological abrasive flow finishing, working process parameters. Thermal barrier coating – laser shock peeni ning. MEMS and Actuators - Sensors and actuators, mems, we romachining, metrology for micro manufactured products.	Finishing finishing, principles, ng – nano
vapor de	eposition - c	g: Fundamental of surface engineering - surface Cleaning - m ating types –ceramic and plastic coating - economics of coating hemical vapor deposition- plasma spraying - ion implantation d chromizing – cladding - laser gladding- friction stir processing –	physicaldiffusion
vapor de coating -	eposition - c boriding and	ating types –ceramic and plastic coating - economics of coating hemical vapor deposition- plasma spraying - ion implantation d chromizing – cladding - laser gladding- friction stir processing – dation process – shot peening and ultrasonic shot peening.	 physical diffusion laser hard
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23ME915		FAILURE ANALYSIS AND NDT TECHNIQUES	3/0/0/3
Nature of	Course	Theory Application	
Pre-Requi		Manufacturing Technology, Industrial Metallurgy, Mechanics of D Solids	eformable
Course O	bjectives		
1	To introd	luce the scope of failure analysis and fundamental sources of failu	ires.
2		the different types of failure analysis tool.	
3	To examination to exa	nine the students to non-destructive testing methods and basic p spection.	orinciples o
4		nine the students to understand the principle of magnetic testing, r nd inspection techniques.	adiograph
5	To study	the basic principles of ultrasonic and acoustic emission testing m	ethod.
		: Upon completion of the course, students shall have ability to	2
C915.1		e fundamental concepts of failures in engineering materials.	[R]
C915.2	Infer the	types of engineering material failures and analyze its causes.	[An]
C915.3	Apply va	rious failure analysis techniques / tools to appropriate scenario.	[Ap]
C915.4	Summar	ize the basic concepts of non-destructive testing methods.	[U]
C915.5		and apply suitable non-destructive testing methods to predict and sub surface flaws.	[Ap]
Course Co	ontents:		
failure and assembly. static loadi of ductile Application and series	Ilysis. Fu Tree diag ng, comb and britt of poiss systems	eed and scope of failure analysis. Engineering disasters and und ndamental sources of failures. Deficient design. Improper manu gram and FMEA. Material failure modes and their identification. T ined stress, principal stresses, theories of failure, fracture processes the fracture, fracture mechanics and failure. Failure Analysis on, exponential and weibull distributions for reliability, bath tub cur , MTBF, MTTR, FMEA-design process, FMEA, analysis of cause ure modes; Fault tree analysis; Industrial case studies on FMEA.	facturing a ensile tes s, meaning & Tools ve, paralle
application materials, Testing: P a compone testing tec imaging, in	s. Liquid penetrant rrinciple o ent, limita hniques, nspection	on-Destructive Testing: Introduction, visual examination, Basi d Penetrant Testing : Procedure for penetrant testing, penetra t testing methods, applications, limitations and standards. Magne f magnetic particle testing, magnetizing techniques, procedure use ations. Eddy Current Testing : Principles, instrumentation for ea applications, limitations. Radiographic Testing : Radiography, ra- techniques, applications of radiographic inspection, limitations by, standards, neutron radiography.	ant testin tic Particl d for testin ddy currer adiographi
industrial r	adiograph	· · · · · · · · · · · · · · · · · · ·	

Ultrasonic Testing: Basic principle, techniques for normal beam inspection, techniques for angle beam inspection, flaw characterization techniques, advantages, limitations. Acoustic Emission Testing: Principle of acoustic emission testing, technique, applications, standards. Thermograph: Basic principles, techniques, applications, codes and standards. In Situ Metallographic Examination: Approach to the selection of site for metallographic examination, significance of microstructure observation, applications, codes and standards (digital signal process)

	I otal Hours:	45
Text	Books:	
1	Fausto Pedro Garcia Marquez, "Non-Destructive Testing", Intech, 2016.	
2	Gilles Corneloup, Cécile Gueudré, Marie-Aude Ploix, "Non Destructive testability of materials and structures", The university of chigaco press, 2022	

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	erstand	20		20				20	
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	C915.4	Understand	Case stu	ıdy					20
	C915.3	Apply							
	C915.1 C915.2	Analyze	Assignm	ent					20 20
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		I. 7, Ultrasonic Te							<u>. </u>
		liographic Testing							
2		Testing, Vol. 2, L							
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	ASM Metals of Metals, N	letals Park, Ohio,				ality Co		merican	Society

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C915.5	3	3	2	3										3	
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23ME916			
Nature of C	ourse	GREEN AND SUSTAINABLE MANUFACTURING Theory	3/0/0/3
Pre requisit		Environmental Science, Manufacturing Technology	
Course Obj			
1		duce the concept of green and sustainable manufacturing.	
1		art knowledge about air, noise and water pollution and its effe	cts on the
2	environ	e i i	
3		bduce the concept of green co-rating and its need.	
Course Out			
		f the course, students shall have ability to	
		te the concept of green and sustainable manufacturing and	(D)
C916.1		g metrics in manufacturing.	[R]
C916.2		e the difficulties in the conventional machining process.	[A]
		arize the manufacturing processes in order to minimize the air,	
C916.3		nd water pollution.	[U]
C916.4		te green co-rating and its benefits.	[AP]
C916.5		the modern approach for sustainable manufacturing.	[R]
Course Cor			[··]
		O SUSTAINABLE GREEN MANUFACTURING: Introduction	of areen
			•
		and its relevance, metrics for green manufacturing, modern appro	
sustainable	manufac	cturing, toxic substances in industry and need of renewable	sources.
		CONVENTIONAL MACHINING: Importance of cutting fluids- heal	
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and environr green machi	mental is ning-con JTION S	sues using coolants-coolant selection criteria-motivations behind incept for productivity improvement-typical measures of affecting pro	the use of oductivity. pollutants-
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23ME917	ADDITIVE MANUFACTURING	3/0/0/3			
Nature of	Course Theory Application				
Pre-Requi	sites Manufacturing Technology I &II				
Course Ob	bjectives:				
1	To develop skills, ideas and knowledge about additive	e manufacturing process.			
2	To demonstrate liquid, solid and powder based additive	ve manufacturing process.			
3	To impart knowledge about additive manufacturing ar	nd its wide applications			
Course Ou	utcomes:				
Upon com	pletion of the course, students shall have ability to	D			
C917.1	Recall the concept of additive manufacturing and pos				
C917.2	Summarize the reverse engineering, data processing	and AM design [U]			
C917.3	Apply the various types of additive manufacturing techniques				
C917.4	Use the various AM process parameter effects on res	ponse [Ap]			
C917.5	Develop critical parts using various AM technology	[A]			

Course Contents:

Introduction to Additive Manufacturing: Overview of AM - scope and need - survey of AM applications. Classification of AM process, AM process chain, reverse engineering – basic concepts, digitization techniques types. **Data Processing for AM:** Conceptualization to build model, AM software's – **AM Design:** Need for Design for Additive Manufacturing (DfAM), CAD tools vs. DfAM tools - generative design technology for developing critical parts - topology optimization. **Post-Processing Techniques:** Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, property enhancements using non-thermal and thermal techniques.

Liquid Based AM Process: Stereo lithography Apparatus, digital light processing, polyjet. **Solid Based AM Process:** Laminated object manufacturing, fused deposition modeling - principle of operation, machine details and variants, materials used, process details, process parameters effect on responses and applications, advantages and disadvantages, case studies.

Powder Based AM Process: Powder Bed Fusion: Selective laser sintering, selective laser melting, electron beam melting, **Directed Energy Deposition:** Laser metal deposition- laser engineered net shaping -direct metal deposition, electron beam based metal deposition, principle of operation, machine details and variants, materials used, process details, process parameters effect on responses and applications, advantages and disadvantages, case studies – research findings of binder jetting technique, friction stir additive manufacturing - wire arc additive manufacturing.

Self-study: Role of AM in I4.0, IIoT AI and ML for AM Systems (not for exam)

	Total Hours: 45
Text Boo	oks:
1	3D Printing Technology, Applications, and Selection By Rafiq Noorani · 2017
2	Additive Manufacturing: Advanced Materials and Design Techniques by Pulak Mohan Pandey 2022.
Referen	ce Books:
1	Duc Pham, S.S. Dimov, "Rapid Manufacturing Technologies and Applications of Rapid Prototyping and Rapid Tooling", 2012
2	Gibson, Ian, David W. Rosen, Brent Stucker, and Mahyar Khorasani, "Additive Manufacturing Technologies", Springer, 2021.
Web Ref	ferences:
1	https://www.youtube.com/watch?v=NkC8TNts4B4

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23ME91	8	DESIGN FOR MANUFACTURING AND ASSEMBLY	3/0/0/3
Nature o	f Course	Theory Application	
Pre-Req	uisites	Manufacturing Technology II	
Course (Objectives:		
1	To enable	the students to understand the general design guidelines of c	design fo
		e and assembly.	
2		the knowledge on minimizing the design cost/time, maximizing t	he qualit
		e ease of manufacture and assembly.	
3		the students to understand the principles and design rules per	taining t
		casting, welding, machining and assembly.	
4		he features of DFMA software.	
	Outcomes:	the source students shall have shility to	
Upon co		the course, students shall have ability to	
C918.1	minimize th	e the design procedure of engineering products in order to ne cost/time.	[U]
C918.2	•	e importance of tolerance and process capability in promoting	[A]
		eability and selective assembly.	
C918.3		e design process of engineering products for ease of assembly.	[A]
C918.4	Apply the d machining of	esign concepts for engineering products for casting, welding and operations.	[Ap]
C918.5	Study the d	lesign parameters of a product using DFMA software.	[U]
Course (Contents:		
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23ME91	9	POWER PLANT ENGINEERING	3/0/0/3
Nature o	f Course	Theory application	
Pre-Req	uisites	Engineering thermodynamics and Thermal engineering	
Course	Objectives:		
1	•	a general perspective of power plant engineering, indicating the	ne role of
		I engineers in their operation and maintenance.	
2		tand the construction, working principles and advantages of the	rmal, gas
		am turbine, hydro, diesel and nuclear power plants.	. ,
3	To create various pov	awareness about renewable energy, tariff calculation and econ	nomics of
Course	Outcomes:		
		the course, students shall have ability to	
C919.1		various techniques used for power generation.	[R]
C919.2		ne functioning of components in steam power plant.	[U]
C919.3		e design layout and explain the working of diesel, gas turbine,	
		ric and nuclear power plants.	[Ap]
C919.4	-	ways to extract power from renewable/ non-conventional energy	[Ap]
0040 5	sources.		
C919.5	units.	e economic feasibility and its implications on power generating	[A]
Course	Contents:		
firing me electrosta condense Diesel p heat bala energy – – boiling radiation intercoold Non-con electric p working conversion fixed and	thods – mea atic precipita er, cooling to ower plant: ance – supe energy from water reactor shielding. Ga ng – reheatin oventional e power plants of wind, tid on power plants operating co	ser – air heaters, coal handling and preparation – combustion equip chanical stokers – pulverized coal firing systems, ash handling ator, feed water treatment, forced draft and induced draught ower – types - induction technology. Components and layout, selection of engine type, starting and sercharging of diesel engines. Nuclear power plant : Principles of fission and fuel burnup – decay rates and half-lives – nuclear react or – pressurized water reactor – fast breeder reactor – reactor m as turbine power plant : Components and layout, open and closed ing and regenerating – combined cycle power plant. Energy based power plant: Hydro power plant : Classification is – selection of prime movers – governing of turbines - constru- tal, solar photo voltaic, geothermal, biogas and ocean therma- ints. economics of power plant: actual load curves – cost of electric osts - energy rates – types of tariffs – energy management and en- haring – variable load operation – comparison of economics of vario	systems, , surface topping – of nuclear or – types aterials – d cycles – of hydro- ction and al energy c energy - ergy audit
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2	•	'Power Plant Engineering", McGraw – Hill Education, Fourth Editio	n, 2017.
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1		nar Mandal, Somnath Chakrabarti, Arup Kumar Das, Prasanta Ku ant Engineering: Theory and Practice", Wiley, 2019.	mar Das,
2	R. Yadav,	"Fundamentals of Power Plant Engineering (Conventional anal) An Innovative Approach", 2 nd Edition, IK International Publishi	
2022 (A	Y: 2023-2024	4) Department of Mechanical Engineering Page	1/2

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23ME92	-		
Nature o	of Course	Theory Technology	
Pre-Req	uisites	Engineering Thermodynamics	
		Thermal Engineering	
Course	Objectives:		
1		and the biomass, types, availability, and characteristics	
2		e bio-methanation process.	
3		nowledge on combustion of biofuels	
4	To describe	e the significance of equivalence ratio on thermochemical con-	version (
5	To provide	insight on the possibilities of producing liquid fuels from biomass	
Course	Outcomes:		
Upon co	mpletion of	the course, students shall have ability to	
C920.1		surplus biomass availability of any given area.	[U]
C920.2		e biogas plant required for variety of biofuels.	[A]
00000		and compare the cost of steam generation from biofuels with that	
C920.3		l petroleum fuels.	[U]
		he influence of governing parameters in thermochemical	
C920.4		of biomass.	[A]
		he properties of Synthesize liquid biofuels used for power	
C920.5	generation.	· · · · · ·	[Ap]
Course	Contents:		1
technolog plants: ty Combus requirem appliance	 biomass gies, Biomet pes and des tion and Ap ent for biofu 	timate & ultimate analysis – comparison with coal - Indian scenarios assessment studies – typical conversion mechanisms - de chenation process – influencing parameters – typical feed stocks sign. plication: Perfect, complete and incomplete combustion – stoichio uels - equivalence ratio – fixed Bed and fluid Bed combustio luminaries and power generation systems – Industrial effluent bas	nsificatio - bioga ometric a n, Bioga
technolog plants: ty Combus requirem appliance plants. Gasifica applicatio paramete for carbo oils and performa	 biomass gies, Biomet pes and des tion and Ap ent for biofulties – burner, I tion and Licon – performation ers – Typical nisation-Stra algae - Proce ince fronts. F 	s assessment studies – typical conversion mechanisms - de thenation process – influencing parameters – typical feed stocks sign. plication: Perfect, complete and incomplete combustion – stoiching uels - equivalence ratio – fixed Bed and fluid Bed combustion	nsificatio
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	21	GAS DYNAMICS AND JET PROPULSION	3/0/0/3		
Nature o	of Course	Theory analytical			
Pre-Req	uisites	Engineering Thermodynamics and Thermal Engineering			
Course	Objectives:				
1	To understa	and the basic difference between incompressible and compressibl	e flow.		
2	To analyse	the phenomenon of shock waves and its effect on flow.			
3	To gain bas	sic knowledge about jet propulsion.			
Course	Outcomes:				
Upon co	mpletion of	the course, students shall have ability to			
C921.1		ehavior of various flow regimes.	[U]		
C921.2					
C921.3	Analyse the	e flow behavior and consequent loads due to flow.	[A]		
C921.4	Analyse the	e shock in flows.	[A]		
C921.5	Estimate pr	opulsion efficiency and design inlets and nozzles.	[E]		
Course	Contents:				
Mach co	ne, Mach ang	, (significance and characteristics) critical Mach number, Types (gle, effect of Mach number on compressibility. Flow through vari (through variable area ducts, T-s, h-s diagrams for nozzles & diffus	of waves able are		
Mach col ducts: Is number	ne, Mach ang entropic flow variation, are	, , , , , , , , , , , , , , , , , , ,	able are ers, Mac		
Mach co ducts: Is number diffusers Fanno a and Fann Isotherm	ne, Mach ang entropic flow variation, are , effect of fric nd Rayleigh no flow equa al flow with f	gle, effect of Mach number on compressibility. Flow through vari through variable area ducts, T-s, h-s diagrams for nozzles & diffus a ratio as a function of Mach number, mass flow rate through r	of waves able are ers, Mac nozzles no curve uct lengtl		

-	Total Hours: 45
Text Bo	oks:
1	Yahya. S.M., "Fundamental of Compressible Flow", New Age International (p) Ltd., New
	Delhi, 2018
2	Patrich.H. Oosthvizen, William E.Carscallen, "Compressible Fluid Flow", McGrawHill
	Education, 2017.
Referen	ce Books:
1	Cohen. H., Rogers R.E.C and Sravanamutoo, "Gas Turbine Theory", Addison Wesley
	Ltd., 2016.
2	Ganesan. V., "Gas Turbines", McGraw-Hill Education, New Delhi, 2015.
3	Balachandran.P, "Fundamentals of Compressible Fluid Dynamics", Prentice Hall of
	India, New Delhi, 2018.
Web Re	ferences:
1	http://www.grc.nasa.gov/WWW/K-12/airplane/bgp.html
2	https://ocw.mit.edu/search/ocwsearch.htm?q=gas%20dynamics
Online I	Resources:
1	https://nptel.ac.in/courses/112106166/

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C92			Eva	alua	te		As	signr	ment							20		
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	2 HEA	TING, VENTILATION AND AIR-CONDITIONING SYSTEMS	3/0/0/3				
Nature o	of Course	Theory application					
Pre-Req	uisites	Engineering thermodynamics and Thermal engineering					
Course	Objectives:						
1	To provide	a general perspective of heating, ventilation and air-conditionin	g system				
		he role of mechanical engineers in their operation and maintenand					
2		and the construction and working principle of sensors and auxiliar	y devices				
		trols and pneumatic controls.					
3		wareness about various control systems in sequence of operation	of HVAC				
	Outcomes:						
		the course, students shall have ability to					
C922.1		various techniques used for air-conditioning systems.	[R]				
C922.2		e functioning of components in air-conditioning systems.	[U]				
C922.3	2.3 Sketch the design layout and explain the working of AC circuits, variable speed drives, valves and dampers						
C922.4		accuracy, range and reliability of various sensors used in the	[Ap]				
	HVAC systems.						
C922.5	Analyze the system.	e water vapor, relative humidity and temperatures in the HVAC	[A]				
Course	Contents:						
Basics c relays, m	of Electricity	g control, gains and loop tuning, control actions and normal position g, controls documentation, maintenance and operations. : Simple circuits and ohm's law, ac circuits, transformers and powe notor starters, variable speed drives. Control Valves and Damp	r services ers: Two				
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23ME923 RENEWABLE ENERGY TECHNOLOGIES Nature of Course Theory. Pre Requisites Thermodynamics, Fluid Mechanics, Heat and Mass Transfer. Course Objectives: To understand and analyze the patterns of renewable energy resources environmental merits 2 To discuss technologies for utilization of renewable energy sources. 3 To enable the students to understand the various economics involved in the of renewable energy sources. Course Outcomes: Upon completion of the course, students shall have ability to C923.1 Recall the various sources of energy. C923.2 Elucidate the various means of utilizing the solar energy resources. C923.3 Infer the impact of Wind energy resources on the environment. C923.4 Analyze the scope of ocean energy, geothermal energy, Biomass and their application. C923.5 Analyze the new energy sources like OTEC energy, MHD energy. Course Contents: Role and potential of renewable source , Renewable energy sources – types , energy energy option – solar cells – pv systems, solar thermal collectors – flat plate and condition of the course of the solar energy option – solar cells – pv systems, solar thermal collectors – flat plate and condition of the solar energy option – solar cells – pv systems	[R] [Ap]
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 water heating systems - active and passive, passive heating and cooling of buildin distillation, solar drying. Energy available from wind, Basis of wind energy conversion, general formula, lift a effect of density, angle of attack, wind energy generators and its performance – win storage – Applications – Hybrid systems – state of the art technology trends for offsh energy operation, biomass, biogas, source, composition, raw materials, properties of bid diesel production and economics. principle of ocean thermal energy conversion, tidal data, technology options, offshore and onshore wave energy conversion machines. Power plants based on ocean energy, Problems associated with ocean thermat conversion systems – Open and closed OTEC Cycles – small hydro turbines, Geothermat sources, power plant and environmental issues – potential in India. Hydrogen, ge storage, transport and utilization, Fuel cells – technologies, types – economics and the generation - Magneto-hydro-dynamic (MHD) energy conversion. Fuel from sea – concertation - Magneto-hydro-dynamic (MHD) energy conversion. 	and drag d energy ore winc o gas, bic energy – al energy al energy eneration he power
Text Books:	
1 S.P.Sukhatme-Solar Energy:Principles of Thermal Collection and Stora McGraw-Hill (2016).	
2 A G.D. Rai, Non-Conventional Energy Sources, Khanna Publishers, New Del	hi, 2011.
Reference Books:	
1 F.A.Duffie and W.A.Beckman-Solar Engineering of Thermal Processes-Jo	hn Wiley
2015.	
2 E.G.N. Tiwari, Solar Energy – Fundamentals Design, Modelling& applications	s, Narosa
Publishing House, New Delhi, 2012.	
3 C. Godfrey Boyle, Renewable Energy, Power for a Sustainable Future University Press, U.K., 2012.	, Oxford
Oniversity (1635, 0.13, 2012.	

1 https://www.nrdc.org/stories/renewable-energy-clean-facts#sec-whatis

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23ME92		GY STORAGE DEVICES AND THERMAL MANAGEMENT OF BATTERIES	3/0/0/3
Nature o	f Course	THEORY	
Pre Requ	uisites	Heat Transfer and Thermal Machines	
Course (Objectives:		
1	To study th them.	e various types of energy storage devices and technologies use	d for building
2	To have ar	n insight about different types of batteries.	
3		e vital components of thermal management systems used in var	rious Electric
	Dutcomes: mpletion of	the course, students shall have ability to	
		e the working of various energy storage devices and their	
C924.1	importance		[U]
C924.2	Elucidate 1 systems.	the basic characteristics of batteries for mobile and hybrid	[U]
C924.3		e different types of Batteries.	[AP]
C924.4		Battery pack with appropriate PCM.	[A]
C924.5		fferent thermal management systems used in E-vehicles.	[A]
	Contents:		[/ 1]
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Open Elective

23ME001		INDUSTRIAL SAFETY	3/0/0/3					
Nature of C	ourse	Theory						
Pre-Requis	ites	Nil						
Course Ob	jectives:							
1	To enable student rules.	is to understand the basic Industrial safety engineerir	ng acts and					
2 To impart knowledge on OSHAS (Occupational Safety and Health Assessment Series) in engineering Industry.								
3	To enable the stud	dents to identify the causes of accidents and its preve	ntions.					
4	To train students t	o identify hazard and assess the risks using suitable t	echniques.					
Course Ou Upon comp		se, students shall have ability to						
C001.1	Identify the evol standards.	ution of industrial safety acts, rules and health	[R]					
C001.2	Summarize differe	ent safety management activities in industry.	[U]					
C001.3	Prepare accident industry.	investigation report and preventive guidelines to	[Ap]					
C001.4	Analyze the proce	ess to avoid, prevent and control workplace hazards.	[A]					
C001.5 Analyze the role of government agencies and private consulting [A]								
Course Co	ntents:							

BASICS OF SAFETY ENGINEERING & ACTS: Evolution of modern safety concept – safety audit; Acts– factories act– 1948–statutory authorities–inspecting staff–Tamil Nadu factories Rules 1950 under safety and health – environment act 1986 – air act 1981, water act 1974 – labour laws; safety in industries – general safety concepts, machine guarding, hazards in metal removing process, Hazardous Wastes (management, handling and Transboundary Movement) Rules 2016, check list for LPG installations, safety precautions using CNG. Introduction to OHSAS 18000 and 14000, National Disaster Management Act.

SAFETY MANAGEMENT: History of Safety movement – general concepts of management – planning for safety for optimization of productivity -productivity, quality and safety-line staff functions for safety -budgeting for safety - safety policy. Incident Recall Technique (IRT), disaster control, job safety analysis, safety survey, safety inspection, safety sampling. Fire Explosion and toxicity Index. ACCIDENT INVESTIGATION AND REPORTING: Concept of an accident, reportable and non-reportable accidents, unsafe act and condition – principles of accident prevention, Supervisory role- Role of safety committee – Accident causation models - Cost of accident. Overall accident investigation process-Response to accidents, India reporting requirement, Planning document, Planning matrix, Investigators Kit, functions of investigator, four types of evidences, Records of accidents - Class exercise with case study.

SAFETY PERFORMANCE MONITORING: Reactive and proactive monitoring techniques -Permanent total disabilities, permanent partial disabilities, temporary total disabilities Calculation of accident indices, frequency rate, severity rate, frequency severity incidence, incident rate, accident rate, safety "t" score, safety activity rate. SAFETY EDUCATION AND TRAINING: Importance of training – identification of training needs – training methods – programme, seminars, conferences, competitions – method of promoting safe practice - motivation – communication - role of government agencies and private consulting agencies in safety training– creating awareness, awards, celebrations, safety posters, safety displays, safety pledge, safety incentive scheme, safety campaign – Domestic Safety and Training, Evaluating Employee's training Performance.

Total Hours: 45

Text Book	s:									
1		s D. Reese "C	Occupatio	nal Health	and Safe	ety Ma	anagement	: A F	Practical	
		ach", 3 rd Edition				•	·			
2	Mark A	. Friend, James	P. Kohn	"Fundame	ntals of Oc	ccupati	onal Safet	y and	Health"	
		ion Bernan pres								
3	Krishna	an N.V., "Safety	Manager	ment in Ind	ustry", Jai	co Pub	lishing Hou	use, E	Bombay,	
	2016.									
Reference										
1		. Haight, "Princi						17		
2		shra, "Safety M								
3		int India Acts an								
4		y Asfahl, David			strial Safe	ty and	l health m	anag	jement",	
		e,7 th Edition, Pe	arson,20	21						
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3		ce.mst.edu/cred								
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Assessi	Assessment based on Continuous and End Semester Examination											
	Continuous Assessment (40%)											
		[200 N	/larks]			End						
	CA 1 : 100 Ma	arks		CA 2 : 100 Ma	arks	Semester						
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Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

60	•		POs											
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C00 ²	1.1	3		2				2		2				
C00 ²	1.2	3		2				2		1				
C00 ²	1.3	3	2					3		3				
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C00 ²	1.5	3	2					3		3				
	3	Strong	y agre	ed	2	M	oderate	ly agre	ed	1 R	leasona	ably agr	eed	•

23ME00	2	FUNDAMENTALS OF MEMS/NEMS							
Nature of	Course	Theory							
Pre requi		Nil							
	bjectives:								
1	To encou	rage the students to learn various techniques available to mak	e micr						
		sing various materials.							
2		the methodologies to be followed in micro fabrication and forming.							
3	applicatio	nce the students knowledge about MEMS / NEMS devices an ns.	nd the						
	Outcomes:	the course, students shall have ability to							
C002.1		e basic concepts related to MEMS / NEMS.	[R]						
C002.2		he various fabrication techniques and micro machining processes	[U]						
3002.E	for MEMS		[0]						
C002.3		ious fabrication techniques to develop a MEMS / NEMS System.	[Ap]						
C002.4	,	he characteristics of MEMS and NEMS devices.	[A]						
C002.5	,	e principles and applications of MEOMS	[R]						
Course C			<u> </u>						
Simulator	gy, Integrat s, MEMS fo	6 - Mechanical, Inertial, Biological, Chemical, Acoustic, Micros ed Smart Sensors and MEMS, Interface Electronics for MEMS, r RF Applications, Bonding & Packaging of MEMS. Introduction to I IS to NEMS - Nano-mechanical Resonators, Nano-mechanical S	NEMS						
Simulator a journey NEMS ard Overview Enhancer Technolog	gy, Integrat s, MEMS fo from MEM chitecture, S to Critical nent Techr gies. E TECHNO	ed Smart Sensors and MEMS, Interface Electronics for MEMS, r RF Applications, Bonding & Packaging of MEMS. Introduction to I IS to NEMS - Nano-mechanical Resonators, Nano-mechanical S Surface Plasmon effects LITHOGRAPHY: Introduction - Photolitho Dimension and Lithographic Sensitivity Photolithography Reso nology Beyond Moore's Law Next Generation – Emerging Lith	NEMS Sensors ography olution ograph Silicor						
Simulator a journey NEMS ard Overview Enhancer Technolog ADDITIVI Physical N Gel Depo Layers in Depositio MINIATU Manufact	gy, Integrat s, MEMS fo from MEM chitecture, S to Critical ment Techr gies. E TECHNO /apor Deposisition Tech BIOMEMS n Method. N RIZATION uring - Intro	 ed Smart Sensors and MEMS, Interface Electronics for MEMS, r RF Applications, Bonding & Packaging of MEMS. Introduction to I IS to NEMS - Nano-mechanical Resonators, Nano-mechanical Surface Plasmon effects LITHOGRAPHY: Introduction - Photolithod Dimension and Lithographic Sensitivity Photolithography Resonology Beyond Moore's Law Next Generation – Emerging Lith LOGY: Introduction –Silicon Growth - Si Doping - Oxidation of sition - Chemical Vapor Deposition- Silk-Screening or Screen-Printing and BIONEMS - Thin versus Thick Film Deposition - Selection Critication with EBL & IBL. TECHNIQUES Introduction - Absolute and Relative Toleraduction to Top-Down Manufacturing Methods and Bottom-Up Appr 	NEMS Sensor ography olution ograph Silicon ng - Sc Organ iteria fo ance oache						
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Referen	ce Books	S:							
1	V.K. Ja	in, "Mic	romanuf	acturir	g Process	es", CRC Press	, 2016.		
2						abrication and I		ology", (CRC Press,
3	Chang 2011.	Liu, "F	oundatio	ons of	MEMS", F	earson educati	on India li	mited, 2	nd Edition,
Web Re	ferences	:							
1	https://	youtu.k	e/ZcCXI	FrHQ7	Ao/Introdu	ction to Materia	ls Science	for MEN	IS and
Online F	Resource	s:							
1	MEMS	and M	icrosyste	ems - <u>h</u>	ttps://npte	.ac.in/courses/1	17105082	/	
2	https://	www.c	oursera.c	org/lea	rn/MEMS/I	NEMS			
Summa	tive asse	ssmen	t based	on Co	ntinuous	and End Seme	ster Exam	ination	
		С	ontinuo	us Ass	sessment	(40%)			End Semester xaminatio n (60 %)
	CA 1 (2	20 Marl	ks)			CA 2 (20 Mar	ks)		Theory
SA 1		FA			SA 2	FA		F	xaminatio
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Marks	t-l		t –l		marks	t-l	t –II	. (60 Marks)
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	ve asses			on Cap	stone Mo	del (16%)			T
Course Outcom		Bloo Leve				Component			Marks
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C002.2/	C002.5	Unde	rstand	Obje	ective type	Quiz			20
C00	2.3	Apply	<i>,</i>	Tech	nnical Pres	entation			20
C00	2.4	Analy	se	Grou	up Assignn	nent			20
Summa	tive asse	ssmen	t based	on Co	ntinuous	and End Seme	ster Exam	ination	
				Conti	nuous As	sessment (24%	6)	End S	Semester
Bloom's				CIA1		CIA2	-	Exan	nination
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Apply				40		30			30
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Evaluate)			-		-			-
Create				-		-			-

Mapping Outcome			omes (CO) w	rith Pr	ograi	mme O	utco	me	s (PO)	Program	nme Sp	ecific
<u> </u>							POs						
COs	1	2	3	4	5	6	7	8	3	9	10	11	12
C002.1	3	2	1										
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C002.4	3	3	3										
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23ME003	TOTAL QUALITY MANAGEMENT	3/0/0/3
Nature of C	D (Theory Application)	
Pre-Requis	ites Nil	
Course Obj	ectives:	
1	To recollect the engineering and management aspects of quality plant control.	ning and
2	Study the methodology of improving quality in manufacturing and service	sectors
3	To implement the concepts of quality management system.	
Course Out Upon comp	tcomes: Detion of the course, students shall have ability to	
C003.1	Define the basic concepts of quality management.	[U]
C003.2	Recall the fundamentals of Total Quality Management and its tools.	[R]
C003.3	Examine the role of TQM tools and techniques in elimination of wastages and reduction of defects.	[A]
C003.4	Inculcate the concepts of quality and continuous improvement as a passion and habit.	[Ap]
C003.5	Analyze and understand the industrial problem and suggest process improvements.	[A]
Guru's, Crit Concepts a Robustness PROCESS	tion and principles, leadership, quality council, quality statements, strategic teria for Deming's Prize. PRODUCT DESIGN AND ANALYSIS: Basic nd TQM Principles, Failure Mode Effect Analysis, Fault Tree Analysis, De , Value Analysis. IMPROVEMENT AND MODERN PRODUCTION MANAGEMENT TOO oach, Total Productive Maintenance, Just-In-Time, Lean Manufacturing, Pa	Design esign fo DLS: Siz
Guru's, Crit Concepts a Robustness PROCESS Sigma Appro Quality Imp Function De QUALITY M Benefits of	teria for Deming's Prize. PRODUCT DESIGN AND ANALYSIS: Basic nd TQM Principles, Failure Mode Effect Analysis, Fault Tree Analysis, De , Value Analysis. IMPROVEMENT AND MODERN PRODUCTION MANAGEMENT TOO oach, Total Productive Maintenance, Just-In-Time, Lean Manufacturing, Pa rovement Tools and Continuous Improvement. Q-7Tools, New Q-7 Tools eployment, Kaizen, 6S, 8D (Disciplines), Poka- Yoke. IANAGEMENT SYSTEMS: Quality Management Systems, Introduction to IS ISO Registration, TS16949: 2002 and EMS 14001certifications. OHSAS	, Qualit Design esign fo DLS: Si radigms , Qualit SO9000
Guru's, Crit Concepts a Robustness PROCESS Sigma Appro Quality Imp Function De QUALITY M Benefits of	teria for Deming's Prize. PRODUCT DESIGN AND ANALYSIS: Basic nd TQM Principles, Failure Mode Effect Analysis, Fault Tree Analysis, De , Value Analysis. IMPROVEMENT AND MODERN PRODUCTION MANAGEMENT TOO oach, Total Productive Maintenance, Just-In-Time, Lean Manufacturing, Pa rovement Tools and Continuous Improvement. Q-7Tools, New Q-7 Tools eployment, Kaizen, 6S, 8D (Disciplines), Poka- Yoke. IANAGEMENT SYSTEMS: Quality Management Systems, Introduction to I	, Qualit Design esign fo DLS: Si radigms , Qualit SO9000
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Course Objectives: 1 To describe the basic concept of product development 2 To learn the concepts and tools that is necessary for the product design and manufacturing. 3 To apply the new product development process by devising a new product or service and an introductory launch plan. Course Outcomes: Upon completion of the course, students shall have ability to C004.1 Identify concept generation activities and summarize the methodology [R] involved in concept generation activities and summarize the methodology course outcomes: [Q] C004.2 Describe the different stages in product development. [U] C004.3 Analyse the relative importance of customer needs in establishing product [A] specifications. [AD] C004.4 Apply the design knowledge in design for manufacturing. [AP] C004.5 Devise innovative product development plan with environmental and societal [A] [A] Course Contents: [INTRODUCTION: Introduction: Importance of engineering design, characteristics of successfu product development, New product development process, Identifying customer needs – Concept testing. DESIGN THINKING TECHNIQUES: Product Specifications - Product Architecture – Industria Design - User Interface Design – Function based design – Designing to codes and standards TRIZ – axiomatic design – Robust design. Total Hours: 45								
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Cou			Bloon			Ass	essment		onent		Ма	arks	
Outco C004		De	Leve memb			uiz		•				20	
C004			dersta			ssignmer	nt.					20	
C004			alyze	nu		SSIGNINE	<u>n</u>				2		
C004			ply		- C	ase Stud	У		2	20			
C004			alyze		A	ssignmer	nt				2	20	
				sed o		ntinuous		d Sem	ester E	xaminat		-	
Bloo	m's		Summ			essment arks]	(24%)	E	End Sei	mester E	-	ation	
Lev	-		CIA1 : Mark	[60		CIA2 : [60) Marks]			(60%) [100 Ma			
Rememb	ber		20	-		20)			20			
Understa	and		40			40				40			
Apply			20			20		_		20			
Analyse			20		_	20)	_		20			
Evaluate			-		_	-				-			
Create	٨٥		- ont ho	cod o		۔ ntinuous	and En	d Som	actor E	- vominati	ion		
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			oont			larks]	(4070)				E	End	
	CA1	: 100 M	/larks	-			CA2:	100 Ma	arks		End Semester		
SA 1		FA1 (40 Mai	'ks)		SA 1		FA2 (4	0 Marks	s)	Examinatio		
(60		poner		mpon		(60		onen		ponen		(60%)	
Marks	t – I (•		– II (2		Marks	t-	-	_	— II	[100	Marks	
<u>)</u> .	Mark			Marks	/)		larks)		Marks)			
Mapping	-		Jutcor	nes (C	:0) w	vith Prog	ramme C	Jutcon	nes (PC)) Progra	amme s	Specifi	
COs				,			POs			,			
	1	2	3	4	5	6	7	8	9	10	11	12	
C004.1	3												
C004.2	3	5											
C004.3	3	3											
C004.4	. 3	,	3						2				
	3						3	3	2				
C004.5	3	,					Ŭ	•	_				

23ME005		FUNDAMENTALS OF ADDITIVE MANUFACTURING	3/0/0/3
Nature of		Theory application	
Pre Requi		-	
Course O			
1		a detailed insight on the additive manufacturing processes.	
2	•	understanding the need, types, application, method of operation M system in industrial applications.	and the
3		ce innovative thinking and solve business case studies in AM techr	nique.
Course O		5	I
		the course, students shall have ability to	
		he basic concepts of additive manufacturing technologies along	FI 13
C005.1		t trends in advanced manufacturing.	[U]
0005.0		e the different methods used for pre-processing and post	F1 13
C005.2		g of additive manufactured products.	[U]
		ate the uses of additive manufacturing in automobile, aerospace	
C005.3		edical fields.	[Ap]
		appropriate CAD formats in the manufacturing of 3D printed	
C005.4	parts.	appropriate on ormats in the manufacturing of op printed	[Ap]
C005 5		e product using additive manufacturing techniques.	[[]]
C005.5		e product using additive manulacturing techniques.	[E]
Course Co			
		RAPID MANUFACTURING:	
		ntals - Historical development - Fundamentals of Additive Manuf	
(AM)- Adv	antages ar	nd Limitations of AM - Commonly used Terms - AM Process	Chain
Fundamer	ital Automa	ted Processes - Process Chain - CAD Model - 3D modelling -3	3D solid
		d their role in AM -Input file formats - Classification of AM syste	
Benefits.			
		E MANUFACTURING PROCESS:	
		: Stereolithography – Solid Ground Curing – Polyjet printing – Appli	
		Fusion Deposition Modeling – Laminated Object Manufacturing	
		ring –Applications. Powder based systems: Selective Laser Sinter	
Dimension	al Printers	- Laser Engineered Net Shaping -Electron Beam Melting Pro	ocess -
Application	ns. Other S	ystems: Metal Additive Manufacturing (SLM, Inkjet, etc), Sand/C	eramics
		aterials - Electronic	
		- Food Printing.	
-			t tooling
•	• ·	plications of AM: Direct Rapid Tooling, Indirect Rapid Tooling: Sof	
		nversion of CT / MRI scan data –Customized implant -Reverse eng	
		rent application of AM –Novel Application of AM systems –Future to	
		on of AM in Medical, Automotive, Aeronautical, Space and Cons	structior
Industries.	Reverse E	ngineering -3D Scanner.	
		Total Hours:	45
Text Book	(S:		
1	C.K. Chua.	K.F. Leong, C.S. Lim, "Rapid prototyping Principles & Applica	tion (3"
		orld Scientific Publication, 2018.	V -
		anufacturing Design, Methods & Processes, Steinarkilli, Taylor &	Francis
	Publication,		Tancia
		, 2017.	
Reference		Devid Destatuation and E. J. A. P. C. A. P. C.	
		Rapid Prototyping and Engineering Applications, A toolbox for pl	rototype
		nt, CRC Press, Taylor & Francis Group LLC, USA, 2018.	
2	Hopkinson,	N., Hague, R.J.M, and Dickens, P.M., Rapid Manufacturing, An Ir	ndustria
	•	for the Digital Age, John Wiley & Sons, Ltd, UK, 2019.	
Web Refe			
1		.ac.in/courses/112107077/382	
2		.ac.in/courses/112107078/37	
2	<u>mup.//nptel.</u>	.au.in/uulaca/11210/0/0/3/	
2022 (AY:	2023-2024)	Department of Mechanical Engineering Page 1	65

3	http://n	otel.ac	.in/cou	urses/112	102103/1	6					
Online F	Resource	s:									
1	https://	www.te	echno	softeng.co	om						
2	https://	school	edbys	cience.co	<u>m</u>						
3	https://	www.m	netal-a	m.com							
		Co	ntinu	ous Asse	ssment				End		
-	native ssment			nmative essment	Тс	otal	Tota Continu Assessr	ious	Semes Examina	ter	Total
8	80 120 200 40 60										100
Assessr	nent Met	hods &	& Lev	els (base	d on Bloo	oms' [·]	Taxonomy	()			
Formati	ve Asses	sment	base	d on Cap	stone Mo	odel					
Cours Outcon	-	Bloom Level	-		Asse	ssme	nt Compo	nent			A (16%) [80 Marks]
C005.	1 Un	dersta	nd	Quiz							20
C005.2	2 Un	dersta	nd	Assignn	nent						20
C005.3	3 Ар	ply		Case St	udy						20
C005.4	4 Ap	ply			-						
C005.	5 Ev	aluate		Mini Pro	oject						20
Assessr	ment bas	ed on	Sumn	native an	d End Se	mest	er Examin	ation			
Bloom's			Sum		.ssessme) Marks]	nt (24	4%)		End Semester		
Bioonia	Level	CIA	\1 : [6	0 Marks]	CIA2	2 : [60	Marks]	Examination (60%) [100 Marks]			•
Rememb			3			20			2		
Understa	and		5			40			4	-	
Apply			2	0		40			4	0	
Analyse			-			-			-	-	
Evaluate	•					-				-	
Create		L	-			-		L	-	-	
Assessr	nent bas						ter Examiı	nation			
		С	ontin		sessment	(40%)				
	0.1.1	00 11		[200 N	iarksj		0 . 400 15				End
CA 4	CA 1 : 100 Marks SA 1 FA 1 (40 Marks)						2:100 Ma		(0)		nester
SA 1					SA 2	<u> </u>	FA 2 (40				minatio (60%)
(60 Marks	Compo t -			nponen t - II	(60 Marks		mponen t - I		nponen t - II		(60%) Marks]
iviai 145 }	(20 Ma			Marks)	1111 N 3	(20) Marks)		Marks)	1100	mai vəl
/		113/	120	mai 13)	/	(20	- Mai N3j	(20	inai 131		

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Out	conic																
~	\ _		POs														
CC	JS	1	2	3	4	5	6	7	8	9	10	11	12				
C00)5.1	3	2	2													
C00)5.2	3	2	2													
C00)5.3	3	2	3													
C00)5.4	3	2	3													
C005.5 3 3		3	3	3													
3	Strongly agreed			2	Moderately agreed 1 Reasonably agreed												

23ME00	6	TECHNOLOGY MANAGEMENT	3/0/0/3					
Nature o	f Course	Theory						
Pre Requ	uisites	Nil						
Course (Objectives:							
1	To underst	tand about basic concepts of management and to get equipped	with the					
		f management functions						
2	To create a	an awareness about the impact of technology and innovation on b	ousiness					
	manageme							
3	To gain k innovation	nowledge to build an effective communication model and to	manage					
	Outcomes:							
		the course, students shall have ability to						
C006.1		the role and significance of technology management	[U]					
C006.2	Interpret the human issues and ethics involved in the technology usage and implementation.							
C006.3	Illustrate th	ne environmental impact of technological change.	[A]					
C006.4	Relate the	issues in deployment of technology management concepts	[A]					
C006.5		trategies for business units to attain global recognition	[Ap]					
Course (Contents:							
Innovatio Social I Industrial Environm	n ssues in T Relations; nental impact	national Business and Strategic Alliances, Management of Re Technology Management: Social Issues, Technological Char ; Technology Assessment and Environmental Impact A t analysis process- Performance Appraisal and Counseling, Leaders t, Sustainable Technology Management	ige and malysis					
0		Total Hours:	45					
Text Boo	oks:		-					
1		ankar, Technology and innovation management, Dubey publish 020.	ner: PH					
2	Margaret A.	. White, Garry D. Bruton, The Management of Technology and Inn Approach, 2nd Edition, 2019.	ovation					
Reference	e Books:							
1								
2		ohn Bessant, Managing Innovation: Integrating Technological, Ma nal Change, 6th Edition 2018.	rket and					
3	Western, 11	nal Change, 6th Edition 2018. lackson and Slocum, Management: A Competency-Based Approac						
	Western, 11 Koontz, Ess	nal Change, 6th Edition 2018. lackson and Slocum, Management: A Competency-Based Approac 1th edition, 2015.						
	Western, 11 Koontz, Ess erences: https://profe	onal Change, 6th Edition 2018. lackson and Slocum, Management: A Competency-Based Approac 1th edition, 2015. sentials of Management, Tata McGraw-Hill, 10th Edition, 2015. essional.mit.edu/course-catalog/management-technology-roadma	h, Soutl					
Web Ref 1	Western, 11 Koontz, Ess erences: <u>https://profe</u> developme	onal Change, 6th Edition 2018. lackson and Slocum, Management: A Competency-Based Approac 1th edition, 2015. sentials of Management, Tata McGraw-Hill, 10th Edition, 2015. essional.mit.edu/course-catalog/management-technology-roadmagent	h, Soutl					
	Western, 11 Koontz, Ess erences: <u>https://profe</u> developme	anal Change, 6th Edition 2018. lackson and Slocum, Management: A Competency-Based Approac 1th edition, 2015. sentials of Management, Tata McGraw-Hill, 10th Edition, 2015. essional.mit.edu/course-catalog/management-technology-roadmagent ent v.referenceforbusiness.com/management/Str-Ti/Technology-	h, Soutl					

Online R	esour	rces:													
1	https	://npt	el.ac.i	n/cou	rses/110	01071	<u>41</u>								
2	https	s://in.c	ourse	ra.org	/special	lizatio	ns/te	chnolog	gy-mana	gement					
Summati	ve as	sess	ment	based	d on Co	ntinu	ous a	and En	d Seme	ster Exa	aminati	ion			
			Со	ntinuo	ous Ass	sessn	nent	(40%)				Ex		ster natio	
	CA 1	(100	Mark	s)				CA 2 ((100 Ma	rks)			Theory		
SA 1			FA 1	1		SA	2		F/	A 2				natio	
(60	Con	npone	en	Comp	onen	(6		Com	ponen	Comp			ann n		
Marks)		t -l		-	-11	ma	rks	-	-111	t -		(6		arks)	
,		mark	-		arks))			narks)	(20 m	arks)	(0			
Assessm															
Formativ	e ass			ased	on Cap	stone	e Moc	lel (16%	%)						
Course Outcome	•	Bloo Leve	-			A	Asses	ssment	t Compo	onent			Ма	rks	
C006.1		Unde	erstan	d (Quiz									20	
C006.2	2	Unde	erstan	d A	Assignm	nent								20	
C006.3	}	Analy	/ze	(Case St	20		20							
C006.4	ŀ	Apply	/		\ccigpm			20							
C006.5					Assignm									20	
Summati	ve as	sess	ment	based	l on Co	ntinu	ous a	and En	d Seme	ster Exa	aminati	ion			
Bloom's	Level			С	IA1 Marks]		3353	CIA2 Ex					d Semester xamination (60%) 100 Marks]		
Rememb	er				30 20							20			
Understa	nd				50	40							40		
Apply					20				40			4	0		
Analyse					-				-				-		
Evaluate					-										
Create					-				-				-		
Mapping Specific					(CO) w	ith Pi	ogra	mme C	Dutcom	es (PO)	Progra	mme	•		
COs								POs	s						
COS		1	2	3	4	5	6	7	8	9	10	11		12	
C006.	1	3		1											
C006.2	2	3	2	2											
C006.3	3	3			2										
C006.4	4	3			2										
C006.	5	3	2		3										
			/ agre		2 M		1 - 1	agreed	1	Reasor					

Mandatory Courses

23MC102		ENVIRONMENTAL SCIENCES	2 /0 /0 /0
Nature of C	Course	:C (Theory Concept)	
Pre requisi	ites	:Basics in Environmental Studies	
Course Ob	jectives:		
1	To learn the i	ntegrated themes on various natural resources.	
2	To gain know	ledge on the type of pollution and its control methods.	
3	To have an	awareness about the current environmental issues and	the social
	problems.		
Course Ou	tcomes:		
Upon com	pletion of the c	course, students shall have ability to	
C102.1		ay an important role in transferring a healthy environment f	or [R]
	future genera	tion.	[, ,]
C102.2		importance of natural resources and conservation	of [U]
	biodiversity.		
C102.3	Interpret and	analyze the impact of engineering solutions in a global ar	nd [U]
	societal conte	ext.	[0]
C102.4	Apply the gair	ned knowledge to overcome pollution problems.	[AP]
C102.5	Apply the g sustainable d	jained knowledge in various environmental issues ar evelopment.	nd [AP]

Course Contents:

Natural Resources:

Introduction-Forest resources: Use and abuse, case study-Major activities in forest-Water resources-over utilization of water, dams-benefits and problems. Mineral resources-Use and exploitation, environmental effects of mining- case study–Food resources- World food problems, case study. Energy resources -Renewable and non-renewable energy sources Land resources-Soil erosion and desertification – Role of an individual in conservation of natural resources.

Environmental Pollutions:

Definition – causes, effects and control measures of: a. Air pollution-Acid rain - Greenhouse effect-Global warming- Ozone layer depletion – case study- Bhopal gas tragedy. Water pollution c. Soil pollution - Solid waste management-Recycling of plastics-Pyrolysis method- causes, effects and control measures of municipal solid wastes d. Noise pollution. e. Nuclear hazards-case study-Chernobyl nuclear disaster-Role of an individual in prevention of pollution.

Social issues and the Environment:

Sustainable development-water conservation, rain water harvesting, E-Waste Management – Environmental ethics: 12 Principles of green chemistry-Scheme of labelling of environmental friendly products (Eco mark) – Emission standards – ISO 14001 standard.

	Total Hours: 30
Text Books	S:
1	AnubhaKaushik and C P Kaushik "Perspectives in Environmental Studies"4 th Edition, Newage International (P) Limited, Publisher Reprint 2014. New Delhi
2	Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press 2015.
Reference	Books:
1	Tyler Miller, Jr., "Environmental Science", Brooks/Cole a part of Cengage Learning, 2014.
2	William Cunningham and Mary Cunningham, "Environmental Science", 13 th Edition, McGraw Hill,2015.
3	Gilbert M. Masters, "Introduction to Environmental Engineering and Science", Third Edition, Pearson Education, 2014.

Web Refer	ences:				
1	http://n	otel.ac.in/courses/104	103020/20		
2	http://n	otel.ac.in/courses/120	108002		
3	http://n	otel.ac.in/courses/122	106030		
4	http://n	otel.ac.in/courses/120	108004/		
5	http://n	otel.ac.in/courses/122	102006/20		
Online Res	sources:				
1	https://v	www.edx.org/course/s	subject/environmental-studie	es	
2	www.er	nvironmentalscience.c	org		
			on Bloom's Taxonomy)		
Formative	assessm	ent based on Capste	one Model (Max. Marks:40))	
Course Outcome	В	loom's Level	Assessment Com	ponent	Marks
C201.1	Remen	nber	Quiz		10
C201.2	Unders	tand	Case study based on env aspect	ironmental	10
C201.3	Unders	tand	Class presentation		10
C201.4& C201.5	Apply		Assignment	10	
Summative	e assessi	ment based on Cont	inuous Assessment		
			Continuous Assessme	ent	
Bloom's	Level	CIA-I [0 marks]	CIA-II [0 marks]	Term Asses [60 m	sment
Remember		-	-	3	0
Understand	k	-	-	4	-
Apply		-	-	3	0
Analyze		-	-	-	
Evaluate		-	-	-	
Create		1		1	

Specific Outcomes (PSO)																		
<u> </u>		POs													PSOs			
COs	1	2	3	4	5	6	7	8	9	10	11	12		1	2	3		
C102.1							3											
C102.2							3											
C102.3						2	3											
C102.4							3											
C102.5							3											
	3																	

23MC ²	103	SOFT SKILLS	2/0/0/0
Nature o	f Cour	se: Theory Concept	
Pre Requ	uisites	: Technical Communication Skills	
Course C	Objecti	ves:	
1	To dev	elop the students competency level and their capabilities.	
2	To tead	ch the students to be effective in workplace and social environments.	
	To creat themse	ate self confidence among the students and to resolve stress and conflice lives.	ct within
	•	o the students to enhance their career skills by increasing their producti nances.	vity and
		centrate more on conversation skills, presentation skills, verbal ability, crit e thinking.	ical and
Course C	Dutcon	nes:	
Upon co	mpletio	on of the course, students shall have ability to	
C103.1	Reme	ember the principles of soft skills required for their profession.	[R]
C103.2		rstand the importance of Interpersonal communication Skills among duals, groups and cultures.	[U]
C103.3	Apply	verbal and non-verbal communication skills in corporate environment.	[AP]
C103.4	Analy skills.	se and apply creativity skills, critical thinking skills and problem-solving	[AN]
C103.5		late oral and written messages in an appropriate and persuasive manner t specific purposes, audiences and contexts at work place.	[AP]
C103.6		good teamwork skills and Leadership Skills	[AP]
Course (Conten	te:	

Course Contents:

Module 1: Professional Communication Skills

Introduction to the Soft Skills, Performance Evaluation 1 – Significance of Soft Skills Understanding the basic Communication Principles –Listening Skills- Listening Exercises Speaking Skills- How to start and Sustain a Conversation- Speaking in Groups- Understanding self and Personal Branding, attitude, types of attitudes, Positive Attitude, Self Confidence and Self-Motivation - Personal Application/Action Taken. Advanced Writing Skills-Principles of Business Writing- E mails- Writing Reports- Types of Reports- Strategies for Report Writing-Personal Application/Action Taken. Verbal Ability- Analogy- Classification- Odd One Out-Idioms and Phrases- Sentence Correction- Empathy and its importance in career -Personal Application/Action (10 Hours) Taken.

Module 2: Interpersonal Communication

Nonverbal Communication- Individual, Groups and Cultures- Body Language- Attire and Etiquettes- Interpersonal Skills- dealing with diverse People- Networking- Emotional Intelligence and its importance. Personal Application/Action Taken. Developing Creativity-Critical Thinking and Problem-Solving Skills- Making the Right Choice- Never Give Up- Begin to Grow- Personal Application/Action Taken. Interviews- Facing Job Interviews - Planning and Preparing- Effective Resume along with Covering Letter- Planning and Preparing- Personal Application/Action Taken. Self-Discipline - Self Presentation - Personal Application/Action Taken.

(10 Hours)

Module 3: Teamwork and Leadership Skills

Industry Expectations- Universal Hiring Rule- Personal Application/Action Taken. Importance of Human Values-Importance of Team Work- Developing Key Traits in Motivation, Persuasion, Negotiation and Leadership Skills- Being an Effective Team Player- Personal Application/Action Taken. Planning- Prioritization - Delegation- Conflict Management-Decision and its necessity in crucial situations- Group Discussion- Personal Application/Action Taken. Essential Skills in working Strategies- Presentation and Interaction Skills- What to Present and How- Being Assertive-Multimedia Presentation-Making Effective Presentations. Interview Skills- Do's and Don'ts - Body Language – Answering the Common Questions of Interview- Performance Evaluation 2- Mock Interview (10 Hours)

Total Hours: 30

Text B	ooks:															
1 P	enrose	e, "B	usir	ness	Con	nmun	icatio	on fo	or man	ager	s: An	adva	ncec	l approach'	", Cenga	age
le	arning									-					-	-
														ave Macmi		
		cott,	Be	rtil E	Billing	, "Co	mmu	nica	ation fo	or Pro	ofessi	onal	Engii	neers", Tho	omas Te	elford,
	<u>998.</u>															
Refere				<u> </u>	"D -		l	D	. : .		41. :	" A - I		Durk Kalakara		000
														Publishing		
	dia Pv			·	-			urai	and Ir	iter C	Juitur		mmu	inication", S	Sage PL	Discation
								mm	unicat	ions:	The	orv a	nd F	Practice", S	Sade Pu	blication
	dia Pv								uniout	10110.	1110			100000, 0	ago i c	billoution
Web R						,										
				urse	s.npt	el.ac	.in/no	oc16	6_hs15	5/prev	/iew					
												us/In	terpe	ersonalCorr	nmunica	ition
3 <u>ht</u>	tps://s	muc	de.e	du.i	n/sm	ude/p	rogra	ams/	/bca/s	oft-sł	kills.h	tml				
4 <u>ht</u>	tps://s	way	am.	.gov	.in/co	ourse	/4047	7-de	velopi	ng-so	oft-sk	ills-aı	nd-pe	ersonality		
5 <u>ht</u>	tps://w	/ww	.cle	aria	s.con	n/inte	rpers	ona	l-skills	-inclu	uding	-com	<u>muni</u>	cation-skill	s-for-cs	<u>at/</u>
					_				raining							
Asses																
Forma									ne Mo							
	se Ou		me			m's l							Com	ponent		Marks
	<u>C103.</u>					mbe			Group			n				10
	<u>3.2 & C</u>		3.3		Understand Listening Skills Analyze Interview											10
	C103.		<u> </u>								(-					10
	3.5 &				Apply				Forma							10
Summ	ative	asse	ess	mer	it bas	sea c	on Co	ntir			nd A		cmo	nt		
Bloom	's Lev	el							16			nark		11		
Remer	nber											20	5]			
Unders												30				
Apply												30				
Analyz	е											20				
Evalua												-				
Create												-				
Mappi	ng of	Cou	irse	e Ou	tcom	nes (CO) \	with	Prog	ramr	ne O	utco	mes	(PO) Prog	ramme	Specific
Outco	mes (I	PSO)													
COs							PC	Ds							PSOs	
605	1	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C103.	1						1	1	2	2	3	2	2			
C103.								1	1	3	3	2	2			
C103.			+						-	2	3	2	2			
C103.			+				1	1	1	2	3	3	2			
C103.			-+				1	1	1	2	3	2	2			
			-+						-							
C103.	b							1	2	3	3	2	2			<u> </u>
			3	Str	ongly	agre	ed	2	Mode	ratel	y agr	eed	1	Reasonab	ly agree	ed

23MC104		MANAGEMENT ORGANIZATIONAL BEHAVIOUR	2/0/0/0
Nature of Co	ourse	Theory Concept	
Pre requisite	es	Nil	
Course Obje	ectives:		
	-	ective of the course is to provide basic knowledge about manageme	
1.		ize the students with the management principles and organizational	
	behavio		
2.	The cou	irse is designed to enable the students to adapt & apply theoretical o	oncepts
	in busin		
3.		w about the role of manager in the area of management.	
4.	To crea	te and implement team building strategies for organization building.	
Course Out			
Upon comp		the course, students shall have ability to	
C104.1	-	and understand different management principles techniques in	[U]
010111		s environment.	[0]
C104.2		nanagement fundamentals and planning to solve organization	[AP]
010112		ns and make effective decisions.	[, .,]
C104.3		tand and analyze the changes within an individual will change the	[A]
010110		s well as the organization	[, ,]
C104.4		tand and analyze the leadership style and organization theories to	[A]
••••		a productive environment to workforce.	[, 1]
C104.5		the organizational climate and change management strategies	[A]
	and tack		
C104.6		ne empowerment strategy and tactics for productivity	[AP]
Course Con	tents:		

Module 1: Fundamentals of Management, Planning and Decision Making (10 Hours) Introduction to Management- Concept and functions- Thought Managerial roles and styles-Principles of Management - Levels of Management- Theories of Management - Classical, Scientific, Administrative, Behavioral, Management Sciences Theories. Organizational planning -Vision, Mission and goals, Types of plans, steps in planning process, Approaches to planning, Planning in Dynamic Environment. Decision making process, types of decisions, decision making styles, Behavioural influences on decision making - Group decision making - Vroom's Participative decision-making model.

Module 2: Individual, interpersonal and group behavior

Definition, need and importance of Organizational behavior –Learning-Nature -Importance of Learning- Introduction and theories Motivation: Content and process theories-Leadership: Styles and Theories - Perception-Personality – Attitudes- Definition, need and importance -Nature and scope-Importance of Groups and Teams- Role relationships and conflict-Group dynamics- Work values. Organization Theories: Maslow's needs hierarchy theory, two factor theory of motivation, McGregor's theory, ERG theory, McClelland's needs theory, Valance Theory.

Module 3: Organizational Development

Organizational culture: Elements - Organizational climate– Factors affecting organizational climate-Organizational Commitment, Organizational schange- Importance- Stability Vs Change-Proactive Vs Reaction change- Change process– Resistance to change- Managing changes-Managing International Workforce – Productivity- Alternative change management approaches and cultural contingencies - power to manage effectively; Empowerment and Participation strategies and tactics.

Total Hours: 30 Hrs

(10 Hours)

(10 Hours)

Text P	Books:			
		uick Khandelwal	"Organizational Behavior", 2nd Edition, Ceng	ane Learning
1.	2016.		Organizational Denavior, 2nd Edition, Ceng	age Learning,
2.		Trinathy "Principle	es of Management", Cengage Learning, 2016.	
3.			onal Behavior", 12 th Edition, Himalaya Publica	
	Stenhen F	Pa, IX, Organizati Robbins Timothy	A. Judge, "Organizational Behavior", 16 th Ed	lition Prentice
4.		Pvt. Ltd, 2014.		
Refere	ence Books:			
		Singh, Aditi Kł	natri, "Principles and Practices of Mana	agement and
1.	Organizatio	nal Behavior", Sag	ge Publications, 2016.	0
2.	Richard L. I	Daft, "Understand earning, 2013.	ing the Theory and Design of Organizations'	', 11 th Edition,
_			rt Konopaske, "Organizational Behavior and I	Management".
3.	McGraw-Hil	I Education, 2013		-
4.	UdaiPareek 2012.	, Sushama Khanr	na, "Organization Behavior", 3 rd Edition, Oxfo	rd Publishing,
Web R	leferences:			
1.		note.com/fundame	ntal-concepts-of-organizational-behavior	
2.		olteksby.ac.id/ebo		
			gement/mba/term 1/DMGT402 MANAGEME	NT
3.			ZATIONAL_BEHAVIOUR.pdf	
4	https://www	.studocu.com/in/d	ocument/vellore-institute-of-technology/organ	izational-
4.	behaviour/le	ecture-notes/ob-no	otes/3208134/view_	
Online	Resources			
1.	https://nptel	.ac.in/syllabus/110	0105034/	
2.	https://nptel	.ac.in/courses/110	<u>)/105/110105033/</u>	
3.	https://freev	ideolectures.com/	course/3502/organizational-behaviour-i	
4.	https://nptel	.ac.in/courses/110	<u>)/106/110106145/</u>	
			sed on Bloom's Taxonomy)	
			apstone Model (Max. Marks:40)	
	e Outcome	Bloom's Level	Assessment Component	Marks
	2104.1	Understand	Quiz	10
	2104.2	Apply	Online Course	10
	2104.6		Tasky isol Dress tation	10
	2104.3	Analyze	Technical Presentation	10
	C104.4 C104.5	Apply	Assignment	10
			Continuous Assessment	
			Term End Assessment	
Bloom	n's Level		[60 marks]	
Remer	nber		20	
Unders	stand		30	
Apply			30	
Analyz	e		20	
Evalua	ite		-	
Create	· · · · · · · · · · · · · · · · · · ·		-	

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Outcome		,														
<u> </u>						P	Os						PSOs			
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C104.1						2	2	2	2		2					
C104.2						2	2	2	2		2					
C104.3						2	2	2	2		2					
C104.4						2	2	2	2		2					
C104.5						2	2	2	2		2					
C104.6						2	2	2	2		2					
		3	Str	ongly	agre	ed	2	Mode	eratel	y agr	eed	1	Reasonal	bly agreed]	

23MC105	GENERAL APTITUDE	2/0/0/0									
Nature of Cours	e: Problem analytical										
Pre Requisites	: Basic Mathematical calculations										
Course Objectiv	/es:										
1 To ensu	To ensure that students learn to think critically about mathematical models for										
relations	relationships between different quantities and use those models effectively to solve										
	problems and reach conclusions about them.										
	To impart skills that enable students to effectively use and interpret data, formulas, and										
<u> </u>	graphs in the workplace.										
3 To instil	Is confidence in facing technical aptitude questions interviewed by recruit	ers									
Course Outcom	es:										
	n of the course, students shall have ability to										
	ch the basics of Quantitative Techniques in a graded manner.	[R]									
	stand the verbal and non-verbal nature of problems in reality and know	[U]									
	ortcut methods of solving it.										
	problems using their general mental ability.	[AP]									
C105.4 To giv proble	e intense focus on improving and increasing the ability of solving real ms.	[AP]									
	critically about mathematical models for relating different quantities to	[AP]									
	conclusion.										
	e effective use of data interpretation, formulas, graphs and assumptions.	[AP]									
Course Content											
	per Theory and Statistics										
	- HCF and LCM of Numbers – Decimal Fractions – Simplification – Squa										
	of a number – Surds and Indices – Problems on numbers – Percentage										
	 Divisibility – Mixtures – Averages- Polynomials – Solving Equatio scard's rule of signs – Problems on ages – Chain rule – Time and Work 										
	Problems on Trains – Problems on Boats and Streams- Measures of										
	n, Median and Mode – Variance and Standard deviation Logarithms – Pr										
	erest – Compound Interest.	011 and (14									
Hours)		(14									

Hours)

Module 2: Logic and Decision Making

Analogy – Classification – Series completion – Coding and Decoding – Blood Relations – Puzzle Test – Direction Sense test – Logical Venn Diagrams - Number Ranking and Time Sequence Test – Decision Making – Assertion and Reason– Inserting the missing one – Logical Sequence of words – Syllogisms. (8 Hours)

Module 3: Reasoning

Logic – Statement and Arguments – Statements and Assumptions – Statements and Course of Action – Statements and Conclusions – Deriving conclusions from passages – Functions – Different kinds of functions – Miscellaneous sets- Series – Analogy – Classifications – Analytical Reasoning – Problems on Cubes and Dice – Mirror Images – Water Images – Rule Detection.

	(o nouis)
	Total Hours: 30
Text	Books:
1	Aggarwal R. S, "Quantitative Aptitude" Revised Edition, S. Chand Publication.
2	Abhijit Guha, "Quantitative Aptitude" 5th Edition, McGraw Hill Education.
Refe	erence Books:
1	Edgar Thorpe "Mental Ability & Quantitative Aptitude" 3rd Edition, McGraw Hill Education.
Web	References:
1	https://www.wiziq.com/tutorial/815468-quantitative-aptitude-reasoning-data-interpretation-
	<u>video-lectures</u>

2 <u>https://learnir</u>	ngpundits.com/cont	est?referrer=harsh.cse15@nituk.ac.in									
3 https://nptel.a											
4 https://nptel.a	https://nptel.ac.in/courses/111103020/2										
5 <u>http://aptitude</u>	tp://aptitudetraining.in/home/index.php										
6 https://www.u	https://www.udemy.com/vedicmaths/										
7 https://www.y	outube.com/chann/	el/UCtmn-DsF4BhPug-ff9LiDAA?disable_p	olymer=true								
Assessment Met	hods & Levels (ba	ised on Bloom's Taxonomy)									
Formative asses	sment based on C	Capstone Model (Max. Marks:40)									
Course	Bloom's Loval	Accessment Component	Marka								
Outcome	Bloom's Level	Assessment Component	Marks								
C105.1	Remember	Classroom or Online Quiz	10								
C105.2 &	Understand	Formal presentation	10								
C105.3											
C105.4, C105.5	Apply	Formal interview tests	20								
& C105.6											
Summative asse	ssment based on	Continuous Assessment									
Bloom's Level	Term End Assessment										
DIOUIII S Level	[60 marks]										
Remember	20										
Understand		40									
Apply	40										
Analyse	-										
Evaluate	-										
Create	-										

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)															
COs	POs											PSOs			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C105.1	3	3	2												
C105.2	3	2	2												
C105.3	3	3	2												
C105.4	3	2	2												
C105.5	3	3	2												
C105.6	3	2	2												
		3 Strongly agreed						2 Moderately agreed 1					Reasonably agreed		

23MC106	LIFE SKILLS AND ETHICS	2/0/0/0
Nature of C	ourse: Theory Concept	
Pre Requisi	tes : Nil	
Course Obj	ectives:	
1 To	develop communication competence in prospective engineers.	
2 To	enable them to convey thoughts and ideas with clarity and focus.	
3 To	develop report writing skills.	
4 To	equip them to face interview & Group Discussion.	
5 To	inculcate critical thinking process.	
6 To	prepare them on problem solving skills.	
7 To	provide symbolic, verbal, and graphical interpretations of statements in a prob	lem
des	cription.	
Course Out	comes:	
Upon comp	letion of the course, students shall have ability to	
C106.1 D	efine and Identify different life skills required in personal and professional life.	[U]
	evelop an awareness of the self and apply well-defined techniques to cope th emotions and stress.	[AP]
	xplain the basic mechanics of effective communication and demonstrate ese through presentations.	[A]
	se appropriate thinking and problem solving techniques to solve new oblems.	[AP]
C106.5 U	nderstand the basics of teamwork and leadership	[U]
Course Con	tents:	

Communication Skill:

Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication. (10 Hours)

Critical Thinking & Problem Solving:

Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking. Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts. (10 Hours)

Ethics, Moral & Professional Values:

Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE. Leadership Skills: Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation (10 Hours)

Total Hours: 3

Text	Books:
1	Barun K. Mitra, "Personality Development & Soft Skills", First Edition, Oxford Publishers, 2011.
2	Kalyana, "Soft Skill for Managers", 1st Edition, Wiley Publishing Ltd, 2015.
3	Larry James, "The First Book of Life Skills", 1st Edition, Embassy Books, 2016
4	Shalini Verma, "Development of Life Skills and Professional Practice", 1st Edition, Sultan Chand (G/L) & Company, 2014
5	John C. Maxwell, "The 5 Levels of Leadership", Centre Street, A division of Hachette Book Group Inc, 2014.
	2 (A)(+ 2022, 2024) Department of Machanical Engineering Department

Web References	:		
1 <u>https://www.</u>	coursera.org/course	es?query=ethics	
Assessment Me	thods & Levels (ba	ased on Bloom's Taxonomy)	
Formative asses	ssment based on C	Capstone Model (Max. Marks:40)	
Course Outcome	Bloom's Level	Assessment Component	Marks
C106.1	Understand	Quiz	10
C106.2	Apply	Assignment	10
C106.3	Analyse	Presentation	10
C106.4 &	Apply	Group Discussion	10
C106.5			
Summative asse	essment based on	Continuous Assessment	
Bloom's Level		Term End Assessment	
		[60 marks]	
Remember		20	
Understand		30	
Apply		30	
Analyse		20	
Evaluate		-	
Create		-	

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Specific Outcomes (PSO)

Outcome	, i) C	00,													
<u> </u>						P	Os			PSOs					
COs	1 2 3 4 5 6 7 8 9 10 11 12 1										2	3			
C106.1								2	2	2		2			
C106.2								2	2	2		2			
C106.3								2	2	3		2			
C106.4								2	2	2		2			
C106.5								2	3	2		2			
		3	Str	ongly	agre	ed	2	Mode	rately	/ agre	ed	1	Reasonabl	ly agreed	

23MC107			STRESS MANAGEMENT	2/0/0/0
Nature of	Course	e: Theory Concept		
Pre Requi	isites	: Nil		
Course O	bjectiv	es:		
1 L	Jnderst	and the basic princip	oles of stress management	
			ers and how to manage them	
			s to stressful situations	
			g stress both on and off the job	
		<u> </u>	ugh diet, sleep and other lifestyle factors	
			blan to minimize and better manage stress	
		U I	bles of stress management	
Course O				
			idente chall have shility to	
			idents shall have ability to	ri 11
			iples of stress management	[U]
	them.	the concept of recog	nizing your stress triggers and find was to manage	[AP]
C107.3	Develo	op proactive respons	es to stressful situations	[A]
C107.4	Develo	op a long term action	plan to minimize and better manage stress	[AP]
Course C	ontent	s:		
	ess - s	Stress and Maior PSV	chiatric disorders (10	Hours
Developir Understan of Though Managem Strategies Developing	ng Resinding yo nts Belin ent). s for Re g cogni	efs and Emotions – elieving Stress: tive coping skills – A	e of personality pattern, Self-esteem, Locus of contro I & II – Life situation Intrapersonal: (Assertivenes (10) utogenic training, imagery and progressive relaxation Health – DIY strategies stress management.	ol – Role ss, Time Hours) – Other
Developir Understan of Though Managem Strategies Developing	ng Resi nding yc nts Beli ent). s for Re g cogni technic	ilience to Stress: bu stress level – Role efs and Emotions – elieving Stress: tive coping skills – Au ques – Exercise and	e of personality pattern, Self-esteem, Locus of contro - I & II – Life situation Intrapersonal: (Assertivenes (10) utogenic training, imagery and progressive relaxation Health – DIY strategies stress management. (10)	ol – Role ss, Time Hours) – Other
Developin Understan of Though Managem Strategies Developin relaxation Reference 1 Jona Stra	ng Resi nding yc nts Beli ent). s for Re g cogni technic <u>e Book</u> athan C tegies",	ilience to Stress: bu stress level – Role efs and Emotions – elieving Stress: tive coping skills – Au ques – Exercise and ss: Smith, "Stress Man , 1st Edition, Springe	e of personality pattern, Self-esteem, Locus of contro I & II – Life situation Intrapersonal: (Assertivenes (10) utogenic training, imagery and progressive relaxation Health – DIY strategies stress management. (10) Total Hours: nagement: A Comprehensive Handbook of Techniquer Publishing Company, 2011.	ol – Role ss, Time Hours) – Other Hours 30 ues and
Developin Of Though Managem Strategies Developin relaxation Reference 1 Jona Stra 2 Bob Wor	ng Resi nding yc nts Beli ent). s for Re g cogni technic <u>e Book</u> athan C tegies", Stahl, kbook",	ilience to Stress: bu stress level – Role efs and Emotions – elieving Stress: tive coping skills – Au gues – Exercise and ss: Smith, "Stress Man , 1st Edition, Springe Elisha Goldstein, S , 2nd Edition, New H	e of personality pattern, Self-esteem, Locus of contro I & II – Life situation Intrapersonal: (Assertivenes (10) utogenic training, imagery and progressive relaxation Health – DIY strategies stress management. (10) Total Hours: nagement: A Comprehensive Handbook of Techniquer Publishing Company, 2011. Jon Kabat-Zinn, "A Mindfulness–based Stress Re- arbinger Publications, 2019.	ol – Role ss, Time Hours) – Other Hours 30 ues and eduction
Developin of Though Managem Strategies Developin relaxation Reference 1 Jona Stra 2 Bob Wor 3 Rya	ng Resi nding yc nts Beli ent). s for Re g cogni technic technic <u>e Book</u> athan C tegies", Stahl, kbook", n M. N	ilience to Stress: bu stress level – Role efs and Emotions – elieving Stress: tive coping skills – Au gues – Exercise and ss: Smith, "Stress Man , 1st Edition, Springe Elisha Goldstein, S , 2nd Edition, New H	e of personality pattern, Self-esteem, Locus of contro - I & II – Life situation Intrapersonal: (Assertivenes (10) utogenic training, imagery and progressive relaxation Health – DIY strategies stress management. (10) Total Hours: nagement: A Comprehensive Handbook of Techniquer Publishing Company, 2011. Jon Kabat-Zinn, "A Mindfulness–based Stress Re	ol – Role ss, Time Hours) – Other Hours 30 ues and eduction
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Summat	ive a	sses	smer	nt bas	sed c	on Co	ontin	uous	Ass	essm	ent					
Bloom's	Leve	el		Term End Assessment [60 marks]												
Rememb	er		20													
Understa	nd									30						
Apply										30						
Analyse										20						
Evaluate										-						
Create										-						
Outcome COs	of Course Outcomes (CO) with Programme Outcomes (es (PSO) POs								PSOs							
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C107.1								2	3	2		2				
C107.2								2	2	2		2				
C107.3								2	3	2		2				
C107.4								2	3	2		3				
		3	Str	ongly	agre	ed	2	Mode	rately	/ agre	ed	1	Reasonab	ly agreed		

23MC108 CONSTITUTION OF INDIA 2/0/0/0 Nature of Course: Theory **Pre Requisites** : Nil **Course Objectives:** To familiarize with basic information about Indian constitution 2 To understand the fundamental rights and duties as citizens of India Course Outcomes: Upon completion of the course, students shall have ability to C108.1 Explain the objectives of the Constitution of India and its formation [U] C108.2 Recall state and central policies (Union and State Executive), fundamental [R] Rights and their duties. C108.3 Make use of legal directions in developing solutions to societal issues [AP] C108.4 Solve for competitive exams that requires knowledge of Indian Constitution [AP] **Course Contents:** Module I Historical perspective, The making of the Constitution, The Role of the Constituent Assembly Preamble and Salient features of the Constitution of India. Fundamental Rights, Directive Principles of State Policy, Fundamental Duties, Citizenship Article 5-11. (10 Hours) Module II Federal structure, Powers of the Union and the states, Centre-State Relations, Union Executive -President, Prime Minister, Union Cabinet, Parliament, Supreme Court of India, State Executives -Governor, Chief Minister, State Cabinet, State Legislature, High Court and Subordinate Courts, Elections, Electoral Process, and Election Commission of India, Election Laws. Powers and Functions of Municipalities and Panchayat (10 Hours) Module II Amendments - Methods, Emergency Provisions, National Emergency, President Rule, Financial Emergency, Provisions for SC & ST, OBC, women, children and backward classes, Right to Property, Freedom of Trade and Commerce. Agricultural Law (10 Hours) Total Hours: 30 **Text Books:** D. D. Basu, "Introduction to the Constitution of India", LexisNexis, New Delhi, 22ndedition, 2016. 2 "Bare act-constitution of India", The universal Publications, LexisNexis 2020, New Delhi, India. **Reference Books:** Subhash. C. Kashyap, "Our Constitution: An Introduction to India's Constitution and Constitutional Law", National Book Trust, India, 5th edition, 2019. M. Laxmikanth, "Constitution of India", Cengage Learning India. 1st edition 2018. 2 Web References:

https://unacademy.com/course/the-indian-constitution/NSKQ8XXQ
 https://unacademy.com/goal/upsc-civil-services-examination-ias-preparation/KSCGY

Assessment Met	thods & Levels (b	ased on Bloom's Taxonomy)										
Formative asses	Formative assessment based on Capstone Model (Max. Marks:40)											
Course Outcome	Bloom's Level	Assessment Component	Marks									
C108.1	Understand	Case Study Assessment	10									
C108.2	Remember	Assignment	10									
C108.3	Apply	Online Quiz	10									
C108.4	Apply	Presentation	10									
Summative asse	essment based on	Continuous Assessment										
Bloom's Level		Term End Assessment [60 marks]										
Remember		20										
Understand		40										
Apply		40										
Analyse		-										
Evaluate		-										
Create		-										

Mapping of Course Outcomes (CO) with Programme Outcomes (PO) Programme Spec													ecific		
000					PSOs										
COs	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C108.1						3	3	3		1					
C108.2		2		3		3	3	3	3		3	3			
C108.3				3		3	3	3	3		3	3			
C108.4		2				3	3	3	3						
		3	Str	ongly	agre	ed	2	Mode	rately	/ agre	ed	1	Reasonab	ly agreed]

23MC109)	ESSENCE OF	F INDIAN TRADITIONAL KNOWLEDGE	2/0/0/0
Nature of	Course	: Theory		
Pre Requ	isites	: Nil		
Course O)bjective	s:		
1	To make	understand the cont	tribution of Indian mind in various fields.	
2	To cultiva	ate critical appreciat	ion of the thought content and provide insights	relevant for
F	oromoting	g cognitive ability, ł	health, good governance, aesthetic appreciatio	n and right
	values.			
Course O				
			dents shall have ability to	
C109.1			tions with contemporary traditions and culture.	[U]
C109.2			dians in different disciplines.	[R]
C109.3		he knowledge to the		[AP]
C109.4	Discove	er a better appreciati	on and understanding of Indian traditions.	[AP]
Agricultur	e (Survey	y) – Early & Classica	- Society state and Polity (Survey) - Education al Architecture – Medieval & Colonial Architecture ditions (Survey) - Indian Literatures - Indian Pl	e. (10 hours)
Systems - and Well-		raditional Knowledg	e on Environmental Conservation - Ayurveda for	Life, Health
	orical Evo	olution of Medical Tr nd Drama in India.	radition in Ancient India - Music in India - Class	
	orical Evo			sical & Folk
dance - T	rical Evo heatre ar		radition in Ancient India - Music in India - Class Total Hou	sical & Folk
dance - T Text Bo	orical Evo heatre ar oks:	nd Drama in India.	Total Hou o, Textbook of "Knowledge Traditions and Practic	sical & Folk (10 hours) Irs: 30
dance - Ti Text Bo 1 Ka Ce	orical Evo heatre ar oks: opil Kapoo entral Boa	nd Drama in India. Dr and Michel Daning ard of Secondary Ed	Total Hou o, Textbook of "Knowledge Traditions and Practic lucation, 2017.	sical & Folk (10 hours) Irs: 30 es of India",
dance - Ti Text Bo 1 Ka Ce 2 Yo	orical Evo heatre ar oks: opil Kapoo optral Boa	nd Drama in India. or and Michel Daning ard of Secondary Ed al, "Indian Society: C	Total Hou o, Textbook of "Knowledge Traditions and Practic	sical & Folk (10 hours) Irs: 30 es of India",
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dance - T Text Bo 1 Ka Ce 2 Yo Referen 1 Do pu 2 Ra Th Web Re 1 htt 2 htt Assessi Formati Cou Outo C10	orical Evo heatre ar oks: opil Kapoc entral Boa ogesh Ata ce Book ouglas Os blications to C.N. S oughts", ferences p://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r ps://nopr.r	nd Drama in India. pr and Michel Daning ard of Secondary Ed al, "Indian Society: C s: sto, "An Indian Tar s, 2020. Shankar, "Sociology S Chand Publisher, S Chand Publisher, ac.in/courses/109/7 thods & Levels (bassed on C Bloom's Level Understand Remember	Total Hou co, Textbook of "Knowledge Traditions and Practic Jucation, 2017. continuity and Change", Pearson Education India htric Tradition and Its Modern Global Revival", y: Principles of Sociology with an Introduction 2019. /123456789/43 104/109104102/ sed on Bloom's Taxonomy) capstone Model (Max. Marks:40) Assessment Component Assignment Online Quiz	sical & Folk (10 hours) Irs: 30 es of India", , 2016. Routledge n to Social Marks 10 10
dance - T Text Bo 1 Ka Ce 2 Yo Referen 1 Do pu 2 Ra Th Web Re 1 htt 2 htt Assessi Formati Cou Outo C10 C10	orical Evo heatre ar oks: opil Kapoo entral Boa ogesh Ata ogesh Ata ce Book ouglas Os blications oughts", ferences p://nopr.r ps://nptel ment Me ve asses urse come	nd Drama in India. or and Michel Danino ard of Secondary Ed al, "Indian Society: C s: sto, "An Indian Tar s, 2020. Shankar, "Sociology S Chand Publisher, S Chand Publisher, s: hiscair.res.in/handle/ I.ac.in/courses/109/ thods & Levels (ba ssment based on C Bloom's Level Understand	Total Hou co, Textbook of "Knowledge Traditions and Practic lucation, 2017. continuity and Change", Pearson Education India htric Tradition and Its Modern Global Revival", y: Principles of Sociology with an Introduction 2019. /123456789/43 104/109104102/ ised on Bloom's Taxonomy) capstone Model (Max. Marks:40) Assessment Component	sical & Folk (10 hours) Irs: 30 es of India", , 2016. Routledge n to Social Marks 10

Summat	ive as	sses	smer	nt bas	sed o	n Co	ontin	uous	Asse	essm	ent				
Bloom's	Leve	el	Term End Assessment [60 marks]												
Rememb	er		20												
Understa	nd									40					
Apply										40					
Analyse										-					
Evaluate										-					
Create										-					
Outcome COs		of Course Outcomes (CO) with Programme Outcomes (s (PSO) POs								PO) Programme Specific PSOs					
003	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C109.1						3	3					3			
C109.2						3	3					3			
C109.3						3	3					3			
C109.4						3	3					3			
		3	Str	ongly	agre	ed	2	Node	rately	agre	ed	1	Reasonab	ly agreed	

23MC1	10	BIOLOGY	2/0/0/0
Nature	of Course	: Theory	
Pre rec	quisites	: Nil	
	e Objectives:		
		d the basic biological concepts related to engineering systems.	
2.	To have ad	equate knowledge about the various human anatomy and	physiological
system			
		knowledge about biological systems in the environment.	
	e Outcomes:		
		f the course, students shall have ability to	
C110		the biological system with engineering concepts	[R]
C110		tands the anatomy and physiology of human system.	[U]
C110		tand the concept of plant, animal and microbial systems and grov ife situations	wth [U]
C110	0.4 Apply findustri	he knowledge of applications of biological systems in releves.	ant [AP]
Course	e Contents:		<u> </u>
physico Cell – I structur skeleta digestic Industri Living	prokaryotes a re and function I system, mu on, nutrition, e ial Microbiolo things as so	and eukaryotes, biological membrane, membrane transport, eu on. Plant – plant division, Animal – reproductive strategies, Hu scular system, nervous system, cardiovascular system, respira excretory system. gy and its Applications, Relationship between Engineering an olution, models, recipients, inadvertently affected. Biological Cell organization, signalling and deciphering human genetic va	(10 hours) karyotic cell man – Skin tory system (10 hours) nd Biology solutions to riation (10 hours)
		Total ho	urs: 30
Text B			
1.		of Biotechnology, R.C.Dubey, S. Chand Higher Academic Public	
2.		n.S., Selvamurugan. N., Rajesh.M.P., Nazeer.R.A., Richard W and Jaganthan.M.K., "Biology for Engineers", Tata McGraw-Hill	
Refere	nce Books:		
1.	Biology for E	Engineers, Arthur T. Johnson, CRC Press, Taylor and Francis, 2	014.
2.	•••	ccari, Peter F. Strom, James E. Alleman," Environmental Biolog	
	Engineers a	nd Scientist", A John Willey Inc. publications, 2018.	
Web R	eferences:	•	
1.	https://www	cellsalive.com/	
2.	https://www	visiblebody.com/teaching-anatomy/courseware	
		· · · · ·	
Online	Resources:		
1	https://bio.lik	pretexts.org/Bookshelves/Microbiology/Book%3A Microbiology	(Boundless)

1.	https://bio.libretexts.org/Bookshelves/Microbiology/Book%3A_Microbiology_(Boundless)
	/17%3A_Industrial_Microbiology/17.1%3A_Industrial_Microbiology
2.	http://sites.khas.edu.tr/bioinformatics/whats/bioinformatics-genetics/

Assessm	nent	Meth	ods a	& Lev	vels (base	ed on	Bloc	om's	Тахо	nom	y)				
Formativ	ve as	sess	ment	base	ed on	Ca	pston	e Mo	del (Max.	Mark	(s:40)			
Cou	rse		Bloc	m's	Leve		Assessment Component							Marks		
Outco						-	•									
C11	-						Assignment							10		
C11	-		Unde		-	C	Online Quiz							10		
C11			Understand Presentation									10				
C11			Apply				Case S								10	
Summati	ive a	sses	smer	nt bas	sed o	n Co	ontinu	Jous	Asse	essm	ent					
Bloom's	Leve	el						Те		nd As 0 mai		smen	t			
Rememb	er			[60 marks] 20												
Understa	-		40													
Apply	i i a		40													
Analyse			-													
Evaluate																
Create																
	of C	ours		tcon	nes ((:0)	O) with Programme Outcomes (PO) Programme Specific								Specific	
Outcome					100 ((,0,	WICH I	iog	anni			100 (i 0) i i 0g		opcomo	
COs						Р	POs						PSOs			
COS	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C110.1	3	3	2			3	3				3	3				
C110.2	3	3	2	2	2	3	3				3	3				
C110.3	3	3	2	2	2	3	3				3	3				
C110.4	3	3	2	2	2	3	3				3	3				
		3	Str	ongly	agre	ed	2	Node	rately	/ agre	ed	1	Reasonab	ly agree	d	

23MC500		SPORTS AND YOGA	2/0/0/0						
Nature of C	Course	Practical concepts							
Pre Requis	sites	NIL							
Course Ob	jectives								
1	Understand the importance of sound health and fitness principles as the better health								
2	Stimula	te their continued inquiry about Yoga, physical education, health	and fitness						
3		Create a safe, progressive, methodical and efficient activity based plan to improvement and minimize risk of injury.							
4	Develop	p physical activities as a lifetime pursuit and a means to better he	alth.						
Course Ou	tcomes:								
Upon com		of the course, students shall have ability to							
C500.1		techniques for increasing concentration and decreasing anxiety eads to stronger academic performance.	[U]						
C500.2	Describ fitness	e various combination and forms and assess current personal levels	[U]						
C500.3	Unders ⁻ lifestyle	tanding of psychological problems associated with the age and	[U]						
C500.4	Apply b and trai	piomechanical and physiological principles related to exercise ning.	[Ap]						
Course Co	ntents:								
Introductio	on to Phy	ysical Education: Meaning and objectives of Physical Education	n, Changin						

Introduction to Physical Education: Meaning and objectives of Physical Education, Changing trends in Physical Education. Ancient & Modern Olympics (Summer & Winter), Awards and Honours in the field of Sports in India. **Physical Fitness, Wellness & Lifestyle:** Components of Physical fitness, Health related fitness, Preventing Health Threats through Lifestyle Change, Concept of Positive Lifestyle.

Fundamentals of Anatomy: Define Anatomy, Effect of exercise on the functioning of Various Body Systems. (Circulatory System, Respiratory System, Neuro-Muscular System etc.). **Postures:** Concept of Postures, Causes of Bad Posture, Common Postural Deformities and advantages of Correct Posture. **Yoga and Lifestyle:** Introduction - Asanas, Pranayama, Meditation & Yogic Kriyas.

Training and Psychology in Sports: Meaning, Warming up, Skill, Technique & Style. Meaning, Concept & Types of Aggressions in Sports. Adolescent Problems and their Management, Psychological benefits of exercise. Anxiety & Fear and its effects on Sports Performance. **Doping:** Meaning, Side Effects of Prohibited Substances. **Sports Medicine:** First Aid, Sports injuries and Management of Injuries.

	Total Hours: 30
Text Book	s:
1	Modern Trends and Physical Education by Prof. Ajmer Singh.
2	Light On Yoga by B.K.S. Iyengar.
3	Health and Physical Education – NCERT (11th and 12th Classes).

Assessment Method	Assessment Methods & Levels (based on Bloom's Taxonomy)											
Formative assessment based on Capstone Model (Max. Marks:40)												
Course Outcome	Bloom's Level	Assessment Component	Marks									
C500.1	Understand	Quiz	10									
C500.2	Understand	Assignment	10									
C500.3	Understand	Presentation	10									
C500.4	Apply	Group Discussion	10									

Summati	ive a	sses	smer	nt bas	sed o	on Co	ontin	uous	Asse	essm	ent					
Bloon	n's L	evel		Term End Assessment [60 marks]												
Rememb	er										20					
Understa	nd			40												
Apply		40														
Analyze									-							
Evaluate									-							
Create				-												
Outcome COs			e Ou	Putcomes (CO) with Programme Outcomes (PO) P POs									PO) Prog	Programme Specific PSOs		
005	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C500.1								2	2	2		2				
C500.2								2	2	2		2				
C500.3								2	2	3		2				
C500.4								2	2	2		2				
		3	Str	ongly	agre	ed	2	Node	rately	/ agre	ed	1	Reasonab	ly agreed		

Value Added Courses

R2022 (AY: 2023-2024)

23VA502	PROJECT MANAGEMENT PROCESS	
Nature of	Course: Theory	
Pre Requ		
Course O	bjectives:	
	o understand about the basics of project management.	
2	o successfully build and lead a team for successful project completion	
3 -	o evaluate the risk factors involved in a project and to manage them effectively.	
4	o align project plans with organization's goals and objectives	
Course O	utcomes:	
Upon cor	npletion of the course, students shall have ability to	
C502.1	Plan and execute a project in the projected timeline.	[U]
C502.2	Propose and control the overall cost and budget of the project.	[U]
	Network with different stakeholders and improvise the business model	[AP]
C502.4	Utilizing different communication models and business plans to accomplish the project.	[AP]
Course C	ontents:	
•	ent Planning – People – Process – Business Environment - Estimation to s – Overview of PMBOK	
	(12	Hours)
 Comm Managen 	and Execution: Cost management planning – Project Budgeting tools and tecl unications planning – Procurement Planning – Human Resource Planning – nent Planning – Stakeholder Management Planning - Continuous impro s – Sequencing of Activities – Quality Assurance	Quality
	(12	Hours)
Trend Ar standards inspection	ng and Controlling: Performance management and tracking techniques (PERT alysis) - Project monitoring tools and techniques - Project quality best practic - Quality measurement tools (statistical sampling, control charts, flowc n, assessment) – Risk Identification Techniques – Compliance and Review Tech oject Management	ces and harting,
	Total Hours:	
Referenc	3	
1 P	oject Management by Merrie Barron and Andrew Barron.	

23VA503		QUALITY MANAGEMENT	
Nature of	f Cours	e: Theory	
Pre Requ	iisites	: Nil	
Course C	Dbjectiv	/es:	
1	To unde	erstand the engineering and management aspects of quality planning and	control.
		ne methodology of improving quality in manufacturing process / products.	
3	To unde	erstand the concepts of quality management system.	
Course C	Outcom	es:	
Upon co	mpletio	n of the course, students shall have ability to	
C503.1	Define	the basic concepts of quality management.	[R]
C503.2	Under	stand the fundamentals of total quality management and its tools.	[U]
C503.3		rate the role of TQM tools and techniques in elimination of wastes and it is not defects.	[AP]
C503.4	Inculca and ha	ate the concepts of quality and continuous improvement as a passion abit.	[AP]
Course C	ontent	S:	
TOM KIT		(S – Evolution of TOM, Quality Guru's – Edward Deming, Joseph Juran	Product
Design a	nd Anal	(S – Evolution of TQM, Quality Guru's – Edward Deming, Joseph Juran. ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis.	
Design a Analysis,	nd Anal Design	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis.	
Design a Analysis, Module I Modern	nd Anal Design I Produc	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis.	ult Tree Hours)
Design an Analysis, Module I Modern Deployme	nd Anal Design I Produc ent, Kai	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED	ult Tree Hours)
Design an Analysis, Module I Modern Deployme Module I Quality	nd Anal Design I Produc ent, Kai Manage :2002 a	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED (12 ement Systems: Quality Management Systems, Introduction to IS and EMS14001 certifications. OHSAS 18001 Occupational Health &	ult Tree Hours) Function Hours)
Design an Analysis, Module I Modern Deployme Module I Quality TS16949	nd Anal Design I Produc ent, Kai Manage :2002 a	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED (12 ement Systems: Quality Management Systems, Introduction to IS and EMS14001 certifications. OHSAS 18001 Occupational Health & es. (12	ult Tree Hours) Function Hours) GO9000, Safety Hours)
Design an Analysis, Module I Modern Deployme Module I Quality TS16949 Assessm	nd Anal Design Produc ent, Kai Manage 2002 a ent Seri	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED (12 ement Systems: Quality Management Systems, Introduction to IS and EMS14001 certifications. OHSAS 18001 Occupational Health & es.	ult Tree Hours) Function Hours) GO9000, Safety Hours)
Design an Analysis, Module I Modern Deployme Module I Quality TS16949 Assessm Reference	nd Anal Design Produce ent, Kaiz Manage :2002 a ent Seri	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED (12 ement Systems: Quality Management Systems, Introduction to IS and EMS14001 certifications. OHSAS 18001 Occupational Health & les. (12 Total Hours:	ult Tree Hours) Function Hours) GO9000, Safety Hours)
Design an Analysis, Module I Modern Deployme Module I Quality TS16949 Assessme Reference 1 D	nd Anal Design Producent, Kai: Manage 2002 a ent Seri aent Seri	ysis: Basic design concepts and TQM, Failure Mode Effect Analysis, Fa for Robustness, Value Analysis. (12 ction Management Tools – Q7 Tools, New Q7 Tools, Quality F zen, 5S, Poka-Yoke, SMED (12 ement Systems: Quality Management Systems, Introduction to IS and EMS14001 certifications. OHSAS 18001 Occupational Health & es. (12	ult Tree Hours) Function Hours) GO9000, Safety Hours)

Service Courses

23ME111 ENGINEERING GRAPHICS Nature of Course Practical application											
Nature of	of Course	Practical application									
Pre-Rec	uisites										
Course	Objectives:										
1	To und applicat	erstand the method to construct the conic curve ions.	es used in er	ngineering							
2	To stud	y the conversion of Isometric to orthographic views	and vice vers	a.							
3	To learr	rn the basic projection of straight lines and plane surfaces.									
4		elop the imagination of solids inclined to one referer									
5		erstand the development of surfaces used in variou	s fields.								
	Outcomes:										
		the course, students shall have ability to									
C111.1		e the basic concepts of engineering graphics.		[U]							
C111.2	views	isometric projections and orthographic projections f	rom pictorial	[Ap]							
C111.3	B Draw th	e projections of lines, planes and solids.		[Ap]							
C111.4	Develop	b lateral surfaces of solids including prisms and pyra	amids	[A]							
C111.5	· · · · · · · · · · · · · · · · · · ·										
Course	Contents:			·							
principle	s of projection	entions: Drafting instruments, BIS conventions, d on in quadrants: First angle projection – Third angl Dimensioning.	U U								
	List of Experiments CO										
S.No		•	CO Mapping	RBT							
S.No	Introductior	List of Experiments to drafting software.		RBT U							
S.No	Introductior	List of Experiments	Mapping								
S.No	Introduction Constructio Hyperbola) Constructio	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes)	Mapping C111.1	U							
S.No 1 2 3 4	Introduction Constructio Hyperbola) Constructio Isometric to	List of Experiments a to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches	Mapping C111.1 C111.1 C111.1 C111.1 C111.1 C111.2	U U							
S.No 1 2 3 4 5	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches	Mapping C111.1 C111.1 C111.1 C111.2 C111.2	U U U							
S.No 1 2 3 4 5 6	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP	Mapping C111.1 C111.1 C111.1 C111.1 C111.1 C111.2	U U U Ap							
S.No 1 2 3 4 5	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches	Mapping C111.1 C111.1 C111.1 C111.2 C111.2	U U U Ap Ap							
S.No 1 2 3 4 5 6 7 8	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o – inclined to	List of Experiments a to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle)	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3	U U U Ap Ap Ap							
S.No 1 2 3 4 5 6 7	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3	U U U Ap Ap Ap Ap							
S.No 1 2 3 4 5 6 7 8	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP	Mapping C111.1 C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4	U U Ap Ap Ap Ap Ap							
S.No 1 2 3 4 5 6 7 8 9	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o Projection o Developme Cylinder)	List of Experiments a to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP of solids (Cone and Cylinder) – inclined to VP	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4 C111.4	U U Ap Ap Ap Ap Ap Ap							
S.No 1 2 3 4 5 6 7 8 9 10	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o Projection o Developme Cylinder)	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP of solids (Cone and Cylinder) – inclined to VP nt of surfaces (Prism, Pyramid, Cone and to Perspective projection	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4 C111.5	U U Ap Ap Ap Ap Ap Ap Ap Ap							
S.No 1 2 3 4 5 6 7 8 9 10 11	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o Developme Cylinder) Introduction	List of Experiments a to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP of solids (Cone and Cylinder) – inclined to VP nt of surfaces (Prism, Pyramid, Cone and a to Perspective projection	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4 C111.5 C111.5	U U Ap Ap Ap Ap Ap Ap A A A 75							
S.No 1 2 3 4 5 6 7 8 9 10 11 Referen 1	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o Projection o Developme Cylinder) Introduction	List of Experiments to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP of solids (Cone and Cylinder) – inclined to VP nt of surfaces (Prism, Pyramid, Cone and to Perspective projection T P.I., "Engineering Drawing", McGraw Hill Education	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4 C111.5 C111.5 Fotal Hours:	U U Ap Ap Ap Ap Ap Ap Ap A 2019.							
S.No 1 2 3 4 5 6 7 8 9 10 11 Referen	Introduction Constructio Hyperbola) Constructio Isometric to Isometric to Projection o Projection o Projection o Projection o Projection o Developme Cylinder) Introduction	List of Experiments a to drafting software. n of conic curves (Ellipse, Parabola and n of special curves (Cycloid and Involutes) orthographic projections – manual sketches orthographic projections – software sketches of lines - inclined to HP, VP and Both HP & VP of plane surfaces (Hexagon, Pentagon and circle) o any one of the principle planes of solids (Prism and Pyramid) – inclined to HP of solids (Cone and Cylinder) – inclined to VP nt of surfaces (Prism, Pyramid, Cone and a to Perspective projection	Mapping C111.1 C111.1 C111.1 C111.2 C111.2 C111.3 C111.3 C111.4 C111.5 C111.5 Fotal Hours:	U U Ap Ap Ap Ap Ap Ap Ap A 2019.							
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C111.1	Unde	erstand	As	ssignment					20			
C111.2 Apply			As	ssignment					20			
C111.3	Appl	y		signment								
C111.5	Appl	y	A	20								
C111.4	Anal	yze	20									
Assessme	ent based	l on Sı	imma	tive and End	d Semester	Exan	ninati	on - Theory	,			
Bloom's L	evel	Summative Assessment (15%) [120 Marks]										
			CIA1: (60 Marks) CIA2: (60							Marks)		
Remember				30			30					
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