



SKIT	Teaching Process	Rev No.: 1.0
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COURSE PLAN - CAY 2019-20

BE-2-EME-SKIT-Ph5b1-F02-V2.2

File No:

SRI KRISHNA INSTITUTE OF TECHNOLOGY, BENGALURU



COURSE PLAN Academic Year 2019 – 20

Program:	B E
Semester :	2
Course Code:	18ME25
Course Title:	Elements of Mechanical Engineering
Credit / L-T-P:	3/2-1-0
Total Contact Hours:	40
Course Plan Author:	APPESE S D

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Note : Remove “Table of Content” before including in CP Book

Each Course Plan shall be printed and made into a book with cover page

Blooms Level in all sections match with A.2, only if you plan to teach / learn at higher levels



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18ME25: ELEMENTS OF MECHANICAL ENGINEERING

A. COURSE INFORMATION

1. Course Overview

Degree:	BE	Program:	ME
Year / Semester :	1 year / 2 sem	Academic Year:	2019-20
Course Title:	ELEMENTS OF MECHANICAL ENGINEERING	Course Code:	18ME25
Credit / L-T-P:	3/2-1-0	SEE Duration:	3 Hours
Total Contact Hours:	40	SEE Marks:	60
CIA Marks:	40	Assignment	1 / Module
Course Plan Author:	APPESE S D	Sign	Dt:
Checked By:	NAVEEN KUMAR PATTAR	Sign	Dt:

2. Course Content

Content / Syllabus of the course as prescribed by University or designed by institute. Identify 2 concepts per module as in G.

Module	Module Content	Teaching Hours	Blooms Level
1	Introduction and application of energy sources Fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels Environmental issues like global warming and ozone depletion. Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics Concept of internal energy, enthalpy and entropy (simple numerical). Formation of steam and thermodynamic properties of steam Properties of steam (simple numericals).	08	L3
2	Introduction to boilers, classification, Boilers: Introduction to boilers, classification, Introduction to boiler mountings and accessories (no sketches) Hydraulic Turbines – Classification specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine classification and specification of pumps, Reciprocating pump and centrifugal pump, Concept of cavitation and priming.	08	L2
3	Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal	08	L2



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	<p>efficiency, mechanical efficiency and specific fuel consumption.</p> <p>Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners</p>		
4	<p>Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers – Thermoplastics and thermo setting polymers. Ceramics -Glass, optical fiber glass, cermets. Composites – Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators. Definitions. Classification and methods of soldering, brazing and welding.</p> <p>Brief description of arc welding, oxyacetylene welding, TIG welding, and MIG welding.</p> <p>Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, Ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.</p> <p>Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, Advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.</p>	08	L3
5	<p>Principle of working of a center lathe. Parts of a lathe. Operations on lathe -Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tail stock offset method and Compound slide swiveling method, Specification of Lathe.</p> <p>Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes – plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.</p> <p>Introduction, components of CNC, open loop and closed loop systems, Advantages of CNC, CNC Machining</p>	08	L2



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centers and Turning centers. Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection		
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3. Course Material

Books & other material as recommended by university (A, B) and additional resources used by course teacher (C).

1. Understanding: Concept simulation / video ; one per concept ; to understand the concepts ; 15 – 30 minutes
2. Design: Simulation and design tools used – software tools used ; Free / open source
3. Research: Recent developments on the concepts – publications in journals; conferences etc.

Module	Details	Available
A	Text books (Title, Authors, Edition, Publisher, Year.)	
1, 2, 3, 4, 5	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore,2008.	In Lib, In dept
1, 2, 3, 4, 5	Elements of Mechanical Engineering, Vol.-1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.	In Lib, In dept
1, 2, 3, 4, 5	A Text Book of Elements of Mechanical Engineering”, S. Trymbaka Murthy, 3 rd revised edition 2006, I. K. International Publishing House Pvt. Ltd., New Delhi.	In Lib, In dept
B	Reference books (Title, Authors, Edition, Publisher, Year.)	
1, 2, 3, 4, 5	Elements of Mechanical Engineering, R.K. Rajput, Firewall Media, 2005.	In Lib, In dept
1, 2, 3, 4, 5	Elements of Mechanical Engineering, Kestoor Praveen, Suggi publication-2018.	
1, 2, 3, 4, 5	Elements of Mechanical Engineering, Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.	In Lib, In dept



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4. Course Prerequisites

Refer to GL01. If prerequisites are not taught earlier, GAP in curriculum needs to be addressed. Include in Remarks and implement in B.5.

Students must have learnt the following Courses / Topics with described Content .

SNo	Course Code	Course Name	Module / Topic / Description	Sem	Remarks	Blooms Level
1	-	Physics	Force, energy wave, heat engine	-	Basic	L2

5. Content for Placement, Profession, HE and GATE

The content is not included in this course, but required to meet industry & profession requirements and help students for Placement, GATE, Higher Education, Entrepreneurship, etc. Identifying Area / Content requires experts consultation in the area. Topics included are like, a. Advanced Topics, b. Recent Developments, c. Certificate Courses, d. Course Projects, e. New Software Tools, f. GATE Topics, g. NPTEL Videos, h. Swayam videos etc.

B. OBE PARAMETERS

1. Course Outcomes

Expected learning outcomes of the course, which will be mapped to POs. Identify a max of 2 Concepts per Module. Write 1 CO per Concept.

Module	#	Cos Student should able to.....	Teach. Hours	Concept	Instr Method	Assessment Method	Blooms' Level
1	CO-1	Identify different sources of energy and their conversion process.	8	Energy sources	Chalk & board, PPT's	Assignment CIA SEE	L2
2	CO-2	Explain the working principle of hydraulic turbines, Boilers, pumps, IC Engines and Refrigeration.	8	Formation of Steam, power transfer	Chalk & board, PPT's	Assignment CIA SEE	L2
3	CO-3	Recognize various joining processes and power transmission.	8	Joining Processes	Chalk & board, PPT's	Assignment CIA SEE	L2
4	CO-4	Understand properties of engineering materials and there application in industries.	8	Smart materials	Chalk & board, PPT's	Assignment CIA SEE	L2
5	CO-5	Discuss the working of	8	Machinin	Chalk	Assignment	



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	conventional machine tool, machining operations and advanced manufacturing systems.		g operation s	& board, PPT's	t CIA SEE	L2
-	Total	40	-	-	-	-

2. Course Applications

SNo	Application Area	CO	Level
1	Power generation in Solar, wind, hydro, nuclear, thermal power plants	CO1	L2
2	Design of Heat transfer equipment's	CO2	L3
3	Thermal power plants, food processing industry, sugar plants, Textiles	CO3	L2
4	Hydro power plants	CO3	L2
5	Running of automobile vehicles	CO3	L2
6	Fridges for domestic and household purposes, air-conditioners for rooms	CO2	L2
7	Design and fabrication of various machine components	CO4	L2
8	Power transmission in vehicles, power transmission between machine components	CO4	L3
9	Used in manufacturing cylindrical jobs, flat surfaces of machine components	CO5	L2
10	Automation in industries	CO5	L2

3. Articulation Matrix

(CO – PO MAPPING)

CO – PO Mapping with mapping level for each CO-PO pair, with course average attainment.

COs	Student should able to.....	Program Outcomes												Level	
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12		
CO1	Identify different sources of energy and their conversion process.	√	-	-	-	-	-	-	-	-	-	-	-	-	L2
CO2	Explain the working principle of hydraulic turbines, Boilers, pumps, IC Engines and Refrigeration.	√	-	-	-	-	-	-	-	-	-	-	-	-	L2
CO3	Recognize various joining processes and power transmission.	√	-	-	-	-	-	-	-	-	-	-	-	-	L2
CO4	Understand properties of engineering materials and	√	-	-	-	-	-	-	-	-	-	-	-	-	L2



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	there application in industries.																		
CO5	Discuss the working of conventional machine tool, machining operations and advanced manufacturing systems.	√	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	L2
18ME25	Average attainment (1, 2, or 3)																		
	<i>PO, PSO</i>	<p><i>1.Engineering Knowledge; 2.Problem Analysis; 3.Design / Development of Solutions; 4.Conduct Investigations of Complex Problems; 5.Modern Tool Usage; 6.The Engineer and Society; 7.Environment and Sustainability; 8.Ethics; 9.Individual and Teamwork; 10.Communication; 11.Project Management and Finance; 12.Life-long Learning; S1.Our graduate engineers will apply all the basic principles of mechanical engineering required in both private and public sector organizations.; S2. We produce graduate engineers specialized in Thermal, Manufacturing, Design and Data Base Management; S3.Our students are well equipped with industrial management skills, and interdisciplinary technologies & Web Design.</i></p>																	

4. Mapping Justification

Mapping		Justification	Mapping Level
CO	PO		-
CO1	1	'Engineering Knowledge:' - Acquisition of Engineering Knowledge of Energy resources is essential to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2

Mapping		Justification	Mapping Level
CO	PO		-
CO2	1	Acquisition of Engineering Knowledge of thermodynamic properties is essential to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2

Mapping		Justification	Mapping Level
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CO	PO		
CO3	1	Acquisition of Engineering Knowledge of turbines and boilers is essential to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2

Mapping		Justification	Mapping Level
CO	PO		-
CO4	1	Acquisition of Engineering Knowledge of hydraulic pumps is essential to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2

Mapping		Justification	Mapping Level
CO	PO		-
CO5	1	Engineering Knowledge: - Acquisition of Engineering Knowledge of engines is required to know the performance parameters to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2

5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	Resources Person	PO Mapping
1	Automotive Sensors	Seminar	-	Self	5

C. COURSE ASSESSMENT

1. Course Coverage

Assessment of learning outcomes for Internal and end semester evaluation. Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

Module #	Title	Teaching Hours	No. of question in Exam						CO	Levels
			CIA-1	CIA-2	CIA-3	Asg	Extra Asg	SEE		
1	Sources of Energy, Basic concepts of Thermodynamics, Steam	08	2	-	-	1	1	2	CO1	L2
2	Boilers, Turbines, Hydraulic pumps	08	2	-	-	1	1	2	CO2	L2
3	Internal Combustion Engines, Refrigeration and Air conditioning	08	-	2	-	1	1	2	CO3	L3
4	Properties, Composition and Industrial Applications of	08	-	2	-	1	1	2	CO4	L2



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	engineering materials, Joining Processes, power transmission									
5	Lathe, milling machine, CNC and robots	08	-	-	4	1	1	2	CO5	L2
-	Total	40	4	4	4	5	5	10	-	-

2. Continuous Internal Assessment (CIA)

Evaluation	Weight-age in Marks	CO	Levels
CIA Exam – 1	30	CO1, CO5	L2
CIA Exam – 2	30	CO2, CO3	L2
CIA Exam – 3	30	CO4	L2
Assignment - 1	5	CO1, CO5	L2
Assignment - 2	5	CO2, CO3	L2
Assignment - 3	5	CO4	L2
Seminar - 1	2.5	CO1, CO5	L2
Seminar - 2	2.5	CO2, CO3	L2
Seminar - 3	2.5	CO4	L2
Other Activities – define – Slip test	2.5	CO1 to CO5	L2
Final CIA Marks	40	-	-

D1. TEACHING PLAN – 1

Module – 1

Title:	Sources of Energy, Basic concepts of Thermodynamics, Steam	Appr Time:	8 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Identify different sources of energy and their conversion process.	CO1	L1
b	Course Schedule	-	-
Class No	Module Content Covered	CO	Level
1	Sources of Energy: Introduction and application of energy sources like fossil fuels, hydel,	C01	L1
2	solar, wind, nuclear fuels and bio-fuels;	C01	L2



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3	environmental issues like global warming and ozone depletion.	C01	L2
4	Basic concepts of Thermodynamics: Introduction, states, concept of work, heat, temperature;	C01	L2
5	Zeroth, 1st, 2nd and 3rd laws of thermodynamics.	C01	L2
6	Concept of internal energy, enthalpy and entropy (simple numericals).	C01	L2
7	Steam: Formation of steam and thermodynamic properties of steam	C01	L2
8	Properties of steam (simple numericals)	C01	L2
c	Application Areas	CO	Level
1	Power generation in Solar, wind, hydro, nuclear, thermal power plants	C01	L3
2	Design of Heat transfer equipment's	C01	L3
d	Review Questions	-	-
1	Briefly explain Sources of Energy	C01	L2
2	Distinguish between Non-Renewable and Renewable energy resources.	C01	L2
3	Define: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.	C01	L2
4	Explain the formation of steam at constant pressure with suitable sketches.	C01	L2
5	Define fuel, calorific value. Describe two types of the calorific values of fuel.	C01	L2
6	Explain global warming	C01	L2
7	Explain ozone depletion	C01	L2
8	Explain the terms thermodynamic states, concept of work, heat, temperature	C01	L2
9	Define Zeroth, law of thermodynamics.	C01	L2
10	Define 1st law of thermodynamics.	C01	L2
11	Define 2nd law of thermodynamics.	C01	L2
12	Define 3rd laws of thermodynamics.	C01	L2
e	Experiences	-	-
1			



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Module – 2

Title:	Boilers, Turbines and Hydraulic Pumps	Appr Time:	08 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Explain the working principle of hydraulic turbines, Boilers, pumps, IC Engines and Refrigeration.		L2
b	Course Schedule	-	-
Class No	Module Content Covered	CO2	Level
1	Boilers: Introduction to boilers, classification,	CO2	L2
2	Lancashire boiler, Babcock and Wilcox boiler.	CO2	L2
3	Introduction to boiler mountings and accessories (no sketches).	CO2	L2
4	Turbines: Hydraulic Turbines – Classification and specification, Principles and operation of Pelton wheel turbine,	CO2	L2
5	Francis turbine and Kaplan turbine (elementary treatment only).	CO2	L2
6	Hydraulic Pumps: Introduction, classification and specification of pumps,	CO2	L2
7	Reciprocating pump and centrifugal pump,	CO2	L2
8	concept of cavitation and priming.	CO2	L2
c	Application Areas	CO	Level
1	Thermal power plants, food processing industry, sugar plants, Textiles	CO2	L3
2	Hydro power plants	CO2	L3
d	Review Questions	-	-
1	Write the detailed classification of boilers	CO2	L2
2	Briefly explain the construction & working of Lancashire Boiler	CO2	L2
3	Explain the working of Babcock and Wilcox Boiler	CO2	L2
4	Write a brief note on boiler mountings and accessories	CO2	L2
5	List the detailed classification of hydraulic turbines	CO2	L2
6	Write a note on specification of hydraulic turbines	CO2	L2



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7	Explain working principle of impulse and reaction turbine.	CO2	L2
8	Explain the working principle of a Pelton Turbine.	CO2	L2
9	Explain briefly with a sketch the working of a Francis Turbine.	CO2	L2
10	Explain the working of a Kaplan Turbine.	CO2	L2
11	List the detailed classification of pumps	CO2	L2
12	Write a note on specification of pumps	CO2	L2
13	Explain the working principle of Reciprocating pump	CO2	L2
14	Explain briefly the working of centrifugal pump	CO2	L2
15	Explain the concept of cavitation and priming.	CO2	L2
e	Experiences	-	-
1			

E1. CIA EXAM – 1

a. Model Question Paper – 1

Dept:	ME	Sem / Div:	2/A, B	Course:	EME	Elective:	N
Date:		Time:	9:30–10:45 AM	C Code:	18ME25	Max Marks:	50

Note: Answer all full questions. All questions carry 25 marks.

QNo	Questions	CO	Level	Marks	Module
1	a	01	L2	8	01
	b	01	L2	9	01
	c	01	L2	8	01
	OR				
2	a	01	L2	09	01
	b	01	L2	06	01
	c	01	L2	10	01



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3	a	Briefly explain the construction & working of Lancashire Boiler	02	L2	10	5
	b	List the detailed classification of pumps	02	L2	5	5
	c	Explain briefly with a sketch the working of a Francis Turbine.	02	L2	10	5
OR						
4	a	Write a brief note on boiler mountings and accessories	02	L2	5	5
	b	Explain the working principle of Reciprocating pump	02	L2	10	5
	c	Explain briefly the working of centrifugal pump	02	L2	10	5

b. Assignment -1

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
C Code:	18ME25	Sem:	II	Marks:	10 / 10	Time: 90 – 120 minutes	
Course:	ELEMENTS OF MECHANICAL ENGINEERING						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							
SNo	USN	Assignment Description			Marks	CO	Level
1		Write a note on Energy sources			10	CO1	L2
2		Differentiate between Non-Renewable and Renewable energy resources.			10	CO1	L2
3		Explain With a neat sketch Hydro-electric power plant.			10	CO1	L2
4		Explain the following terms: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.			10	CO1	L2
5		Explain the formation of steam at constant pressure with suitable sketches.			10	CO1	L2
6		Define fuel, calorific value. Describe two types of the calorific values of fuel.			10	CO1	L2
7		Explain briefly flat plate solar collectors and solar pond with neat sketches			10	CO1	L2
8		Explain global warming			10	CO1	L2
9		Explain ozone depletion			10	CO1	L2
10		Write a note on following terms thermodynamic states, concept of work, heat, temperature			10	CO1	L2
11		State and explain Zeroth, law of thermodynamics.			10	CO1	L2
12		State and explain 1st law of thermodynamics.			10	CO1	L2
13		State and explain 2nd law of thermodynamics.			10	CO1	L2



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14	State and explain 3rd laws of thermodynamics.	10	CO1	L2
15	Write the detailed classification of boilers	10	CO2	L2
16	Briefly explain the construction & working of Lancashire Boiler with a neat sketch	10	CO2	L2
17	Sketch and explain the working of Babcock and Wilcox Boiler	10	CO2	L2
18	Explain boiler mountings and accessories	10	CO2	L2
19	Write the detailed classification of hydraulic turbines	10	CO2	L2
20	Write a note on specification of hydraulic turbines	10	CO2	L2
21	Explain working principle of impulse and reaction turbine sketches.	10	CO2	L2
22	With a neat sketch explain the working principle of a Pelton Turbine.	10	CO2	L2
23	Explain briefly with a sketch the working of a Francis Turbine.	10	CO2	L2
24	With a schematic diagram explain the working of a Kaplan Turbine.	10	CO2	L2
25	List the detailed classification of pumps	10	CO2	L2
26	Write a note on specification of pumps	10	CO2	L2
27	With a neat sketch explain the working principle of Reciprocating pump	10	CO2	L2
28	Explain briefly with a sketch the working of centrifugal pump	10	CO2	L2

D2. TEACHING PLAN – 2

Module – 3

Title:	Internal Combustion Engines, Refrigeration and Air conditioning	Appr Time:	08 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	Explain the working principle of IC Engine & Refrigeration.	CO2	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Internal Combustion Engines-Classification, I.C. Engines parts,	CO2	L2
2	2 and 4 stroke petrol and 4-stroke diesel engines.	CO2	L2
3	P-V diagrams of Otto and Diesel cycles.	CO2	L2
4	Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.	CO2	L2



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5	Refrigeration – Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity,	CO2	L2
6	COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants.	CO2	L2
7	Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator.	CO2	L2
8	Principles and applications of air conditioners, window and split air conditioners.	CO2	L2
c	Application Areas	CO	Level
1	Aerospace and Automotive industries	CO2	L3
2	Fridges for domestic and household purposes, air-conditioners for rooms	CO2	L3
d	Review Questions	-	-
1	Explain Parts of Internal Combustion Engine	CO2	L2
2	Explain the working of a four stroke petrol and diesel engine.	CO2	L2
3	Explain the working of a four stroke diesel engine.	CO2	L2
4	Explain the working of a two stroke petrol engine.	CO2	L2
5	Distinguish between two stroke and four stroke I.C. Engine.	CO2	L2
6	Write the differences between petrol engine and diesel engine.	CO2	L2
7	Define the following terms-indicated power, brake power, indicated thermal efficiency.	CO2	L2
8	Define the following terms-brake thermal efficiency, mechanical efficiency and specific fuel consumption.	CO2	L2
9	Explain the parts of refrigerator.	CO2	L2
10	Define: a. Refrigeration b. Refrigeration Effect	CO2	L2
11	Explain working of Vapour absorption refrigeration.	CO2	L2
12	Define: a. Ton of Refrigeration b. Ice making capacity	CO2	L2
13	Define: a. Co-efficient of performance b. Relative Co-efficient of performance	CO2	L2
14	Explain working of Vapour compression refrigeration.	CO2	L2
15	What are the properties of good refrigerant?	CO2	L2
16	List different types of refrigerants.	CO2	L2
e	Experiences	-	-
1			

Module – 4

Title:	Engineering materials, Joining Processes, Belt drives, Gear drives	Appr Time:	08 Hrs
a	Course Outcomes	-	Blooms



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-	The student should be able to:	-	Level
1	Recognize various joining processes and power transmission.	CO3	L2
2	Understand properties of engineering materials and there application in industries.	CO4	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers - Thermoplastics and thermosetting polymers. Ceramics - Glass, optical fiber glass, cermets.	CO4	L2
2	Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.	CO4	L2
3	Definitions. Classification and methods of soldering, brazing and welding.	CO3	L2
4	Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.	CO3	L2
5	Belt drives Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, ratio of tension in flat belt drives,	CO3	L2
6	advantages and disadvantages of V belts and timing belts, simple numerical problems.	CO3	L2
7	Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives,	CO3	L2
8	simple numerical problems on velocity ratio.	CO3	L2
c	Application Areas	CO	Level
1	Design and fabrication of various machine components in Aerospace and Automotive industries?	CO4	L2
2	Power transmission in vehicles, power transmission between machine components	CO3	L2
d	Review Questions	-	-
1	Define a composite material. How are composite materials classified? Give example for each.	CO4	L2
2	Write the applications of Composite Materials.	CO4	L2
3	What are the key applications of composite materials in Aerospace and Automotive industries?	CO4	L2
4	State the composition and application of any four ferrous	CO4	L2



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	metals.		
5	Briefly explain the types and applications of Non-ferrous alloys.	CO4	L2
6	State the composition, properties and applications of high carbon steels.	CO4	L2
7	Write a note on Ferrous Alloys.	CO4	L2
8	Write a note on Non-Ferrous Alloys	CO4	L2
9	Define the following terms -slip, creep, velocity ratio, ratio of tension in flat belt drives	CO3	L2
10	Derive the relation for length of belt in open and crossed belt drive,	CO3	L2
11	Write the advantages and disadvantages of V belts and timing belts	CO3	L2
12	Write the advantages and disadvantages of gear drives over belt drives	CO3	L2
e	Experiences	-	-
1			L2

E2. CIA EXAM – 2

a. Model Question Paper – 2

Dept: ME	Sem : Div: 2/A, B	Course: EME	Elective: N
Date:	Time: 9:30–10:45 AM	C Code: 18ME15	Max Marks: 50

Note: Answer all full questions. All questions carry 25 marks.

QNo	Questions	CO	Level	Marks	Module
1	a Explain 4-stroke Petrol engine with neat sketch along with PV diagram.	02	L2	10	03
	b A single cylinder 4-s engine runs at 1000 rpm and has a bore of 118 mm and a stroke of 145mm. the brake load is 80 N at 650mm radius and the mechanical efficiency is 75%. Calculate brake power and mean effective pressure.	02	L2	5	03
	c With the help of a sketch, explain the functioning of vapor Absorption system.	02	L2	10	03
	OR				
2	a Difference between Four stroke and Two stroke Engine.	02	L2	5	03
	b Define i) Ton of Refrigeration (TOR) ii) Coefficient of performance (COP) iii) Refrigerating effect iv) Ice making Capacity v) Refrigeration cycle.	02	L2	10	03
	c With a neat sketch explain the working principle of Room Air conditioners and its applications.	02	L2	10	03



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3	a	Derive the relation for length of belt in open and crossed belt drive,	03	L2	10	04
	b	Define the following terms -slip, creep, velocity ratio, ratio of tension in flat belt drives	03	L2	5	04
	c	Define a composite material. How are composite materials classified? Give example for each.	04	L2	10	04
OR						
4	a	Write the advantages and disadvantages of gear drives over belt drives	03	L2	10	04
	b	Briefly explain the types and applications of Non-ferrous alloys.	04	L2	05	04
	c	What are the key applications of composite materials in Aerospace and Automotive industries?	04	L2	10	04

b. Assignment – 2

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18ME25	Sem:	II	Marks:	10/ 10	Time:	90 – 120 minutes
Course:	ELEMENTS OF MECHANICAL ENGINEERING						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							
SNo	USN	Assignment Description			Marks	CO	Level
1		Explain with a neat sketch Parts of Internal Combustion Engine			10	CO2	L2
2		Explain the working of a four stroke petrol engine with the help of PV diagram.			10	CO2	L2
3		With the help of PV diagram explain the working of a four stroke diesel engine.			10	CO2	L2
4		With a neat sketch explain the working of a two stroke petrol engine.			10	CO2	L2
5		Distinguish between two stroke and four stroke I.C. Engine.			10	CO2	L2
6		Write the differences between petrol engine and diesel engine.			10	CO2	L2
7		Define the following terms-indicated power, brake power, indicated thermal efficiency.			10	CO2	L2
8		Define the following terms-brake thermal efficiency, mechanical efficiency and specific fuel consumption.			10	CO2	L2
9		Explain the parts of refrigerator.			10	CO2	L2
10		Define: a. Refrigeration b. Refrigeration Effect			10	CO2	L2



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11	Explain with neat sketch vapour absorption refrigeration.	10	CO2	L2
12	Define: a. Ton of Refrigeration b. Ice making capacity	10	CO2	L2
13	Define: a. Co-efficient of performance b. Relative Co-efficient of performance	10	CO2	L2
14	Explain with neat sketch vapour compression refrigeration.	10	CO2	L2
15	What are the properties of good refrigerant?	10	CO2	L2
16	List different types of refrigerants.	10	CO2	L2
17	Define a composite material. How are composite materials classified? Give example for each.	10	CO3	L2
18	Write the applications of Composite Materials.	10	CO3	L2
19	What are the key applications of composite materials in Aerospace and Automotive industries?	10	CO3	L2
20	State the composition and application of any four ferrous metals.	10	CO3	L2
21	Briefly explain the types and applications of Non-ferrous alloys.	10	CO3	L2
22	State the composition, properties and applications of high carbon steels.	10	CO3	L2
23	Write a note on Ferrous Alloys.	10	CO3	L2
24	Write a note on Non-Ferrous Alloys	10	CO3	L2
25	Briefly describe arc welding,	10	CO4	L2
26	Describe oxyacetylene welding with a neat sketch,	10	CO4	L2
27	Explain with sketch TIG welding,	10	CO4	L2
28	Briefly describe MIG welding.	10	CO4	L2
29	Define the following terms -slip, creep, velocity ratio, ratio of tension in flat belt drives	10	CO4	L2
30	Derive the relation for length of belt in open and crossed belt drive,	10	CO4	L2
31	Write the advantages and disadvantages of V belts and timing belts	10	CO4	L2
32	Write the advantages and disadvantages of gear drives over belt drives	10	CO4	L2



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D3. TEACHING PLAN - 3

Module – 5

Title:	Lathe, Milling machine, CNC and Robots	Appr Time:	08 Hrs
a	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	students will be able to Discuss the working of conventional machine tools, machining processes, tools and accessories.	CO5	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Lathe - Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	CO5	L2
2	Taper turning by Tail stock offset method and Compound slide swiveling method, Specification of Lathe.	CO5	L2
3	Milling Machine – Principle of milling, types of milling machines. Working of horizontal and vertical milling machines.	CO5	L2
4	Milling processes – plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	CO5	L2
5	Computer Numerical Control (CNC): Introduction, components of CNC,	CO5	L2
6	open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.	CO5	L2
7	Robots: Robot anatomy, joints and links, common robot configurations.	CO5	L2
8	Applications of Robots in material handling, processing and assembly and inspection	CO5	L2
c	Application Areas	CO	Level
1	Used in manufacturing cylindrical jobs, flat surfaces of machine components	CO5	L2
2	Automation in industries	CO5	L2



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d	Review Questions		
1	Write the Specification of Lathe.	CO5	L2
2	Explain the Principle of working of a center lathe.	CO5	L2
3	Explain the following Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	CO5	L2
4	Explain with a sketch Taper turning by Tail-stock offset method	CO5	L2
5	Explain with a sketch Taper turning by Compound slide swiveling method,	CO5	L2
6	Illustrate with sketch Principle of milling,	CO5	L2
7	Explain with sketches the following Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	CO5	L2
8	Sketch and explain the Working of horizontal milling machine.	CO5	L2
9	Sketch and explain the Working of vertical milling machine.	CO5	L2
10	Define Automation? Explain briefly different types of Automation	CO5	L2
11	Explain briefly NC and CNC Machines with the help of flow diagram.	CO5	L2
12	Define Robot? Explain with a neat sketch different configuration system of robots.	CO5	L2
13	Write the Advantages and Disadvantages of NC and CNC Machines.	CO5	L2
14	Categorize the applications of Robots in material handling, processing and assembly and inspection.	CO5	L2
e	Experiences		
1			

E3. CIA EXAM – 3

a. Model Question Paper – 3

Dept:	ME	Sem / Div:	2/A, B	Course:	EME	Elective:	N
Date:		Time:	9:30–10:45 AM	C Code:	18ME25	Max Marks:	50

Note: Answer all full questions. All questions carry 25 marks.

QNo	Questions	CO	Lev el	Mark s	Modu le
1	a Sketch and explain the Working of horizontal milling machine.	05	L2	8	5
	b Write the Advantages and Disadvantages of NC and CNC Machines.	05	L2	9	5
	c Define Automation? Explain briefly different types of Automation	05	L2	8	5



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OR						
2	a	Explain the Principle of working of a center lathe	05	L2	09	5
	b	Explain with a sketch Taper turning by Tail-stock offset method	05	L2	06	5
	c	Sketch and explain the Working of vertical milling machine.	05	L2	10	5
OR						
3	a	Explain the following operations on lathe with neat sketches. I) Turning ii) knurling iii) facing iv) thread cutting v) Taper turning by off-set.	05	L2	10	5
	b	Difference between up milling and down milling.	05	L2	5	5
	c	Elaborate the various robot configurations with simple sketches	05	L2	10	5
OR						
4	a	Explain the components of CNC with a block diagram	05	L2	5	5
	b	Explain the following operations on Milling machine with neat sketches i) Form milling ii) Angular milling iii) slot milling iv) Straddle milling v) slab milling	05	L2	10	5
	c	Define robot & write down industrial application with advantages and disadvantages.	05	L2	10	5

b. Assignment – 3

Note: A distinct assignment to be assigned to each student.

Model Assignment Questions							
Crs Code:	18ME25	Sem:	II	Marks:	10 / 10	Time:	90 – 120 minutes
Course:	ELEMENTS OF MECHANICAL ENGINEERING						
Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.							
SNo	USN	Assignment Description			Marks	CO	Level
1		Write the Specification of Lathe.			10	CO5	L2
2		Explain the Principle of working of a center lathe.			10	CO5	L2
3		Explain the following Operations on lathe – Turning, Facing, Knurling, Thread Cutting, Drilling,			10	CO5	L2
4		Explain with a sketch Taper turning by Tail-stock offset method			10	CO5	L2
5		Explain with a sketch Taper turning by Compound slide swiveling method,			10	CO5	L2
6		Illustrate with sketch Principle of milling,			10	CO5	L2
7		Explain with sketches the following Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.			10	CO5	L2
8		Sketch and explain the Working of horizontal milling machine.			10	CO5	L2



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9	Sketch and explain the Working of vertical milling machine.	10	CO5	L2
10	Define Automation? Explain briefly different types of Automation	10	CO5	L2
11	Explain briefly NC and CNC Machines with the help of flow diagram.	10	CO5	L2
12	Define Robot? Explain with a neat sketch different configuration system of robots.	10	CO5	L2
13	Write the Advantages and Disadvantages of NC and CNC Machines.	10	CO5	L2
14	Categorize the applications of Robots in material handling, processing and assembly and inspection.	10	CO5	L2
15	Write the Specification of Lathe.	10	CO5	L2
16	Explain the Principle of working of a center lathe.	10	CO5	L2
17	Explain the following Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	10	CO5	L2
18	Explain with a sketch Taper turning by Tail-stock offset method	10	CO5	L2
19	Explain with a sketch Taper turning by Compound slide swiveling method,	10	CO5	L2
20	Illustrate with sketch Principle of milling,	10	CO5	L2
21	Explain with sketches the following Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	10	CO5	L2
22	Sketch and explain the Working of horizontal milling machine.	10	CO5	L2
23	Sketch and explain the Working of vertical milling machine.	10	CO5	L2
24	Define Automation? Explain briefly different types of Automation	10	CO5	L2
25	Explain briefly NC and CNC Machines with the help of flow diagram.	10	CO5	L2
26	Define Robot? Explain with a neat sketch different configuration system of robots.	10	CO5	L2
27	Write the Advantages and Disadvantages of NC and CNC Machines.	10	CO5	L2
28	Categorize the applications of Robots in material handling, processing and assembly and inspection.	10	CO5	L2



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F. EXAM PREPARATION

1. University Model Question Paper

Course:	ELEMENTS OF MECHANICAL ENGINEERING				Month / Year	May /2018		
Crs Code:	18ME25	Sem:	II	Marks:	100	Time:	180 minutes	
-	Note	Answer all FIVE full questions. All questions carry equal marks.				Marks	CO	Level
1	a	Distinguish between Non-Renewable and Renewable energy resources.				20	CO1	L2
	b	Define: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.					CO1	L2
	c	Explain global warming					CO1	L2
	d	Write a note on following terms thermodynamic states, concept of work, heat, temperature					CO1	L2
		OR						
-	a	With a neat sketch briefly explain the Hydro-electric power plant.				20	CO1	L2
	b	Explain the formation of steam at constant pressure with suitable sketches.					CO1	L2
	c	Explain ozone depletion					CO1	L2
	d	Define laws of thermodynamics.					CO1	L2
2	a	Write a brief note on boiler mountings and accessories				20	CO2	L2
	b	Explain briefly with a sketch the working of centrifugal pump					CO2	L2
	c	With a neat sketch explain the working of Babcock and Wilcox Boiler					CO2	L2
	d	With a neat sketch explain the working principle of Reciprocating pump					CO2	L2
		OR						
-	a	Write the detailed classification of boilers				20	CO2	L2
	b	With a neat sketch explain the working principle of a Pelton Turbine.					CO2	L2
	c	Briefly explain the construction & working of Lancashire Boiler with a neat sketch					CO2	L2
	d	Explain briefly with a sketch the working of a Francis Turbine.					CO2	L2



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3	a	Explain with a neat sketch Parts of Internal Combustion Engine	20	CO3	L2
	b	Explain the parts of refrigerator.		CO3	L2
	c	With the help of PV diagram explain the working of a four stroke diesel engine.		CO3	L2
	d	Explain with neat sketch Vapour absorption refrigeration.		CO3	L2
		OR			
-	a	With the help of PV diagram explain the working of a four stroke petrol and diesel engine.	20	CO3	L2
	b	Define: a. Refrigeration b. Refrigeration Effect		CO3	L2
	c	With a neat sketch explain the working of a two stroke petrol engine.		CO3	L2
	d	Define: a. Ton of Refrigeration b. Ice making capacity		CO3	L2
4	a	Write a note on Ferrous Alloys.	20	CO4	L2
	b	Write the advantages and disadvantages of V belts and timing belts		CO4	L2
	c	State the composition, properties and applications of high carbon steels.		CO4	L2
	d	Derive the relation for length of belt in open and crossed belt drive,		CO4	L2
-	a	Define a composite material. How are composite materials classified? Give example for each.	20	CO4	L2
	b	Briefly describe arc welding,		CO4	L2
	c	Write the applications of Composite Materials.		CO4	L2
	d	Describe oxy-acetylene welding with a neat sketch,		CO4	L2
5	a	Explain the following Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	20	CO5	L2
	b	Define Automation? Explain briefly different types of Automation		CO5	L2
		OR			
	a	Explain with sketches the following Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	20	CO5	L2
	b	Explain briefly NC and CNC Machines with the help of flow diagram.		CO5	L2



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2. SEE Important Questions

Course:	ELEMENTS OF MECHANICAL ENGINEERING				Month /Year	/May /2018	
Crs Code:	18ME25	Sem:	II	Marks:	100	Time:	180 minutes
Note	Answer all FIVE full questions. All questions carry equal marks.				-	-	
Module	Q no.	Important Question			Marks	CO	Year
1	1	Explain global warming			20	CO1	2014
	2	Explain ozone depletion				CO1	2016
	3	Write a note on following terms thermodynamic states, concept of work, heat, temperature.				CO1	2004
	4	Define Zeroth law of thermodynamics.				CO2	2007
	5	Define 1st law of thermodynamics.				CO2	2007
2	1	With a neat sketch explain the working of Babcock and Wilcox Boiler			20	CO2	2005
	2	Write a brief note on boiler mountings and accessories				CO2	2015
	3	With a neat sketch explain the working principle of a Pelton Turbine.				CO2	2009
	4	With a neat sketch explain the working principle of Reciprocating pump				CO3	2016
	5	Explain the concept of cavitation and priming.				CO3	2008
3	1	Explain with a neat sketch Parts of Internal Combustion Engine			20	CO3	2012
	2	With the help of PV diagram explain the working of a four stroke petrol and diesel engine.				CO3	2010
	3	Write the differences between petrol engine and diesel engine.				CO3	2007
	4	Explain with neat sketch vapour compression refrigeration.				CO3	2004
	5	Explain with neat sketch vapour absorption refrigeration.				CO3	2011
4	1	State the composition, properties and applications of high carbon steels.			20	CO4	2004
	2	Describe oxy-acetylene welding with a neat sketch,				CO4	2004
	3	Define the following terms -slip, creep, velocity ratio, ratio of				CO4	2006



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		tension in flat belt drives			
	4	Derive the relation for length of belt in open belt drive,		CO4	2004
	5	Write the advantages and disadvantages of gear drives over belt drives		CO4	2007
5	1	Explain with a sketch Taper turning by Compound slide swiveling method,	20	CO5	2009
	2	Sketch and explain the Working of vertical milling machine.		CO5	2007
	3	Define Automation? Explain briefly different types of Automation		CO5	2016
	4	Explain briefly NC and CNC Machines with the help of flow diagram.		CO5	2015
	5	Define Robot? Explain with a neat sketch different configuration system of robots.		CO5	2017

G. Content to Course Outcomes

1. TLPA Parameters

Table 1: TLPA – Example Course

Module-#	Course Content or Syllabus	Content Teaching Hours	Blooms' Learning Levels for Content	Final Blooms' Level	Identified Action Verbs for Learning	Instruction Methods for Learning	Assessment Methods to Measure Learning
A	B	C	D	E	F	G	H
1	Introduction and application of energy sources Fossil fuels, hydel, solar, wind, nuclear fuels and bio-fuels Environmental issues like global warming and ozone depletion. Introduction, states, concept of work, heat, temperature; Zeroth, 1st, 2nd and 3rd laws of thermodynamics Concept of internal energy, enthalpy and entropy (simple numerical). Formation of steam and thermodynamic properties of steam Properties of steam (simple numericals).	8	L2	L2	Understand	Chalk and board, PPT & Video	Assignment and Class Test
2	Introduction to boilers, classification, Boilers: Introduction to boilers, classification, Introduction to boiler	8	L2	L2	Understand	Chalk and board,	Assignment and Class Test



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	<p>mountings and accessories (no sketches)</p> <p>Hydraulic Turbines – Classification specification, Principles and operation of Pelton wheel turbine, Francis turbine and Kaplan turbine classification and specification of pumps, Reciprocating pump and centrifugal pump, Concept of cavitation and priming.</p>					PPT & Video	
3	<p>Classification, I.C. Engines parts, 2 and 4 stroke petrol and 4-stroke diesel engines.</p> <p>P-V diagrams of Otto and Diesel cycles. Simple problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.</p> <p>Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration Refrigerants, Properties of refrigerants, List of commonly used refrigerants. Principle and working of vapor compression refrigeration and vapor absorption refrigeration.</p> <p>Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners</p>	8	L2	L2	Understand	Chalk and board, PPT & Video	Assignment and Class Test
4	<p>Metals – Ferrous: cast iron, tool steels and stainless steels and nonferrous: aluminum, brass, bronze. Polymers – Thermoplastics and thermo setting polymers. Ceramics -Glass, optical fiber glass, cermets. Composites – Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators. Definitions. Classification and methods of soldering, brazing and welding.</p>	8	L2	L2	Understand	Chalk and board, PPT & Video	Assignment and Class Test



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<p>Brief description of arc welding, oxyacetylene welding, TIG welding, and MIG welding.</p> <p>Open & crossed belt drives, Definitions -slip, creep, velocity ratio, derivations for length of belt in open and crossed belt drive, Ratio of tension in flat belt drives, advantages and disadvantages of V belts and timing belts, simple numerical problems.</p> <p>Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, Advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.</p>						
<p>5 Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tail stock offset method and Compound slide swiveling method, Specification of Lathe.</p> <p>Principle of milling, types of milling machines. Working of horizontal and vertical milling machines. Milling processes – plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.</p> <p>Introduction, components of CNC, open loop and closed loop systems, Advantages of CNC, CNC Machining centers and Turning centers.</p> <p>Robot anatomy, joints and links, common robot configurations.</p> <p>Applications of Robots in material handling, processing and assembly and inspection</p>	8	L2	L2	Underst and	Chalk and board, PPT & Video	Assignme nt and Class Test