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SANGALORE	Title:	Course Plan	F	Page: 1 / 25
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### Table of Contents

18ME15: ELEMENTS OF MECHANICAL ENGINEERING	<u>3</u>
A. COURSE INFORMATION	<u>3</u>
1. Course Overview	3
2. Course Content	<u>3</u>
3. Course Material	4
4. Course Prerequisites	5
5. Content for Placement, Profession, HE and GATE	<u>5</u>
B. OBE PARAMETERS	
1. Course Outcomes	
2. Course Applications	
3. Articulation Matrix	6
4. Mapping Justification	
5. Curricular Gap and Content	
C. COURSE ASSESSMENT	
1. Course Coverage	
2. Continuous Internal Assessment (CIA)	
D1. TEACHING PLAN – 1	
<u>Module – 1</u>	
<u>Module – 2</u>	
<u>E1. CIA EXAM – 1</u>	
a. Model Question Paper – 1	
b. Assignment -1	12
D2. TEACHING PLAN - 2	12
<u>Module – 3</u>	12
<u>Module – 4</u>	
<u>E2. CIA EXAM – 2</u>	15
a. Model Question Paper - 2	
<u>b. Assignment – 2</u>	<u>15</u>
D3. TEACHING PLAN - 3	
<u>Module – 5</u>	
<u>E3. CIA EXAM – 3</u>	
a. Model Question Paper - 3	17
b. Assignment – 3	18
F. EXAM PREPARATION	19
1. University Model Question Paper	
2. SEE Important Questions	20
G. Content to Course Outcomes	
1. TLPA Parameters	
2. Concepts and Outcomes:	25
Table 2: Concept to Outcome – Example	25

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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COURSE PLAN - CAY 2019-20

Page: 2 / 25 BE-2-ME-SKIT-Ph5b1-F02-V2.2

# 18ME15: ELEMENTS OF MECHANICAL ENGINEERING

### A. COURSE INFORMATION

#### 1. Course Overview

Degree:	BE	Program:	ME
Year / Semester :	2019 / I	Academic Year:	2019-20
Course Title:	ELEMENTS OF MECHANICAL ENGINEERING	Course Code:	18ME15
Credit / L-T-P:	3/2-1-0	SEE Duration:	3 Hours
Total Contact Hours:	40	SEE Marks:	60 Marks
CIA Marks:	40 Marks	Assignment	1 / Module
Course Plan Author:	APPESE S D	Sign	Dt:
Checked By:		Sign	Dt:
CO Targets	CIA Target : %	SEE Target:	%

Note: Define CIA and SEE % targets based on previous performance.

#### 2. Course Content

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

Mod	Module Content	Teaching	Module	Blooms
ule		Hours	Concepts	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	Energy sources, Thermodynam ic properties	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	Steam generation, Energy conversion	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 efficiency, mechanical efficiency and specific fuel consumption. 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 refrigerator. Principles and applications of air conditioners, window and split air conditioners	08	Combustion, refrigeration	L2
4	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. Composites – Fiber reinforced composites, Metal Matrix Composites Smart materials –			

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SAM	GALORE	Title:	Course Plan				Page: 3 / 2	25
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			ials, shape mer	nory alloys, semiconduc	ctors			
		isulators.						
			ation and metho	ods of soldering, brazing	gand			
	weldi	0	£		TIC			
				oxyacetylene welding,	, HG			
		ng, and MIG w		nitions -slip, creep, vel	ocity			
				t in open and crossed				
				ves, advantages and	DCII			
				ing belts, simple nume	erical		Engineering	
	proble	•					materials,	
	, Types	s–spur, helical	, bevel, worm a	nd rack and pinion. Vel	locity	08	power	L3
				ges over belt drives, sir			transmission	_
	nume	rical problems	s on velocity rati	О.				
				er lathe. Parts of a la				
				ng, Knurling, Thread Cut				
				stock offset method	and			
				Specification of Lathe.				
				lling machines. Working				
				chines. Milling process				
			ling, and gang n	nilling, angular milling, t milling	юпп		Machining	
				open loop and closed	loon		process,	
				NC Machining centers			Automation	
		ng centers.			3110	08		L2
		0	nts and links, co	ommon robot configurat	tions.			
				al handling, processing				
	assen	nbly and inspe	ection					

### 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.

<u> </u>	search: Recent developments on the concepts – publications in journals, confere	
Mod	Details	Available
ule		
Α	Text books (Title, Authors, Edition, Publisher, Year.)	
	Elements of Mechanical Engineering, K. R. Gopalakrishna, Subhas Publications, Bangalore,2008.	In Lib, In dept
	Elements of Mechanical Engineering, Vol1 & 2, Hajra Choudhury, Media Promoters, New Delhi, 2001.	In Lib, In dept
	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
В	Reference books (Title, Authors, Edition, Publisher, Year.)	
	Elements of Mechanical Engineering, R.K. Rajput, Firewall Media, 2005.	In Lib, In dept
	Elements of Mechanical Engineering, Dr. A. S. Ravindra, Best Publications, 7th edition, 2009.	In Lib, In dept
	CAD/CAM/CIM, Dr. P Radhakrishnan, 3 rd edition, New Age International Publishers, New Delhi.	In Lib, In dept
	Introduction to Robotics: Mechanics And Control, Craig, J. J., 2nd Ed. Addison- Wesley Publishing Company, Readong, MA, 1989.	In Lib, In dept
	Introduction to Engineering Materials", B.K. Agrawal, Tata McGraHill Publication, New Delhi.	In Lib, In dept
	Thermal Science and Engineering", Dr. D.S. Kumar, S.K. Kataria & sons Publication, New Delhi	In Lib, In dept

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С	<b>Concept Videos or Simulation</b>			

#### **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 .

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

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

#### 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.

Mod	Topic / Description	Area		Remarks			Blooms
ules							Level
1	Basic engineering physics	Higher	Gap	А	seminar	on	Understa
		Study	Thermodynamic			nd L2	

### **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	Teach.	Concept	Instr	Assessment	Blooms'
			Hours		Method	Method	Level
1	CO-1	students will be able to Identify	04	Energy	Chalk &	Assignment	
		different sources of energy and		sources	board,	CIA	L2
		their conversion process.			PPT's	SEE	Understan
							d
1	CO-2	students will be able to	04	Thermody	Chalk &	Assignment	
		understand thermodynamic		namic	board,	CIA	L3
		properties		properties	PPT's	SEE	Application
2	CO-3	students will be able to	04	Steam	Chalk &	Assignment	
		understand boiler mountings and		generation		CIA	L2
		accessories			PPT's	SEE	Understan
							d
2	CO-4	students will be able to Explain	-	Energy	Chalk &	Assignment	
		the working principle of hydraulic		conversion	board,	CIA	L2
		turbines, pumps			PPT's	SEE	Understan
							d
3	CO-5	students will be able to Explain	04	Combustio	Chalk &	Assignment	
		the working principle of IC	- 7	n	board,	CIA	L2
		engines			PPT's	SEE	Understan

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											d		
	3	CO-6	students	s will be	able to I	Explain	04	Refrigeratio	Chalk &	Assignment			
			the w	vorking	principle	e of		n	board,	CIA	L2		
			refrigera	tion.					PPT's	SEE	Understan		
											d		
	4	CO-7	students	s will	be ab	le to	04	Mechanical	Chalk &	Assignment			
			Understa	and the	propert	ies of		properties	board,	ČIA	L2		
					eering ma				PPT's	SEE	Understan		
					pplication						d		
			enginee	ring indus									
F	4	CO-8	students	-	be ab	le to	04	Power	Chalk &	Assignment			
			Recogni	ze va	arious	power		transmissio		ČIA	L3		
				sion elen				n	PPT's	SEE	Application		
t	5	CO-9			able to D	Discuss	04	Machining	Chalk &	Assignment	+ · · · · · · · · · · · · · · · · · · ·		
	5	00 0			of conve		-	process	board,	CIA	L2		
			machine	0		chining		process	PPT's	SEE	Understan		
				es, tools a		orming				022	d		
			accesso								G		
╞	5	CO-10			able to De	escribe	04	Advance	Chalk &	Assignment			
	5	00 10			manufa		-	manufactur		CIA	12		
			systems		manura	ctuning		ing	PPT's	SEE	Understan		
			Systems					systems	1113	JLL	d		
								systems			u		
			1					1			1		

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Total Note: Identify a max of 2 Concepts per Module. Write 1 CO per concept.

### 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	CO4	L2
5	Running of automobile vehicles	CO5	L2
6	Fridges for domestic and household purposes, air-conditioners for rooms	CO6	L2
7	Design and fabrication of various machine components	CO7	L2
8	Power transmission in vehicles, power transmission between machine components	CO8	L3
9	Used in manufacturing cylindrical jobs, flat surfaces of machine components	CO9	L2
10	Automation in industries	CO10	L2

Note: Write 1 or 2 applications per CO.

#### **3. Articulation Matrix**

#### (CO - PO MAPPING)

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

-	Course Outcomes	Program Outcomes												
#	COs	PO1	PO <sub>2</sub>	PO3	PO4	PO5	PO	PO7	PO	PO9	PO1	PO1	PO1	Level
							6		8		0	1	2	
18ME25.1	students will be able to Identify different sources of energy and their conversion process.		-	-	-	-	-	-	-	-	-	-	-	L2
18ME25.2	students will be able to understand thermodynamic properties		V	-	-	-	-	-	-	-	-	-	_	L2
18ME25.3	students will be able to understand boiler mountings		_	_	_	_	_	_	_	_	_	_	_	L2

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	and accessor	ies													
18ME25.4	students will the workir hydraulic turk		L .	-	-	-	-	-	-	-	-	-	-	-	L2
18ME25.5		be able to Explain principle of IC		V	-	-	-	-	-	-	-	-	-	-	L2
18ME25.6	students will the workir refrigeration.	be able to Explain ng principle of		-	-	-	-	-	-	-	-	-	-	-	L2
18ME25.7	Understand	rill be able to the properties of gineering materials applications in ndustry.	√	_	-	-	-	-	_	-	-	-	-	-	L2
18ME25.8	students w Recognize transmission	various power		V	V	-	-	-	-	-	-	-	-	-	L2
18ME25.9	the working	be able to Discuss of conventional tools, machining tools and	√	V	J	-	-	-	-	-	-	-	-	-	L2
18ME25.10	students will the advanc systems.	be able to Describe ed manufacturing		1	1	-	-	-	-	-	-	-	-	-	L2
CS501PC	Average atta	inment (1, 2, or 3)													
	PO, PSO 1.Engineering Knowledge; 2.Problem Analysis; 3.Design Development of Solutions; 4.Conduct Investigations Complex Problems; 5.Modern Tool Usage; 6.The Engin and Society; 7.Environment and Sustainability; 8.Eth 9.Individual and Teamwork; 10.Communication; 11.Pro-									ns of gineer Ethics; Project arning;					

# 4. Mapping Justification

Мар	ping	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

Map	ping	Justification	Mapping Level
СО	PO		-
CO2	1	Acquisition of Engineering Knowledge of thermodynamic properties is essential to accomplish solutions to complex engineering problems in Mechanical Engineering.	L2
CO2	2	Analyzing problems require knowledge / understanding of different temperature conditions in bodies to accomplish solutions to complex engineering problems in Electronics engineering.	L2

Мар	ping	Justification	Mapping Level
СО	PO		-

	SKIT	Teaching Process	Rev No.:	1.0			
152 A BE AVIOLOGIA	Doc Code:	SKIT.Ph5b1.F02	Date:04-	08-2019			
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CO3	1	Acquisition of Engineering Knowledge of turbi	nes and boilers is	L2			
essential to accomplish solutions to complex engineering problems							
	in Mechanical Engineering.						

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

Мар	ping	Justification	Mapping Level
СО	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
CO5	2	Engineering Knowledge is require to know the knowledge of efficiency of engine	L2

Мар	ping	Justification	Mapping Level
СО	PO		-
CO6	1	Knowledge of refrigeration is required to understand the working principals of refrigeration and air conditioning	L2

Mapping		Justification	Mapping Level
СО	PO		-
CO7	1	Knowledge of Engineering science is required to understand the material properties	L2

Мар	ping	Justification	Mapping Level
СО	PO		-
CO8	1	Knowledge of basic power transmission is required	L2
CO8	2	Solving problems based on speed of the belt drives and tensions of belt drives	L2
CO8	3	Design and development of different belt drives	L2

Мар	ping	Justification	Mapping Level
СО	PO		-
CO9	1	Knowledge of basic engineering tools is required	L2
CO9	2	Solving problems based on cutting speed	L2
CO9	3	Development of different work pieces with different cutting operations	L2

Mapping	Justification	Mapping Level
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SKIT		Teaching Process	Rev No.:	1.0
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Title:		Course Plan	Page: 8 /	/ 25
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СО	PO			-
CO10 1		Knowledge of basic engineering tools is rec	quired	L2
CO10 2 Solving problems based on cutting speed				L2
CO10				

Note: Write justification for each CO-PO mapping.

operations

#### 5. Curricular Gap and Content

SNo	Gap Topic	Actions Planned	Schedule Planned	<b>Resources Person</b>	PO Mapping		
1	Automotive Sensors	Seminar	2 <sup>nd</sup> week	Self			
Note: W/rite Cap topics from A 4 and add others also							

Note: Write Gap topics from A.4 and add others also.

### 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.

Mod	Title	Teaching		No. of	f quest	tion in	Exam		CO	Levels
ule		Hours	CIA-1	CIA-2	CIA-3	Asg	Extra	SEE		
#							Asg			
	Sources of Energy, Basic concepts of Thermodynamics, Steam	08	2	-	-	1	1	2	CO1, CO2	L2
2	Boilers, Turbines, Hydraulic pumps	08	2	-	-	1	1	2	CO3, CO4	L2
3	Internal Combustion Engines, Refrigeration and Air conditioning	08	-	2	-	1	1	2	CO5, CO6	L3
	Properties, Composition and Industrial Applications of engineering materials, Joining Processes, power transmission	08	-	2	-	1	1	2	CO7, C08	L2
5	Lathe, milling machine, CNC and robots	08	-	-	4	1	1	2	CO9, CO10	L2
-	Total	40	4	4	4	5	5	10	-	-

Note: Distinct assignment for each student. 1 Assignment per chapter per student. 1 seminar per test per student.

#### 2. Continuous Internal Assessment (CIA)

Evaluation	Weight-age in Marks	СО	Levels
CIA Exam – 1	30	CO1, CO2, CO3, CO4	L2
CIA Exam – 2	30	CO5, CO6, CO7, C08	L2
CIA Exam – 3	30	CO9, CO10	L2
Assignment - 1	10	CO1, CO2, CO3, CO4	L2
Assignment - 2	10	CO5, CO6, CO7, CO8	L2
Assignment - 3	10	CO9, CO10	L2
Seminar - 1	-	CO1, CO2, CO3, CO4	L2
Seminar - 2	-	CO5, CO6,CO7,CO8	L2
Seminar - 3	-	CO9, CO10	L2
Other Activities – define – Slip test		CO1 to Co9	L2

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SANGALORE	Title:	Course Plan			Page: 9 / 25
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Final CIA Marks		40	_		_

Note : Blooms Level in last column shall match with A.2 above.

### 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
2	understand thermodynamic properties	CO2	L2
b	Course Schedule	-	-
lass No	Module Content Covered	СО	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
3	environmental issues like global warming and ozone depletion.	C01	L2
4	Basic concepts of Thermodynamics: Introduction, states, concept of work, heat, temperature;	CO2	L2
5	Zeroth, 1st, 2nd and 3rd laws of thermodynamics.	CO2	L2
6	Concept of internal energy, enthalpy and entropy (simple numericals).	CO2	L2
7	Steam: Formation of steam and thermodynamic properties of steam	CO2	L2
8	Properties of steam (simple numericals)	CO2	L2
С	Application Areas	СО	Level
1	Power generation in Solar, wind, hydro, nuclear, thermal power plants	CO1	L3
2	Design of Heat transfer equipment's	CO2	L3
d	Review Questions	-	-
1	Briefly explain Sources of Energy	CO1	L2
2	Distinguish between Non-Renewable and Renewable energy resources.	CO1	L2
3	Define: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.	CO2	L2
4	Explain the formation of steam at constant pressure with suitable sketches.	CO2	L2
5	Define fuel, calorific value. Describe two types of the calorific values of fuel.	CO1	L2
6	Explain global warming	CO1	L2
7	Explain ozone depletion	CO1	L2
8	Explain the terms thermodynamic states, concept of work, heat, temperature	CO2	L2
9	Define Zeroth, law of thermodynamics.	CO2	L2
10	Define 1st law of thermodynamics.	CO2	L2
11	Define 2nd law of thermodynamics.	CO2	L2
12	Define 3rd laws of thermodynamics.	CO2	L2
е	Experiences	-	-
1			

	-			
Title:	Boilers, Turbines and Hydraulic Pumps		Appr Time:	08 Hrs

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BANGALORE	Title: 0	Course Plan	Page: 10	/ 25
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	Course Outcome		-	Blooms
	The student sho		-	Level
		able to understand boiler mountings and accessories		L2
	students will be pumps	able to Explain the working principle of hydraulic turbines,		L2
b	Course Schedule	<u>,</u>	_	_
	Module Content		CO	Level
		tion to boilers, classification,	CO3	Level L2
		r, Babcock and Wilcox boiler.	CO3	L2 L2
3	Introduction to boiler mountings and accessories (no sketches).		CO3	L2
		ulic Turbines – Classification and specification, Principles Pelton wheel turbine,	CO4	L2
5	Francis turbine a	nd Kaplan turbine (elementary treatment only).	CO4	L2
6	Hydraulic Pumps	s: Introduction, classification and specification of pumps,	CO4	L2
7	Reciprocating pu	Imp and centrifugal pump,	CO4	L2
8	concept of cavita	ation and priming.	CO4	L2
с	Application Area	AS	со	Level
		plants, food processing industry, sugar plants, Textiles	CO3	L3
	Hydro power pla		CO4	L3
	Review Question		-	-
		d classification of boilers	CO3	L2
		e construction & working of Lancashire Boiler	CO3	L2
		ing of Babcock and Wilcox Boiler	CO3	L2
		e on boiler mountings and accessories	CO3	L2
		classification of hydraulic turbines	CO4	L2
		specification of hydraulic turbines	CO4	L2
		principle of impulse and reaction turbine.	CO4	L2
		ing principle of a Pelton Turbine.	CO4	L2
		ith a sketch the working of a Francis Turbine.	CO4	L2
		ing of a Kaplan Turbine.	CO4	L2
		classification of pumps	CO4	L2
		specification of pumps	CO4	L2
-		ing principle of Reciprocating pump	CO4	L2
		e working of centrifugal pump	CO4	L2
15	Explain the conc	ept of cavitation and priming.	CO4	L2
	1			
е	Experiences		_	_

### E1. CIA EXAM – 1

# a. Model Question Paper – 1

C Cc	de:	18ME25 Sem: II Marks: 50 Time: 75	minute	es						
Cou	rse:	ELEMENTS OF MECHANICAL ENGINEERING								
-	-	Note: Answer any 2 full questions, each carry equal marks.	СО	Level	Marks					
1	a	Explain Vapour compression refrigerator with a neat sketch.	5	L2	6					
	b	Explain 4-stroke petrol engine with neat sketch and pv diagram.	6	L2	7					
	С	Define i)TOR ii)COP	5	L2	2					
		OR								

	TRCHINOLOG
BS+ BANGALON	100

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	2010
	2019
e: 11 / 2	5
02-V2.2	
L2	7
L2	6
L2	2
12	6
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	5
L2	4
L2	6
	L2 L2 L2 L2 L2 L2 L2 L2 L2

#### b. Assignment -1

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

b Explain taper turning by swiveling of compound rest method.

c With a neat sketch explain joint armed configuration robot.

C Code:       18ME25       Sem:       II       Marks:       10 / 10       Time:       90 - 120 minutes         Course:       ELEMENTS OF MECHANICAL ENGINEERING       Marks       CO       Lew         Note:       Each student to answer 2-3 assignments. Each assignment carries equal mark.       Marks       CO       Lew         1       1KT18IS000       Write a note on Energy sources       10       CO1       L         2       1KT18IS003       Explain With a note on Energy sources.       10       CO1       L         3       1KT18IS003       Explain With a neat sketch Hydro-electric power plant.       10       CO2       L         4       1KT18IS005       Explain the following terms:       i) Wet Steam; ii) Enthalpy of wet incomes in with suitable sketches.       0       CO2       L         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific values of fuel.       10       CO1       L         7       1KT18IS008       Explain briefty flat plate solar collectors and solar pond with neat sketches       10       CO1       L         8       1KT18IS008       Explain acone depletion       10       CO1       L         9       1KT18IS019       State and explain Zeroth,law of thermodynamics.       10       CO2					del Assignmen					
Note:         Each student to answer 2-3 assignments. Each assignment carries equal mark.         Vol         Assignment Description         Marks         CO         Le           1         1KTi8lS001         Write a note on Energy sources         10         CO1         L           2         1KTi8lS002         Differentiate between Non-Renewable and Renewable energy not compare to the securces.         10         CO1         L           3         1KTi8lS003         Explain Writh a neat sketch Hydro-electric power plant.         10         CO2         L           4         1KTi8lS004         Explain the following terms: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.         10         CO2         L           5         1KTi8lS006         Define fuel, calorific value. Describe two types of the calorific values of fuel.         10         CO1         L           7         1KTi8lS007         Explain briefly flat plate solar collectors and solar pond with not con collowing terms thermodynamic states, concept of work, heat.temperature         10         CO1         L           10         1KTi8lS003         State and explain zeroth.law of thermodynamics.         10         CO2         L           11         1KTi8lS013         State and explain zeroth.law of thermodynamics.         10         CO2         L           10         1KTi8lS013	C Cod	le: 18ME25	Sem:				Time:	90 - 120	minute	S
SNo         USN         Assignment Description         Marks         CO         Lex           1         1KT18IS001         Write a note on Energy sources         10         CO1         L           2         1KT18IS002         Differentiate between Non-Renewable and Renewable energy resources.         10         CO1         L           3         1KT18IS003         Explain With a neat sketch Hydro-etectric power plant.         10         CO1         L           4         1KT18IS005         Explain the following terms: i) Wet Steam: ii) Enthalpy of wet steam: iii) Dryness fraction.         10         CO2         L           5         1KT18IS006         Define fuel, calorific value. Describe two types of the calorific values of fuel.         10         CO1         L           7         1KT18IS007         Explain briefly flat plate solar collectors and solar pond with neat sketches         10         CO1         L           8         1KT18IS009         Explain global warming         10         CO1         L           10         1KT18IS009         Explain global warming         10         CO2         L           11         1KT18IS019         Write a note on following terms thermodynamics.         10         CO2         L           10         1KT18IS01         State and explain znd	Course: ELEMENTS OF MECHANICAL ENGINEERING									
1       1KT18IS001       Write a note on Energy sources       10       CO1       L         2       1KT18IS002       Differentiate between Non-Renewable and Renewable energy notices       10       CO1       L         3       1KT18IS003       Explain With a neat sketch Hydro-electric power plant.       10       CO1       L         4       1KT18IS004       Explain With a neat sketch Hydro-electric power plant.       10       CO2       L         5       1KT18IS005       Explain the following terms : i) Wet Steam: ii) Enthalpy of wet steam: iii) Dryness fraction.       10       CO2       L         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific ralues of fuel.       10       CO1       L         7       1KT18IS007       Explain briefly flat plate solar collectors and solar pond with neat sketches       10       CO1       L         8       1KT18IS008       Explain ozone depletion       10       CO1       L         10       1KT18IS013       State and explain Zeroth.law of thermodynamics.       10       CO2       L         11       1KT18IS013       State and explain zeroth.law of thermodynamics.       10       CO2       L         12       1KT18IS013       State and explain staw of thermodynamics.       10       CO2<	Note:	Each student	to answer 2-	3 assignr	nents. Each ass	ignment ca	rries equal ma	ark.		
2       IKT18IS002       Differentiate between Non-Renewable and Renewable energy resources.       10       C01       L         3       IKT18IS003       Explain With a neat sketch Hydro-electric power plant.       10       C02       L         4       IKT18IS004       Explain the following terms : i) Wet Steam, ii) Enthalpy of wet steam. iii) Dryness fraction.       10       C02       L         5       IKT18IS005       Explain the formation of steam at constant pressure with suitable sketches.       10       C01       L         6       IKT18IS006       Define fuel, calorific value. Describe two types of the calorific to values of fuel.       10       C01       L         7       IKT18IS008       Explain briefly flat plate solar collectors and solar pond with neat sketches       10       C01       L         8       IKT18IS008       Explain global warming       10       C01       L         9       IKT18IS008       Explain zone depletion       10       C02       L         10       IKT18IS01       State and explain zeroth.law of thermodynamics.       10       C02       L         11       IKT18IS01       State and explain znd law of thermodynamics.       10       C02       L         12       IKT18IS014       State and explain znd law of thermodynamics.       10 <td>SNo</td> <td>USN</td> <td></td> <td>A</td> <td>ssignment Des</td> <td>cription</td> <td></td> <td>Marks</td> <td>CO</td> <td>Level</td>	SNo	USN		A	ssignment Des	cription		Marks	CO	Level
resources.       10       CO1         3       1KT18IS003       Explain With a neat sketch Hydro-electric power plant.       10       CO1       L         4       1KT18IS004       Explain the following terms: i) Wet Steam; ii) Enthalpy of wet is suitable sketches.       10       CO2       L         5       1KT18IS005       Explain the formation of steam at constant pressure with suitable sketches.       10       CO2       L         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific is values of fuel.       10       CO1       L         7       1KT18IS007       Explain briefly flat plate solar collectors and solar pond with neat sketches       10       CO1       L         8       1KT18IS008       Explain ozone depletion       10       CO1       L         10       1KT18IS010       Write a note on following terms thermodynamic states, concept of work, heat,temperature       10       CO2       L         11       1KT18IS013       State and explain Zeroth,Law of thermodynamics.       10       CO2       L         12       1KT18IS013       State and explain and law of thermodynamics.       10       CO2       L         13       1KT18IS013       State and explain and law of thermodynamics.       10       CO2       L	1		Write a note	on Ener	gy sources			10	CO1	L2
4       1KT18IS004       Explain the following terms : i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.       10       CO2       L         5       1KT18IS005       Explain the formation of steam at constant pressure with values of fuel.       10       CO1       L         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific values of fuel.       10       CO1       L         7       1KT18IS007       Explain briefly flat plate solar collectors and solar pond with no neat sketches       10       CO1       L         8       1KT18IS009       Explain global warming       10       CO1       L         9       1KT18IS00       Explain global warming       10       CO1       L         10       1KT18IS00       Write a note on following terms thermodynamic states.       10       CO2       L         11       1KT18IS01       State and explain Zeroth.law of thermodynamics.       10       CO2       L         12       1KT18IS013       State and explain 3rd laws of thermodynamics.       10       CO2       L         13       1KT18IS014       State and explain 3rd laws of thermodynamics.       10       CO2       L         14       1KT18IS015       Write the detailed classification of boilers       10       CO3	2	1KT18IS002		betweer	n Non-Renewa	ole and Ren	ewable enerç	gy 10	CO1	L2
steam; iii) Dryness fraction.       steam; iii) Dryness fraction.         5       1KT18IS005       Explain the formation of steam at constant pressure with suitable sketches.       10       CO2       L         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific of the ca	3	1KT18IS003	Explain With	na neat s	ketch Hydro-e	lectric powe	er plant.	10	CO1	L2
suitable sketches.       suitable sketches.         6       1KT18IS006       Define fuel, calorific value. Describe two types of the calorific values of fuel.       10       CO1       L         7       1KT18IS007       Explain briefly flat plate solar collectors and solar pond with neat sketches       10       CO1       L         8       1KT18IS008       Explain global warming       10       CO1       L         9       1KT18IS009       Explain ozone depletion       10       CO1       L         10       1KT18IS010       Write a note on following terms thermodynamic states.       10       CO2       L         11       1KT18IS012       State and explain 2eroth, law of thermodynamics.       10       CO2       L         13       1KT18IS013       State and explain 3rd laws of thermodynamics.       10       CO2       L         14       1KT18IS014       State and explain 3rd laws of thermodynamics.       10       CO2       L         15       1KT18IS016       Briefly explain the construction & working of Lancashire Boiler       10       CO3       L         16       1KT18IS017       Sketch and explain the working of Babcock and Wilcox Boiler       10       CO3       L         17       1KT18IS018       Explain boiler mountings and accessories </td <td>4</td> <td>1KT18IS004</td> <td></td> <td></td> <td></td> <td>Steam; ii) E</td> <td>Enthalpy of w</td> <td>et 10</td> <td>CO2</td> <td>L2</td>	4	1KT18IS004				Steam; ii) E	Enthalpy of w	et 10	CO2	L2
values of fuel.values of fuel.71KT18IS007Explain briefly flat plate solar collectors and solar pond with neat sketches10CO1L81KT18IS008Explain global warming10CO1L91KT18IS009Explain ozone depletion10CO1L101KT18IS009Explain ozone depletion10CO1L101KT18IS010Write a note on following terms thermodynamic states. concept of work, heat,temperature10CO2L111KT18IS013State and explain Zeroth,law of thermodynamics.10CO2L121KT18IS013State and explain 2roth,law of thermodynamics.10CO2L131KT18IS013State and explain 2rd law of thermodynamics.10CO2L141KT18IS014State and explain 3rd laws of thermodynamics.10CO2L151KT18IS016Briefly explain the construction & working of Lancashire Boiler with a neat sketch10CO3L171KT18IS018Explain boiler mountings and accessories10CO3L191KT18CV013Write the detailed classification of hydraulic turbines10CO4L201KT18CV018Explain boiler mountings and accessories10CO4L211KT18CV019Write the detailed classification of hydraulic turbines10CO4L221KT18CV019Write a note on specification of hydraulic turbines10CO4L231	5	1KT18IS005			on of steam a	at constant	pressure wi	th 10	CO2	L2
neat sketches       10       CO1         8       1KT18IS008       Explain global warming       10       CO1       L         9       1KT18IS009       Explain ozone depletion       10       CO1       L         10       1KT18IS010       Write a note on following terms thermodynamic states, concept of work, heat,temperature       10       CO2       L         11       1KT18IS011       State and explain Zeroth,law of thermodynamics.       10       CO2       L         12       1KT18IS012       State and explain 1st law of thermodynamics.       10       CO2       L         13       1KT18IS013       State and explain 3rd laws of thermodynamics.       10       CO2       L         14       1KT18IS015       Write the detailed classification of boilers       10       CO3       L         15       1KT18IS015       Write the detailed classification of boilers       10       CO3       L         16       1KT18IS017       Sketch and explain the working of Babcock and Wilcox Boiler       10       CO3       L         19       1KT18IS018       Explain boiler mountings and accessories       10       CO4       L         20       1KT18CV013       Write the detailed classification of hydraulic turbines       10       CO4	6	1KT18IS006	values of fue	el.		,,			CO1	L2
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Image: concept of work, heat, temperatureImage: concept of work, heat, temperature111KT18IS011State and explain Zeroth, law of thermodynamics.10CO2L121KT18IS012State and explain 1st law of thermodynamics.10CO2L131KT18IS013State and explain 2nd law of thermodynamics.10CO2L141KT18IS014State and explain 3rd laws of thermodynamics.10CO2L151KT18IS015Write the detailed classification of boilers10CO3L161KT18IS016Briefly explain the construction & working of Lancashire Boiler10CO3L171KT18IS017Sketch and explain the working of Babcock and Wilcox Boiler10CO3L181KT18IS018Explain boiler mountings and accessories10CO4L201KT18CV013Write the detailed classification of hydraulic turbines10CO4L211KT18CV018Explain working principle of impulse and reaction turbine10CO4L221KT18CV019With a neat sketch explain the working principle of a Pelton10CO4L231KT18CV021Explain briefly with a sketch the working of a Francis Turbine.10CO4L241KT18CV022With a schematic diagram explain the working of a Kaplan10CO4L	9	1KT18IS009	Explain ozor	ne deplet	tion			10	CO1	L2
121KT18IS012State and explain 1st law of thermodynamics.10CO2L131KT18IS013State and explain 2nd law of thermodynamics.10CO2L141KT18IS014State and explain 3rd laws of thermodynamics.10CO2L151KT18IS015Write the detailed classification of boilers10CO3L161KT18IS016Briefly explain the construction & working of Lancashire Boiler10CO3L171KT18IS017Sketch and explain the working of Babcock and Wilcox Boiler10CO3L181KT18IS018Explain boiler mountings and accessories10CO3L201KT18CV013Write the detailed classification of hydraulic turbines10CO4L211KT18CV018Explain working principle of impulse and reaction turbine sketches.10CO4L221KT18CV019With a neat sketch explain the working principle of a Pelton Turbine.10CO4L231KT18CV021Explain briefly with a sketch the working of a Francis Turbine.10CO4L241KT18CV022With a schematic diagram explain the working of a Kaplan10CO4L	10	1KT18IS010				s thermody	ynamic state	es, 10	CO2	L2
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181KT18IS018Explain boiler mountings and accessories10CO3L191KT18CV013Write the detailed classification of hydraulic turbines10CO4L201KT18CV017Write a note on specification of hydraulic turbines10CO4L211KT18CV018Explain working principle of impulse and reaction turbine sketches.10CO4L221KT18CV019With a neat sketch explain the working principle of a Pelton Turbine.10CO4L231KT18CV021Explain briefly with a sketch the working of a Francis Turbine.10CO4L241KT18CV022With a schematic diagram explain the working of a Kaplan10CO4L	16	1KT18IS016			onstruction & w	orking of La	ncashire Boil	er 10	CO3	L2
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211KT18CV018Explain working principle of impulse and reaction turbine sketches.10CO4L221KT18CV019With a neat sketch explain the working principle of a Pelton Turbine.10CO4L231KT18CV021Explain briefly with a sketch the working of a Francis Turbine.10CO4L241KT18CV022With a schematic diagram explain the working of a Kaplan10CO4L	19	1KT18CV013	Write the de	tailed cla	assification of h	ydraulic turl	oines	10	CO4	L2
sketches.Sketches.221KT18CV019With a neat sketch explain the working principle of a Pelton Turbine.10CO4L231KT18CV021Explain briefly with a sketch the working of a Francis Turbine.10CO4L241KT18CV022With a schematic diagram explain the working of a Kaplan10CO4L	20	1KT18CV017	Write a note	on spec	ification of hydı	aulic turbin	es	10	CO4	L2
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24 1KT18CV022 With a schematic diagram explain the working of a Kaplan 10 CO4 L	22		Turbine.		•			on 10	CO4	L2
	23								CO4	L2
	24	1KT18CV022	With a sche Turbine.	ematic d	iagram explain	the workir	ng of a Kapla	an 10	CO4	L2

L2

L2

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AND
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A MATUT	SKIT Teaching Process						Rev	Rev No.: 1.0				
Sel Kal	Doc Code: SKIT.Ph5b1.F02						Date	Date:04-08-2019				
SANG	ALORE	Title	e:	Course Pl	lan						e: 12 / 2	5
Copyright	©2017. cA	AS. All rights	reserved.		COURS	E PLAN - C	AY 201	9-20	BE-2-ME-SKI	T-Ph5b1-	F02-V2.2	
25	25 1KT18CV026 List the detailed classification of pumps							10	CO4	L2		
26	1KT18	3CV028	Write	a note on	specifica	ation of p	umps	5		10	CO4	L2
27	27 1KT18CV030 With a neat sketch explain the working principle of						10	CO4	L2			
Reciprocating pump												
28	1KT18	3CV032	Expla	in briefly v	with a ske	etch the w	/orkir	ng of centr	ifugal pump	10	CO4	L2

# D2. TEACHING PLAN - 2

Title:	Internal Combustion Engines,Refrigeration and Air conditioning	Appr Time:	08 Hrs
а	Course Outcomes	-	Blooms
-	The student should be able to:	-	Level
1	students will be able to Explain the working principle of IC engines	CO5	L2
2	students will be able to Explain the working principle of refrigeration.	CO6	L2
b	Course Schedule		
Class No	Module Content Covered	CO	Level
1	Internal Combustion Engines-Classification, I.C. Engines parts,	CO5	L2
2	2 and 4 stroke petrol and 4-stroke diesel engines.	CO5	L2
3	P-V diagrams of Otto and Diesel cycles.	CO5	L2
4	Simple problems on indicated power, brake power,indicated thermal efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.	CO5	L2
5	Refrigeration - Definitions - Refrigerating effect, Ton of Refrigeration, Ice making capacity,	CO6	L2
6	COP, relative COP, Unit of Refrigeration. Refrigerants, Properties of refrigerants, List of commonly used refrigerants.	CO6	L2
7	Principle and working of vapor compression refrigeration and vapor absorption refrigeration. Domestic refrigerator.	CO6	L2
8	Principles and applications of air conditioners, window and split air conditioners.	CO6	L2
С	Application Areas	СО	Level
1	Aerospace and Automotive industries	CO5	L3
2	Fridges for domestic and household purposes, air-conditioners for rooms	CO6	L3
d	Review Questions	-	-
1	Explain Parts of Internal Combustion Engine	CO5	L2
2	Explain the working of a four stroke petrol and diesel engine.	CO5	L2
3	Explain the working of a four stroke diesel engine.	CO5	L2
4	Explain the working of a two stroke petrol engine.	CO5	L2
5	Distinguish between two stroke and four stroke I.C. Engine.	CO5	L2
6	Write the differences between petrol engine and diesel engine.	CO5	L2
7	Define the following terms-indicated power, brake power,indicated thermal efficiency.	CO5	L2
8	Define the following terms-brake thermal efficiency, mechanical efficiency and specific fuel consumption.	CO5	L2
9	Explain the parts of refrigerator.	CO6	L2
10	Define: a. Refrigeration b. Refrigeration Effect	CO6	L2
11	Explain working of vapour absorption refrigeration.	CO6	L2
12	Define: a. Ton of Refrigeration b. Ice making capacity	CO6	L2
13	Define: a. Co-efficient of performance b. Relative Co-efficient of performance	CO6	L2
14	Explain working of vapour compression refrigeration.	CO6	L2

STATUTE OF THE	SKIT	Teaching Process		Rev No.:	1.0	
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94NGALORU	Title:	Course Plan	ourse Plan			
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15	What are the p	properties of good refrigerant?		CO6	L2	
16	List different ty	pes of refrigerants.		CO6	L2	
е	Experiences	-	-			
1						

Title:	Engineering materials, Joining Processes, Belt drives, Gear drives	Appr Time:	08 Hrs
а	Course Outcomes	-	Bloom
-	The student should be able to:	-	Level
1	students will be able to Understand the properties of common engineering materials and their applications in engineering industry.	CO7	L2
2	students will be able to Recognize various power transmission elements.	CO8	L2
b	Course Schedule		
Class No	Module Content Covered	СО	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.	CO7	L2
2	Composites - Fiber reinforced composites, Metal Matrix Composites Smart materials – Piezoelectric materials, shape memory alloys, semiconductors and insulators.	CO7	L2
3	Definitions. Classification and methods of soldering, brazing and welding.	CO7	L2
4	Brief description of arc welding, oxy-acetylene welding, TIG welding, and MIG welding.	CO7	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,	CO8	L2
6	advantages and disadvantages of V belts and timing belts, simple numerical problems.	CO8	L2
7	Types–spur, helical, bevel, worm and rack and pinion. Velocity ratio, advantages and disadvantages over belt drives,	CO8	L2
8	simple numerical problems on velocity ratio.	CO8	L2
С	Application Areas	СО	Level
1	Design and fabrication of various machine components in Aerospace and Automotive industries?	C07	L2
2	Power transmission in vehicles, power transmission between machine components	CO8	L2
d	Review Questions	_	-
1	Define a composite material. How are composite materials classified? Give example for each.	CO7	L2
2	Write the applications of Composite Materials.	CO7	L2
3	What are the key applications of composite materials in Aerospace and Automotive industries?	CO7	L2
4	State the composition and application of any four ferrous metals.	CO7	L2
5	Briefly explain the types and applications of Non-ferrous alloys.	CO7	L2
6	State the composition, properties and applications of high carbon steels.	CO7	L2
7	Write a note on Ferrous Alloys.	CO7	L2
8	Write a note on Non-Ferrous Alloys	CO7	L2
9	Define the following terms -slip, creep, velocity ratio, ratio of tension in flat belt drives	CO8	L2
10	Derive the relation for length of belt in open and crossed belt drive,	CO8	L2
11	Write the advantages and disadvantages of V belts and timing belts	CO8	L2
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24NGALORE	Title:	Course Plan	Page: 14	/ 25	
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12	Write the adva	ntages and disadvantages of gear drives over belt drives	CO8	L2	
е	Experiences		-	-	
1			C07	L2	

### E2. CIA EXAM – 2

#### a. Model Question Paper - 2

C Cc	de:	18ME25	Sem:	П	Marks:	30	Time: 75	minute	S		
Cour	rse:	ELEMENT	S OF MECH	HANICAL	ENGINEERING						
-	-	Note: Ansv	wer any 2 (	questions	s, each carry ec	lual ma	rks.	Marks	СО	Level	
1	а	Explain wit	Explain with a neat sketch Parts of Internal Combustion Engine								
	b	Explain the	e parts of r	efrigerato	or.				CO6	L2	
	С	Define a d Give exam			. How are con	nposite	materials classified?		C07	L2	
	d	Briefly des	cribe arc v	velding,					CO8	L2	
2	а	With the h and diesel		diagram	explain the wo	orking of	f a four stroke petrol	20	CO5	L2	
	b	Define: a. F	Refrigeratio	on b. Refri	igeration Effect				CO6	L2	
	С	Write the a	application	s of Com	posite Materials	S.			CO7	L2	
	d	Describe c	xy-acetyle	ene weldi	ng with a neat s	sketch,			CO8	L2	
3	а	With the h engine.	nelp of PV	diagram	explain the wo	orking of	f a four stroke diesel	20	CO5	L2	
	b	Explain wit	th neat ske	tch vapo	ur absorption re	frigerat	ion.		CO6	L2	
	С	State the c	compositio	n, proper	ties and applica	tions of	high carbon steels.		CO7	L2	
	d	Derive the	relation fo	r length c	of belt in open a	nd cros	sed belt drive,		CO8	L2	
4	a	With a nea	at sketch e	xplain the	working of a tw	vo strok	e petrol engine.	20	CO5	L2	
	b				b. Ice making ca				CO6	L2	
	С	Write a no		<u> </u>	v				C07	L2	
	d	Write the a	advantage	s and disa	advantages of V	' belts a	nd timing belts		CO8	L2	

#### b. Assignment – 2

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

	Model Assignment Questions										
Crs Co	ode:	18ME25	Sem:	11	Marks:	10/10	Time:	90 - 120	)0 – 120 minutes		
Cours	ie:	ELEMENT	<b>FS OF MECH</b>	ANICAL ENC	GINEERING						
Note:	Each	student to	o answer 2-3	assignment	s. Each assignr	nent carr	ies equal ma	rk.			
SNo	ι	JSN		Assig	nment Descript	ion		Marks	CO	Level	
1	1KT:	18 S001 [	Explain with a	a neat sketcl	n Parts of Interr	ial Comb	ustion Engin	e 10	CO5	L2	
2 1KT18IS002 Explain the working of a four stroke petrol engine with the help						p 10	CO5	L2			
of PV diagram.											

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3	1KT18IS003	With the help of PV diagram explain the working of a four stroke diesel engine.	10	CO5	L2
4	1KT18IS004	With a neat sketch explain the working of a two stroke petrol engine.	10	CO5	L2
5	1KT18IS005	Distinguish between two stroke and four stroke I.C. Engine.	10	CO5	L2
6	1KT18IS006	Write the differences between petrol engine and diesel engine.	10	CO5	L2
7	1KT18IS007	Define the following terms-indicated power, brake power, indicated thermal efficiency.	10	CO5	L2
8	1KT18IS008	Define the following terms-brake thermal efficiency, mechanical efficiency and specific fuel consumption.	10	CO5	L2
9	1KT18IS009	Explain the parts of refrigerator.	10	CO6	L2
10	1KT18IS010	Define: a. Refrigeration b. Refrigeration Effect	10	CO6	L2
11	1KT18IS011	Explain with neat sketch vapour absorption refrigeration.	10	CO6	L2
12	1KT18IS012	Define: a. Ton of Refrigeration b. Ice making capacity	10	CO6	L2
13	1KT18IS013	Define: a. Co-efficient of performance	10	CO6	L2
Ū	-	b. Relative Co-efficient of performance			
14	1KT18IS014	Explain with neat sketch vapour compression refrigeration.	10	CO6	L2
15	1KT18IS015	What are the properties of good refrigerant?	10	CO6	L2
16	1KT18IS016	List different types of refrigerants.	10	CO6	 L2
17	1KT18IS017	Define a composite material. How are composite materials classified? Give example for each.	10	CO7	L2
18	1KT18IS018	Write the applications of Composite Materials.	10	CO7	L2
19	1KT18CV013	What are the key applications of composite materials in Aerospace and Automotive industries?	10	CO7	L2
20	1KT18CV017	State the composition and application of any four ferrous metals.	10	CO7	L2
21	1KT18CV018	Briefly explain the types and applications of Non-ferrous alloys.	10	CO7	L2
22	1KT18CV019	State the composition, properties and applications of high carbon steels.	10	CO7	L2
23	1KT18CV021	Write a note on Ferrous Alloys.	10	CO7	L2
24	1KT18CV022	Write a note on Non-Ferrous Alloys	10	CO7	L2
25	1KT18CV026	Briefly describe arc welding,	10	CO8	L2
26	1KT18CV028	Describe oxyacetylene welding with a neat sketch,	10	CO8	L2
27	1KT18CV030	Explain with sketch TIG welding,	10	CO8	L2
28	1KT18CV032	Briefly describe MIG welding.	10	CO8	L2
29	1KT18IS001	Define the following terms -slip, creep, velocity ratio, ratio of tension in flat belt drives	10	CO8	L2
30	1KT18IS002	Derive the relation for length of belt in open and crossed belt drive,	10	CO8	L2
31	1KT18IS003	Write the advantages and disadvantages of V belts and timing belts	10	CO8	L2
32	1KT18IS004	Write the advantages and disadvantages of gear drives over belt drives	10	CO8	L2



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COURSE PLAN - CAY 2019-20

### D3. TEACHING PLAN - 3

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.	COg	L2
2	students will be able to Describe the advanced manufacturing systems.	CO10	L2
b	Course Schedule		
-	o Module Content Covered	со	Level
1	Lathe - Principle of working of a center lathe. Parts of a lathe. Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	C09	L2
2	Taper turning by Tailstock offset method and Compound slide swiveling method, Specification of Lathe.	C09	L2
3	Milling Machine - Principle of milling, types of milling machines. Working of horizontal and vertical milling machines.	C09	L2
4	Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	C09	L2
5	Computer Numerical Control (CNC): Introduction, components of CNC,	CO10	L2
6	open loop and closed loop systems, advantages of CNC, CNC Machining centers and Turning centers.	CO10	L2
7	Robots: Robot anatomy, joints and links, common robot configurations.	CO10	L2
8	Applications of Robots in material handling, processing and assembly and inspection	CO10	L2
С	Application Areas	СО	Level
1	Used in manufacturing cylindrical jobs, flat sufaces of machine components	CO9	L2
2	Automation in industries	CO10	L2
d	Review Questions		_
1	Write the Specification of Lathe.	COg	L2
2	Explain the Principle of working of a center lathe.	CO9	L2
3	Explain the following Operations on lathe - Turning, Facing, Knurling, Thread Cutting, Drilling,	CO9	L2
4	Explain with a sketch Taper turning by Tail-stock offset method	CO9	L2
5	Explain with a sketch Taper turning by Compound slide swiveling method,	CO9	L2
6	Illustrate with sketch Principle of milling,	CO9	L2
7	Explain with sketches the following Milling processes - plane milling, end milling, slot milling, angular milling, form milling, straddle milling, and gang milling.	CO9	L2
8	Sketch and explain the Working of horizontal milling machine.	CO9	L2
9	Sketch and explain the Working of vertical milling machine.	CO9	L2
10	Define Automation? Explain briefly different types of Automation	CO10	L2
11	Explain briefly NC and CNC Machines with the help of flow diagram.	CO10	L2
12	Define Robot? Explain with a neat sketch different configuration system of robots.	CO10	L2
13	Write the Advantages and Disadvantages of NC and CNC Machines.	CO10	L2
14	Categorize the applications of Robots in material handling, processing and	CO10	L2

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84NGALORE	Title:	Course Plan	purse Plan				
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	assembly and i	nspection.					
е	Experiences	-	-				
1							

### E3. CIA EXAM – 3

#### a. Model Question Paper - 3

Crs Code	9:	18ME25	Sem:	II	Marks:	30	Time:	75	minute	minutes		
Cour	Course: ELEMENTS OF MECHANICAL ENGINEERING											
-	-	Note: Answ	ote: Answer any 2 questions, each carry equal marks. Marks									
1	а	1 1	plain the following Operations on lathe - Turning, Facing, Knurling, 20 CO9 L2 read Cutting, Drilling,									
	b	Define Auto	mation? E	kplain briefly	/ different ty	pes of Ai	utomation			CO10	L2	
2	а	milling, slo	xplain with sketches the following Milling processes - plane milling, e nilling, slot milling, angular milling, form milling, straddle milling, a jang milling.								L2	
	b	Explain brie	efly NC and	CNC Machi	ines with the	e help of	flow diagram.			CO10	L2	
3	а	Explain with	n a sketch <sup>-</sup>	Taper turning	g by Compo	ound slide	e swiveling me	thod,	20	CO9	L2	
	b	Define Robo robots.	ot? Explain	with a neat	sketch diffe	erent con	figuration syste	em of		CO10	L2	
4	а	Sketch and	explain the	e Working o	f vertical mi	ling mac	hine.		20	CO9	L2	
	b	Categorize and assemt			obots in m	aterial h	andling, proce	ssing		CO10	L2	

### b. Assignment – 3

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

	Model Assignment Questions										
Crs C	ode: 18N	E25 Sem: II Marks: 10 / 10 Time:	90 – 120 minutes								
Cours	se: ELE	MENTS OF MECHANICAL ENGINEERING									
Note:	Note: Each student to answer 2-3 assignments. Each assignment carries equal mark.										
SNo	USN	Assignment Description	Marks	CO	Level						
1	1KT18IS0	<sup>1</sup> Write the Specification of Lathe.	10	CO9	L2						
2	1KT18IS0	2 Explain the Principle of working of a center lathe.	10	CO9	L2						
3	1KT18IS0	3 Explain the following Operations on lathe - Turning, Facing	, 10	CO9	L2						
		Knurling, Thread Cutting, Drilling,									
4	1KT18IS0	4 Explain with a sketch Taper turning by Tail-stock offset method	10	CO9	L2						
5	1KT18IS0	5 Explain with a sketch Taper turning by Compound slide	e 10	CO9	L2						
		swiveling method,									
6		6 Illustrate with sketch Principle of milling,	10	CO9	L2						
7	1KT18IS0	7 Explain with sketches the following Milling processes - plane		CO9	L2						
		milling, end milling, slot milling, angular milling, form milling	Ι,								
		straddle milling, and gang milling.									
8		8 Sketch and explain the Working of horizontal milling machine.	10	CO9	L2						
9		9 Sketch and explain the Working of vertical milling machine.	10	CO9	L2						
10	1KT18IS0	<ul> <li>Define Automation? Explain briefly different types of Automation</li> </ul>	10 ו	CO10	L2						
11	1KT18IS0	1 Explain briefly NC and CNC Machines with the help of flow	/ 10	CO10	L2						
		diagram.									
12	1KT18IS0	<sup>2</sup> Define Robot? Explain with a neat sketch different configuration	10 ו	CO10	L2						
		system of robots.									
13	1KT18IS0	3 Write the Advantages and Disadvantages of NC and CN	C 10	CO10	L2						

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			Machine				
14	1KT18	S014		rize the applications of Robots in material handling,	10	CO10	L2
			process	sing and assembly and inspection.			
15	1KT181	S015	Write th	ne Specification of Lathe.	10	CO9	L2
16	1KT181	S016	Explain	the Principle of working of a center lathe.	10	CO9	L2
17	1KT18	S017	Explain	the following Operations on lathe - Turning, Facing,	10	CO9	L2
			Knurling	g, Thread Cutting, Drilling,			
18	1KT18IS018 Explain with a sketch Taper turning by Tail-stock offset method				10	CO9	L2
19	g 1KT18CV013 Explain with a sketch Taper turning by Compound slide					CO9	L2
	swiveling method,						
20	1KT18C	1KT18CV017 Illustrate with sketch Principle of milling,					L2
21	1KT18C	V018	Explain	with sketches the following Milling processes - plane	10	CO9	L2
			milling,	end milling, slot milling, angular milling, form milling,			
			straddle	e milling, and gang milling.			
22	1KT18C	:V019	Sketch	and explain the Working of horizontal milling machine.	10	CO9	L2
23	1KT18C	V021	Sketch	and explain the Working of vertical milling machine.	10	CO9	L2
24	1KT18C	V022	Define A	Automation? Explain briefly different types of Automation	10	CO10	L2
25	1KT18C	V026	Explain	briefly NC and CNC Machines with the help of flow	10	CO10	L2
			diagram	ח.			
26	1KT18C	V028	Define I	Robot? Explain with a neat sketch different configuration	10	CO10	L2
			system	of robots.			
27	1KT18C	V030	Write t	he Advantages and Disadvantages of NC and CNC	10	CO10	L2
			Machine	es			
28	1KT18CV032 Categorize the applications of Robots in material handling			10	CO10	L2	
			process	sing and assembly and inspection.			

### F. EXAM PREPARATION

#### 1. University Model Question Paper

Cour	'se:	ELEMENTS OF	MECHANICA	L ENGINEER	ING		Month /	∕ Year	May /2018	
Crs (	Code:	18ME25	Sem:	II	Marks:	100	Time:		180 mi	nutes
-	Note	Answer all FIVE	E full questior	ns. All questio	ns carry equa	al marks.		Marks	CO	Level
1	а	Distinguish bet	ween Non-Re	ources.	20	CO1	L2			
	b	Define: i) Wet S	efine: i) Wet Steam; ii) Enthalpy of wet steam; iii) Dryness fraction.							L2
	С	Explain global <sup>,</sup>	xplain global warming							
	d	Write a note o	/rite a note on following terms thermodynamic states, concept of wo							L2
		heat,temperatı	ure							
				0						
-	а	With a neat ske	etch briefly ex	plain the Hyd	dro-electric p	ower plant.		20	CO1	L2
		Explain the for sketches.	ormation of	steam at co	onstant pres	sure with	suitable		CO2	L2
	С	Explain ozone	Explain ozone depletion							L2
	d	Define laws of thermodynamics.							CO2	L2

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BAN	NGALORE		Course Plan	Page:	19 / 25			
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2	а		ote on boiler mountings and accessories	20	CO3	L2		
	b		with a sketch the working of centrifugal pump		CO4	L2		
	С		etch explain the working of Babcock and Wilcox Boiler		CO3	L2		
	d	With a neat ske	etch explain the working principle of Reciprocating pump		CO4	L2		
			OR					
-	а		iled classification of boilers	20	CO3	L2		
	b	With a neat ske	etch explain the working principle of a Pelton Turbine.		CO4	L2		
	С	Briefly explain sketch	the construction & working of Lancashire Boiler with a neat		CO3	L2		
	d	Explain briefly	with a sketch the working of a Francis Turbine.		CO4	L2		
3	а	Explain with a	neat sketch Parts of Internal Combustion Engine	20	CO5	L2		
	b		rts of refrigerator.		CO6	L2		
	С	With the help engine.	of PV diagram explain the working of a four stroke diesel		CO5	L2		
	d	Explain with ne	eat sketch vapour absorption refrigeration.		CO6	L2		
			OR					
-	а	and diesel eng		20	CO5	L2		
	b	Define: a. Refriç	geration b. Refrigeration Effect		CO6	L2		
	С	With a neat ske	etch explain the working of a two stroke petrol engine.		CO5	L2		
	d	Define: a. Ton c	of Refrigeration b. Ice making capacity		CO6	L2		
4	а	Write a note or	n Ferrous Alloys.	20	CO7	L2		
	b		ntages and disadvantages of V belts and timing belts		CO8	L2		
	С		position, properties and applications of high carbon steels.		CO7	L2		
	d		tion for length of belt in open and crossed belt drive,		CO8	L2		
-	а	Define a com Give example t	posite material. How are composite materials classified? for each.	20	C07	L2		
	b	Briefly describ	e arc welding,		CO8	L2		
	С		ications of Composite Materials.		CO7	L2		
	d	Describe oxy-a	acetylene welding with a neat sketch,		CO8	L2		
5	а	Thread Cutting		20	CO9	L2		
	b	Define Automa	ation? Explain briefly different types of Automation		CO10	L2		
			OR					
	а	milling, slot m gang milling.	etches the following Milling processes - plane milling, end hilling, angular milling, form milling, straddle milling, and		CO9	L2		
	b	Explain briefly	NC and CNC Machines with the help of flow diagram.		CO10	L2		

#### 2. SEE Important Questions

Cour	rse:	ELEMENTS OF	MECHAN	NCAL ENGI	NEERING		Month	/ Year	May ,	/2018
Crs (	Code:	18ME25	Sem:	II	Marks:	100	Time:			tes
	Note	Answer all FIV	wer all FIVE full questions. All questions carry equal marks.							
Mo dul e	Qno.	Important Que	stion					Marks	СО	Year
1	1	Explain global	warming					20	CO1	2014
	2	Explain ozone	Explain ozone depletion							2016
	-	Write a note of heat,temperati		g terms the	ermodynamic sta	ites, conce	pt of work,		CO2	2004

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	NGALON	Title:	Course Plan	Page: 2		5
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	4		law of thermodynamics.			2007
	5	Define 1st law	of thermodynamics.		CO2	2007
2	1		etch explain the working of Babcock and Wilcox Boiler	20	-	2005
	2		ote on boiler mountings and accessories		-	2015
	3		etch explain the working principle of a Pelton Turbine.			2009
	4	With a neat sk			2016	
	5	Explain the co	ncept of cavitation and priming.		CO4	2008
3	1	Explain with a	neat sketch Parts of Internal Combustion Engine	20	CO5	2012
	2		of PV diagram explain the working of a four stroke petrol			2010
	3	Write the diffe	rences between petrol engine and diesel engine.		CO5	2007
	4	Explain with n	eat sketch vapour compression refrigeration.		CO6	2004
	5	Explain with n	eat sketch vapour absorption refrigeration.		C06	2011
4	1	State the com	position, properties and applications of high carbon steels.	20	C07	2004
	2	Describe oxy-	acetylene welding with a neat sketch,		CO7	2004
	3	Define the fol flat belt drives	lowing terms -slip, creep, velocity ratio, ratio of tension in		CO8	2006
	4	Derive the rela	ation for length of belt in open belt drive,		CO8	2004
	5	Write the adva	antages and disadvantages of gear drives over belt drives		CO8	2007
5	1	Explain with method,	a sketch Taper turning by Compound slide swiveling	20	CO9	2009
	2	Sketch and ex	plain the Working of vertical milling machine.		CO9	2007
	3		ation? Explain briefly different types of Automation		CO1 0	2016
	4	Explain briefly	NC and CNC Machines with the help of flow diagram.		CO1 0	2015
	5	Define Robot? of robots.	P Explain with a neat sketch different configuration system		CO1 0	2017

### G. Content to Course Outcomes

# 1. TLPA Parameters

# Table 1: TLPA – Example Course

Mod ule-	Course Content or Syllabus (Split module content into 2 parts which have	Conte nt	Blooms' Learning	Final Blooms'	Identified Action	Instruction Methods
#	similar concepts)	Teachi ng Hours	Levels for Content	Level	Verbs for Learning	for Learning
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).		Energy sources, Thermodyna mic properties	Chalk & Talk + PPT & Video	Writing	L2 Understand
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.		Steam generation, Energy conversion	Chalk & Talk + PPT & Video	Writing	L2 Understand
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 efficiency, mechanical efficiency and specific fuel consumption. 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 refrigerations. Domestic refrigerator. Principles and applications of air conditioners, window and split air conditioners		Combustion, refrigeration	Chalk & Talk + PPT & Video	Writing	L2 Understand
4	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, cermet's. 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. Brief description of arc welding, oxyacetylene welding, TIG welding, and MIG welding. 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. Types-spur, helical, bevel, worm and rack and pinion. Velocity ratio, Advantages and		Engineering materials, power transmission	Chalk & Talk + PPT & Video	Writing	L2 Understand

	disadvantages over belt drives, simple numerical problems on velocity ratio.					
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. 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. Introduction, components of CNC, open loop and closed loop systems, Advantages of CNC, CNC Machining centers and Turning centers. Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection.	8	Machining process, Automation	Chalk & Talk + PPT & Video	Writing	L2 Understand

### 2. Concepts and Outcomes:

Mod	Course Content	Table	Refined	Course Outeene Componente	Blooms'
ule-	Course Content (Split into 2 parts for each Module)		Concept		Level
#	(Split into 2 parts for each Module)	Hour		Condition/methodology, Bench mark	Level
π		S		condition/ methodology, bench mark	
1	Introduction and application of energy	-	Sources	The sources of Energy like renewable	L2
	sources Fossil fuels, hydel, solar, wind,			and nonrenewable.	Understan
	nuclear fuels and bio-fuels	1	energy		d
	Environmental issues like global				
	warming and ozone depletion.				
1	Introduction, states, concept of work,			Laws of thermodynamic and	L2
	heat, temperature; Zeroth, 1st, 2nd and			formation of steam.	Understan
	3rd laws of thermodynamics Concept		thermo		d
	of internal energy, enthalpy and entropy		dynami		
	(simple numerical). Formation of steam and		CS		
	Formation of steam and thermodynamic properties of steam	1			
	Properties of steam (simple				
	numericals).				
2	Introduction to boilers, classification,	04	Steam	Working and construction of boiler for	L2
	Boilers: Introduction to boilers,		generati	formation of steam.	Understan
	classification, Introduction to boiler		on,		d
	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	04	Enoraly	Working of centrifugal and	L2
	pumps, Reciprocating pump and			reciprocating pumps.	Understan
	centrifugal pump, Concept of cavitation	1	on		d
	and priming.				
3	Classification, I.C. Engines parts,2 and 4	04	Combus	Classification of I.C. Engines parts,2	L2
	stroke petrol and 4-stroke diesel			and 4 stroke petrol and 4-stroke	Understan
	engines.			diesel engines working.	d
	P-V diagrams of Otto and Diesel				
	cycles. Simple problems on indicated power, brake power, indicated thermal	1			
	power. Drake power. Indicated thermal				
	efficiency, brake thermal efficiency,				
	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel				
	efficiency, brake thermal efficiency,		Refriaer	working of vapor compression	L2
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption.	04	Refriger ation	working of vapor compression refrigeration and vapor absorption	
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration	04	ation and Air	refrigeration and vapor absorption refrigeration.	
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration Refrigerants, Properties of refrigerants,	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, relative COP, Unit of Refrigeration Refrigerants, Properties of refrigerants, List of commonly used refrigerants.	04	ation and Air	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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,	04	ation and Air conditio	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio ning	refrigeration and vapor absorption refrigeration.	Understan
3	efficiency, brake thermal efficiency, mechanical efficiency and specific fuel consumption. 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	04	ation and Air conditio ning Enginee	refrigeration and vapor absorption refrigeration.	Understan d

# Table 2: Concept to Outcome – Example

	Thermoplastics and thermo setting polymers. Ceramics -Glass, optical fiber glass, cermet's. 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. Brief description of arc welding, oxyacetylene welding, TIG welding, and MIG welding.		s and Joining process es		
4	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. Types-spur, helical, bevel, worm and rack and pinion. Velocity ratio, Advantages and disadvantages over belt drives, simple numerical problems on velocity ratio.	04	transmis sion	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	d
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. 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.		ng operatio	Machining processes like Turning, Facing, Knurling, Thread Cutting, Drilling, Taper turning by Tail stock offset method	L2 Understan d
5	Introduction, components of CNC, open loop and closed loop systems, Advantages of CNC, CNC Machining centers and Turning centers. Robot anatomy, joints and links, common robot configurations. Applications of Robots in material handling, processing and assembly and inspection.	04		Components of CNC, open loop and closed loop systems. Applications of Robots in material handling, processing and assembly and inspection.	L2 Understan d