

ERODE SENGUNTHAR ENGINEERING COLLEGE



(An Autonomous Institution, Affiliated to Anna University) PERUNDURAI, ERODE - 638 057

UG Curriculum and Syllabus

(1 to 8 Semesters)

B.E – MECHANICAL ENGINEERING

Choice Based Credit System (CBCS)

REGULATION 2019



MECH - 20-21

The state

ERODE SENGUNTHAR ENGINEERING COLLEGE, ERODE DEPARTMENT OF MECHANICAL ENGINEERING REGULATIONS – 2019

CHOICE BASED CREDIT SYSTEM

I TO VIII SEMESTERS CURRICULAM

(Applicable for the students admitted from 2020-2021 onwards)

Induction Program (Mandatory)	3 weeks duration
	Physical activity
	Creative Arts
	Universal Human Values
Induction program for students to be	Literary
offered right at the start of the first year	Proficiency Modules
A REAL CONTRACTOR AND A REAL	Lectures by Eminent People
	Visits to local Areas
	 Familiarization to Dept. / Branch & Innovations

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Code No	Course	Objective & Outcomes				Т	Р	c	1	Maxim Marl		Catanan
Code No	Course	PEOs	POs	PSO s	L		Р		СА	ES	Total	Category
19BS101	Calculus and its Applications	1,111	1,2,3 4,12		3	1	0	4	40	60	100	BS
19BS102	Engineering Physics	1,111	1,2,4,56, 8,9	2	2	0	2	3	40	60	100	BS
19BS103	Engineering Chemistry	1,11	1,2,3,45, 7,12	2	3	0	0	3	40	60	100	BS
19HS101	Communicative English	IV	2,3,6,9, 10,12	3	3	0	0	3	40	60	100	HS
19ES103	Engineering Mechanics	1,11,111	1,2,6,7,1 2	2	3	1	0	4	40	60	100	ES
19TPS01	Soft Skills- I	IV	8,9,10, 12	3	1	0	1	1.5	40	60	100	EEC

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			. P	RACT	ICAL					*		
19ES106	Engineering Graphics	1,11,111	1,2,3, 5,10, 12	1	0	0	4	2	60	40	100	ES
19ES107	Workshop Practice	11,111	1,3,9, 12	2	0	0	2	1	60	40	100	ES
19BS105	Chemistry Laboratory	i,III	1,2,3 4,5, 12	2	0	0	4	2	60	40	100	BS
	TOTAL					02	13	23.5				

10.7			S	EMEST	ER II		1.5					
				THEO	RY		1.9			16	3000	
Code No	Course		bjective Jutcomes		L	т	Р	с	Max	kimum	Marks	Catagor
Code No	Course	PEOs	POs	PSO s			P		CA	ES	Total	Category
19BS201	Vector Calculus and Complex Variables	, 1,III	1,2,3, 4,12	-	3	1	0	4	40	60	100	BS
19BS206	Engineering Materials	· 1,111	1,4,5, 7	2	3	0	0	3	40	60	100	BS
	Language Elective	IV	9,10, 12	3	3	0	0	3	40	60	100	HS
19ES201	Problem Solving and Python Programming	1,111	1,2,3, 4,12	1	3	0	0	3	40	60	100	ES
19ES204	Principles of Electrical and Electronics Engineering	I ,III	1,2,3, 4	2	3	0	0	3	40	60	100	ES
19MC201	Environmental Science and Engineering	1,111	1,2,3, 4,5,6, 7,8,12		3	0	0	0	40	60	100	МС
19TPS02	Soft skills - II	IV	8,9, 10,12	3	1	0	1	1.5	40	60	100	EEC
			F	RACTI	CAL	1				1.1		
19ES213	Problem Solving and Python Programming Laboratory	i,III	1,2,3, 4,5,12	1	0	0	2	- 1	60	0 40	0 100	ES
19ES216	Electrical Engineering	1,111	1,2,3, 4,9	2	0	0	2	1	60	0 40	0 100	ES

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	Total				19	01	05	19.	5		-	
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O a da Na			bjective & Outcomes	<u>s</u>					Max	imum	Marks	
Code No	Course	PEOs	POs	PS Os	L	Т	Р	С	CA	ES	Total	Categor
19BS303	Transform Techniques and Partial Differential Equations	1,111	1,2,3,4	-	3	1	0	4	40	60	100	BS
19ME301	Engineering Metallurgy	1,11,111	1,2,6,7 ,12	2	3	0	0	3	40	60	100	PC
19ME302	Engineering Thermodynamics	1,11,111	1,2,4,6 7,12	2	3	1	0	4	40	60	100	PC
19ME303	Manufacturing Technology – I	1,11,111	1,2,5,6 7,12	2	3	0	0	3	40	60	100	PC
19ME304	Fluid Mechanics and Machinery	1,11,111	1,2,3,4 6,7,12	2	3	0	0	3	40	60	100	PC
19ME305	Strength of Materials	1,11,111	1,2,3,4 6,7, 12	2	3	0	0	3	40	60	100	PC
19TPS03	Quantitative Aptitude and Logical Reasoning - I	IV	1,2,9, 10,12	3	2	0	0	0	40	60	100	EEC
19MC301	Indian Constitution	I	6,8,10,1 1,12	3	2	0	0	0	40	60	100	MC

			F	RACT	ICAL							
19ME306	Fluid Mechanics and Machinery Laboratory	1,11,111	1,2,3, 4,6,7, 12	2	0	0	-2	1	60	40	100	PC
19ME307	Strength of Materials Laboratory	1,11,111	1,2,3, 4,6,7, 12	2	0	0	2	1	60	40	100	PC
19HS301	Communication Skills Laboratory	IV	9, 10,12	3	0	0	4	2	60	40	100	HS
	Total				22	2	08	24			-	67-

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			1.11	THEOR	Y							
Code No	C		bjective & outcomes		L	т	Р	с	Max	imum	Marks	Categor
Code No	Course	PEOs	POs	PSO s	L		P	C	СА	ES	Total	У
19BS403	Numerical Methods and Statistics	1,111	1,2,3, 4	-	3	1	0	4	40	60	100	BS
19ME401	Thermal Engineering	1,11,111	1,2,3, 5,6,7, 12	2	3	0	0	3	40	60	100	PC
19ME402	Manufacturing Technology –II	1,11,111	1,2,5, 6,7,12	2	3	0	0	3	40	60	100	PC
19ME403	Kinematics of Machines	1,11,111	1,2,3, 4,12	2	3	0	0	3	40	60	100	PC
19TPS04	Quantitative Aptitude and Logical Reasoning - II	IV	1,2,9, 10,12	3	2	0	0	0	40	60	100	EEC
19HS402	Universal Human Values 2 : Understanding Harmony	I, II, III, IV	1, 6, 7, 10,12	3	2	1	0	3	40	60	100	HS
19ES406	Internet of Things	1,11	1,10, 12	3	2	0	2	3	40	60	100	ES

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19ME404	Thermal Engineering Laboratory	1,11,111	1,2,3, 5,6,7, 12	2	0	0	2	1	60	40	100	PC
19ME405	Machine Drawing Laboratory	1,11,111	1,3,5,9 ,10,12	1	0	0	2	1	60	40	100	PC
19ME406	Manufacturing Technology Laboratory	1,11,111	1,2,5, 6,7,12	2	0	0	2	1	60	40	100	PC
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	Total				19	1	8	22			-	

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Code No	C		ojective & utcomes			-			Max	imum	Marks	0.4
Code No	Course	PEOs	POs	PS Os	L	Т	Р	C	СА	ES	Total	Category
19ME501	Design of Machine Elements	1,11,111	1,2,3, 5,12	2	3	1	0	4	40	60	100	PC
19ME502	Dynamics of Machines	1,11,111	1,2,3,4 ,6,12	2	3	1	0	4	40	60	100	PC
19ME503	Engineering Metrology and Measurements	1,11,111	1,5,12	2	3	0	0	3	40	60	100	PC
19ME504	Non-Destructive Testing	1,11,111	1,2, 3,12	2	3	0	0	3	40	60	100	PC
	Professional Elective I	-	-	-	(-)	-	en i	3	40	60	100	PE
× 1	Professional Elective II	-	-	-	-	-	÷	3	40	60	100	PE
19TPS05	Quantitative Aptitude and Logical Reasoning - III	1,11,111	1,2,9, 10,12	3	2	0	0	0	40	60	100	EEC

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19HS501	Career skills	1,11,111	2,5,6, 10,12	1,2, 3	0	0	2	0	60	40	100	HS
19ME505	Dynamics & Metrology and Measurements Laboratory	1,11,111	1,2,3, 4,6,7, 12	2	0	0	4	2	60	40	100	PC
19ME506	Computer Aided Modelling Laboratory	1,11,111	1,2,5, 6,7,12	1	0	0	2	1	60	40	100	PC
19ME507	Industrial Training / Internship		1,2,3, 4,5,6, 7,8,9, 10,11, 12	3	0	0	2	1	100	0	100	EEC
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				THEO	RY							-
Code No	Course		bjective & outcomes		L	т	Р	с	Max	imum	Marks	Catanan
Code No	Course	PEOs	POs	PS Os	L		F		CA	ES	Total	Category
19ME601	Design of Transmission Systems	1,11,111	1,2,3,5 ,12	2	3	1	0	4	40	60	100	PC
19ME602	Finite Element Analysis	1,11,111	1,2,3,4, 5,12	2	3	0	0	3	40	60	100	PC
19ME603	Heat and Mass Transfer	1,11,111	1,2,3,4 ,6,7,12	2	3	0	0	3	40	60	100	PC
	Professional Elective III	-	-	-	-	-	-	3	40	60	100	PE
- 12	Open Elective I	-	-	-		-	-	3	40	60	100	OE
19TPS06	Quantitative Aptitude and Logical Reasoning - IV	1,11,111	1,9, 10,12	3	2	0	0	0	40	60	100	EEC

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19ME604	Computer Aided Analysis Laboratory	1,11,111	1,2,5, 6,7,12	1	0	0	2	1	60	40	100	PC
19ME605	Heat Transfer Laboratory	1,11,111	1,2,3, 4,6,7, 12	2	0	0	2	1	60	40	100	PC
19ME606	Mini Project	1,11,111	1,2,3, 4,5,6, 7,8,9, 10, 11,12	1,2	0	0	2	1	100	0	100	EEC
19ME607	Comprehensive Review	1,11,111	2,5,6, 10,12	- 111 	0	0	2	0	100	0	100	EEC
	Total				8	0	8	19				

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				THEO	RY							
Code No	Course		bjective)utcome		L	т	Р	С	Maximum Marks			Category
		PEOs	Pos	PSOs	-				CA	ES	Total	
19HS701	Engineering Economics	11,111	1,2,6, 10,11 ,12	2	3	0	0	3	40	60	100	HS
19ME701	Mechatronics	1,11,111	1,2,3, 5,6,1 2	1	3	0	0	3	40	60	100	PC
19ES702	Research Methodology	1,11,111	1,2,3, 8,10, 12	2	3	1	0	4	40	60	100	ES
	Professional Elective IV	-	-	-	-	-	-	3	40	60	100	PE
_	Open Elective II	-	-	-	-		-	3	40	60	100	OE
			F	RACTIC	ALS			1		10.1		4 M
19ME702	Computer Aided Manufacturing Laboratory	1,11,111	1,5,9, 10,12	1	0	0	2	1	60	40	100	PC
19ME703	Mechatronics Laboratory	1,11,111	1,2,3, 5,12	1	0	0	2	1	60	40	100	PC
19ME704	Project Work Phase – I	1,11,111	1,2,3, 4,5,6, 7,8,9, 10,11 ,12	1,2	0	0	2	1	60	40	100	EEC
	Total				9	1	6	19	a e	-1-2		

			S	EMESTE	ER V	/111						
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Code No.	Course		Objective & Outcomes			т	Р	с	Max	timum	Marks	Categor
	of Lester of	PEOs	Pos	PSOs				CA	ES	Total		
	Professional Elective V	-	-	-	-	-	-	3	40	60	100	PE
	Professional Elective VI		-	-	-	-	-	3	40	60	100	PE
		1 (- L -	F	PRACTIC	CAL	S						
19ME801	Project Work	1,11,111	1,2,3,	1,2	-	-	12	6	60	40	100	EEC

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	Phase – II		4,5,6, 7,8,9, 10,11, 12		1	10.04		***	ale fi s	त्वत्वम् द्वित्वत्	and the second	
mgangé s	Total				-	-	12	12			-	
5		PR	OFES	SIONAL	ELI	ЕСТІ	VES					1
Code No.	Course		Ob	jective	& O	utco	mes		L	Т	Р	c
	Course	F	PEOs	Po	s	1	PSC	Ds	_			
	1	PRO	OFESS	IONAL	ELE	СТІ	/E – I			_	<	_
19MEX01	Computer Aided Desig	gri I	,11,111	1,2,3,4 1	4,5,1 2	0,	1		3	0	0	3
19MEX02	Mechanical Vibrations		,11,111	1,2,3,	4,6,1	2	2		3	0	0	3
19MEX03	Applied Hydraulics and Pneumatics	d I	,11,111	1,2,3,4 12			2	1	3	0	0	3
		PRC	FESS	ONAL I	ELE	стіу	'E – II					1997 - 19
19MEX04	Composite Materials a Mechanics	and I	,11,111	1,2,3,4 7,1		1	2		3	0	0	3
19MEX05	Welding Technology	. 1	,11,111	1,2,3,4 12		1	2		3	0	0	3
9MEX06	Mechanical Behavior of Materials	of I	,11,111	1,2,3,4 , 1			2		3	0	0	3
		PRO	FESSI	ONAL E	ELEC	TIV	E – III				No.	81
9MEX07	Automobile Engineerin	ng I	,II,III	1,5,6,7 2			2	р. 	2	0	2	3
9MEX08	Internal Combustion Engines	1	,11,111	1,5,6,7 2	7,8,1		2		3	0	0	3
9MEX09	Refrigeration and Air- Conditioning	1	,11,111	1,2,3,4 7,1			2		3	0	0	3
		PRO	FESSI	ONAL E	LEC	TIV	E – IV		1		en en de se de s	a na an
9MEX10	Fibre Reinforced Plastics		1,11,111	1,2,3, 12			2	2	3	0	0	3
9MEX11	Process Planning and Cost Estimation		,11,111	1,2,3,8 1,1		12	2		3	0	0	3
9MEX12	Statistical Quality Control and Reliability	I	,11,111	1,2,3,4	1,5,8		2		3	0	0	3
and the state	and a second second second second	PRO	FESSI	ONAL E	LEC	TIV	E – V	esen ese	and the second		Cost House	and the second
9MEX13	Non – Traditional Machining Processes		,11,111	1,2,5,7	7,12		2		3	0	0	3
9MEX14	Flexible Manufacturing Systems	· . I,	,11,111	1,2,5	,12		2		3	0	0	3

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19MEX15	Computer Integrated Manufacturing	1,11,111	1,2,3,5	2	3	0	0	3
		PROFESS	IONAL ELECTIV	Έ–VI	-	2010	n.	
19MEX16	Industrial Safety Engineering	1,11,111	1,2,3,5,6,7, 8,9,10,12	2	3	0	0	3
19MEX17	Industrial Robotics	1,11,111	1,2,3,5,6,1 2	2	3	0	0	3
19MEX18	Total Quality Management	1,11,111	1,2,3,5,6,7, 8,9,10,11	2	3	0	0	3
19MEX19	Gas Dynamics and Jet Propulsion	1,11,111	1,2,3,4,6,7, 12	2	3	0	0	3

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Code No	0	Ob	jective & Outo	omes		-	P	_
Code No	Course	PEOs	Pos	PSOs		Ţ	Р	С
19MEY01	Additive Manufacturing	1,11,111	1,2,3,5,12	2	3	0	0	3
19MEY02	Non-Destructive Evaluation For Engineers	1,11,111	1,2,3,12	2	3	0	0	3
19MEY03	Industrial Safety Engineering	11, 111	1,2,3,5, 6, 7, 8,9	2	3	0	0	3
19MEY04	Maintenance Engineering	11, 111	1,2,3,5, 6, 7	2	3	0	0	3
19MEY05	Renewable Energy Sources	1,11,111	1,2,7,8	2	3	0	0	3
19MEY06	Power Plant Engineering	1,11,111	1,2,3,6,7, 11	2	3	0	0	3
19MEY07	Rapid Prototyping	1, 11, 111	1,2,5,12	2	3	0	0	3
19MEY08	Nanomaterials Science	1,11,111	1,2,3,5, 6, 7, 8,9	2	3	0	0	3
19MEY09	Advanced Mechatronics for Engineers	1,11,111	1,2,3,5,6, 12	1	3	0	0	3
19MEY10	Automobile Engineering	1,11,111	1,5,6,7,8, 12	2	3	0	0	3
19MEY11	Robotics	1,11,111	1,2,3,5,6, 12	2	3	0	0	3
19MEY12	Advanced Finite Element Analysis	1,11,111	1,2,3,4,5, 12	2	3	0	0	3
19MEY13	Entrepreneurship Development	1,11,111	1,2,3,4,5,	2	3	0	0	3

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19MEY14	Production Technology of Agricultural Machinery	1,11,111	1,10,12	3	3	0	0	3
		LANG	UAGE ELECT	IVES		1		
Code No	Course	0	bjective & Ou	tcomes		т	Р	
Code No	Course	PEOs	POs	PSOs			Р	С
8		LANG	UAGE ELECT	TIVE				
19HX201	English for Engineers	1,11,111	2,3,6,9, 10,12	3	3	0	0	3
19HX202	Hindi	1,11,111	2,3,6,9, 10,12	3	3	0	0	3
19HX203	Japanese	1,11,111	2,3,6,9, 10,12	3	3	0	0	3
19HX204	French	1,11,111	2,3,6,9, 10,12	3	3	0	0	3
	ADD	ITIONAL	ONE CREDIT	COURSES		6.0		
Code No.	Course	0	ojective & Out	tcomes	L	т	Р	с
Code No.	Course	PEOs	POs	PSOs	-		F	C
19MEZ01	Geometric Dimensioning and Tolerancing	1,11,111	1,3	1	-		-	1
19MEZ02	Lean Manufacturing	1,11,111	1,3,5	2	-	- /	-	1
19MEZ03	Piping Engineering	-1,11,111	1,3	2			-	1
19MEZ04	Automotive Exhaust System	1,11,111	1,7	2	- 1			1
19MEZ05	Plastics – Design, Processing, Tooling, Assembly and Testing	1,11,111	1,3,5	2			R	1
19MEZ06	5s-Introduction and Implementation		6	a Thirthe an 3 Anna a An	d al a nnad		ritaa <u>a</u> tee	· · · · ·
1.		VALUE	ADDED COU	RSES				
Code No.	Course	Ob	jective & Out	comes	L	Т	Р	c
		PEOs	POs	PSOs				
19MEV01	Modeling using CATIA v5	1,11,111	1,3,5,12	1			-	-
19MEV02	Modeling in solid works	1,11,111	1,3,5,12	1	i			
19MEV03	Core java programming	1,11,111	1,12	1		- trating - the	a (1970) (1970) (1970) -	
	Tool design and	1,11,111	1,3,5,12	2		-	8 L 7	
19MEV04	manufacturing					Second 1	and the second	

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	operations							
19MEV06	Welding inspection & testing	1,11,111	1,5,12	2	-	-	-	-
19MEV07	Pump inspection and testing	1,11,111	1,5,12	2	-	4 - 4	-	-
19MEV08	Sheet metal tools - design and manufacturing process	1,11,111	1,3,5,12	2	-	-		-
		MANDA	TORY COUR	SES				
CadaNa			Objective & Outcomes				Р	•
Code No.	Course	PEOs	POs	PSOs	L	T	Р	С
19MC201	Environmental Science and Engineering	1,111	1,6,7,8	-	3	0	0	0
19MC301	Indian Constitution	1,11,111	6	3	1	0	0	0

Summary of Credit Distribution

CNA	Catanan			Cred	ts Pei	Seme	ester			Total	
S.No.	Category	- 1 -	11	. 111	IV	V	VI	VII	VIII	Credit	
1	BS	12	7	4	4	0	0	0	0	27	
2	ES	7	8	0	3	0	0	4	0	22	
3	HS	3	3	2	3	0	0	3	0	14	
4	PC	0	0	18	12	17	12	5	0	64	
5	PE	0	0	0	0	6	3	3	6	18	
6	OE	0	0	0	0	0	3	3	0	6	
7	EEC	1.5	1.5	0	0	1	1	1	6	12	
8	MC	0	0	0	0	0	0	0	0	0	
	Total	23.5	19.5	24	22	24	19	19	12	163	

BS - Basic Sciences

ES - Engineering Sciences

HS - Humanities and Social Sciences

PC - Professional Core

PE - Professional Elective

OE - Open Elective

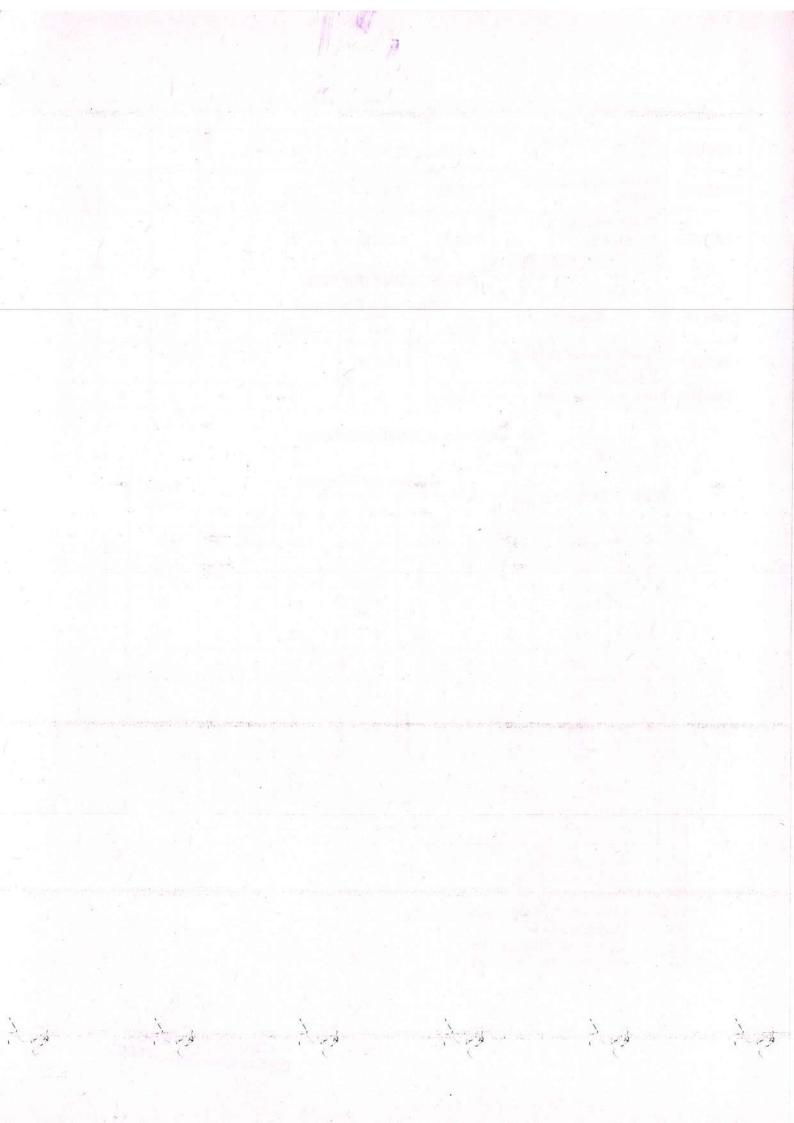
EEC - Employability Enhancement Course

MC - Mandatory Course

CA - Continuous Assessment

ES - End Semester Examination

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	MECHANICAL ENGINE			R 2019	Semester I		
Course Code	Course Name		lou We	rs / ek	Credit	Total	Maximum
		L	Т	Ρ	С	Hours	Marks
19BS101	CALCULUS AND ITS APPLICATIONS	3	1	0	4	60	100
 To interp To interp phenome To find e arising in To summ variables To develo Course Outcom Apply diffidifferentia Identify and the higher Analyze the second second	ive(s): The purpose of learning this course is ret the introductory concepts of Limit and con- ret the introductory concepts of calculus, this ena involving continuous change of variables igen values and eigen vectors which is one of the field of engineering. arize and apply the methodologies involved i op enough confidence to identify surface and re(s): At the end of this course, learners will the erentiation to solve maxima and minima prob- tion to differentiate functions and model the real time problems using first or order ordinary differential equations. The characteristics of a linear system with Eigen ize the functions for evaluation the solve and get	tinuity will ena f the po n solvir area th be able lems us der line	ng p nere to: se t	both t	ools to ha ems relate colving usi the limit d rential equ	ndle practio ed to functio ng integrati efinition an ations. Rec	cal problems ons of several ion d rules of
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U2000 Chairman - BoS Dept. of Maths - ESEC

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TEXT BOOK(S):

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2. Gaur, R.K. & Gupta, S.L. —Engineering PhysicsII. Dhanpat Rai Publishers, 2012

3 Pandey, B.K. & Chaturvedi, S. — Engineering PhysicsII. Cengage Learning India, 2012

REFERENCE(S):

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1.	Halliday, I	D., Resnick,	R. & Walker, J.	 —Principles of PhysicsII. 	Wiley, 2015	-1
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2. Serway, R.A. & Jewett, J.W. — Physics for Scientists and Engineers II. Cengage Learning, 2010

3. Tipler, P.A. & Mosca, G. - Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007

List of Experiments - 30 hours

PHYSICS (ANY FIVE)

- 1. Determination of rigidity modulus Torsion pendulum
- 2. Determination of Young"s modulus by non-uniform bending method
- 3. Determination of Young"s modulus by uniform bending method
- 4. Determination of wavelength and particle size using Laser
- 5. Determination of acceptance angle and numerical aperture in an optical fiber
- 6. Determination of thermal conductivity of a bad conductor Lee's Disc method
- 7. Determination of velocity of sound and compressibility of liquid Ultrasonic interferometer
- 8. Determination of wavelength of mercury spectrum spectrometer grating
- 9. Determination of band gap of a semiconductor

10. Determination of thickness of a thin wire - Air wedge method

N. Am

Course Code Course Name Hurs / U Credit Total Hours Maximum Marks 19BS103 ENGINEERING CHEMISTRY 3 0 0 3 45 100 Course Objective(s): The purpose of learning this course is: To understand the basic concepts of water characterization and treatment methods. To to diversite the principles and generation of energy in Batteries, Solar cells & Nuclear reactors. To gain knowledge on nano materials. To know the trudamental concepts of Electrochemistry and concesion. To understand the principles and generation of energy in Batteries, Solar cells & Nuclear reactors. To understand the principles and generation of energy in Batteries, Solar cells & Nuclear reactors. Course Outcome(s): At the end of this course, learners will be able to: Mark knowledge on various preparation methods of nano particles and know the applications. Impart knowledge on various preparation methods of nano particles and know the applications. Integrat Knowledge on different types of fuels (solid liquid, gas, primary, secondary and synthetic) and about combustion. 9 Hardness of water - types - Estimation of hardness of water by EDTA - problems - Domestic water treatment - Demineralization process - Desalination - Reverse Osmosis. 9 Electorochemical cell - redox reaction, electrode coloresi	Department	MECHANICAL ENGIN	IEER	ING	the second		R 2019	Semester	BS
Course Order L T P C 19BS103 ENGINEERING CHEMISTRY 3 0 0 3 45 100 Course Objective(s): The purpose of learning this course is: To understand the basic concepts of Alectrochemistry and corrosion. To understand the principles and generation of energy in Batteries, Solar cells & Nuclear reactors. To gain knowledge on nano materials. To know the types of fuels and the manufacture of solid, liquid and gaseous fuels. Course Outcome(s): At the end of this course, learners will be able to:	Course Code	Course Name				Credit			
Course Objective(s): The purpose of learning this course is: To understand the basic concepts of water characterization and treatment methods. To know the fundamental concepts of Electrochemistry and corrosion. To understand the principles and generation of energy in Batteries, Solar cells & Nuclear reactors. To gain knowledge on nano materials. To know the types of fuels and the manufacture of solid, liquid and gaseous fuels. Course Outcome(s): At the end of this course, learners will be able to: Make the students conversant with water treatment techniques Know the reaction involved in corrosion and corrosion protection methods Impart knowledge on renewable energy sources like nuclear, solar and wind and to impart knowledge on energy storage devices Impart knowledge on various preparation methods of nano particles and know the applications. Unit I WATER CHEMISTRY 9 Hardness of water - types – Estimation of hardness of water by EDTA – problems – Domestic water treatment – Demineralization process – Desalitation - Reverse Osmosis. 9 Unit I ELECTROCHEMISTRY AND CORROSION 9 Electrochemical cell - redox reaction, electrode potential- Nernst equation (derivation and impressed current cathodic method. 9 Unit II ELECTROCHEMISTRY AND CORROSION 9 Electrochemical cell - redox reaction, electrode potential- Nernst equation (derivation and i	Course Code		L	Т	Р	С	nours	Marks	
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hydrogen electrode-Calomel Electrode- Corrosion-factors- types- chemical, electrochemical corrosion (galvanic, differential aeration)-factors influencing corrosion-corrosion control - sacrificial anode and impressed current cathodic method. 9 Unit III ENERGY SOURCES 9 Introduction- nuclear energy- nuclear fission- nuclear fusion- nuclear chain reactions- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery- lead storage battery- lithium ion battery- fuel cell H2-O2 fuel cell. 9 Unit IV NANOCHEMISTRY 9 Basics -Nanoparticles: nano cluster, nano rod, nanotube(CNT) and nanowire. Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablatior; Properties and applications. 9 Fuel: Introduction- classification of fuels- solid fuels-coal- proximate and ultimate analysis- manufacture of metallurgical coke (Otto Hoffmann method) – Liquid fuels: petroleum- synthetic petrol Fischer-Trophs and Bergius processes- knocking- octane number – cetane number – Gaseous fuels: liquefied petroleum gases(LPG)-water gas- bio diesel. Combustion- flue gas analysis (ORSAT Method). TEXT BOOK(S): 1 1. Jain P.C. and Monica Jain, "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company (P) Ltd., New Delhi, 2010. 2. Kannan P., Ravikrishnan A., "Engineering Chemistry", Sri Krishna Hi-tech Publishing Company Pvt. Ltd. Chennai, 2009 3. S. Vairam, P. Kalyani and Suba Rames	A REAL PROPERTY AND A REAL		lorno	+ 0.01	intior	(dorivati	on and pro	blome) Stone	
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1.	Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
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M. Bos Chairman - Bos Dept. of Chemistry - ESEC

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Chairman - BoS Dept. of Mech Engg. - ESEC

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Course Coue		L	Т	Р	С	Hours	Marks	
19HS101	COMMUNICATIVE ENGLISH	3	0	0	3	45	100	
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	unicate fluently in real time context.		-	3.24				9
	h - Word formation - Sentence types (decla	rative	impe	rativ	e exclam	atory & inte	errogative) -	3
Tense forms -	Subject - Verb agreement - Verbs - Adverbs						nogative)	
Jnit II LIST	ENING				1.2.2			9
Telephone etic lyrics - Clear in	pecific information: Short conversations / mo juette - Note-taking - Listening for gist / inte idividual sounds - Word stress DING	erviews	s - Lis	stenir	ng to song	s and com	pleting the	9
	e sentences - Prediction - Skimming for gist	Scar	nina	for s	necific inf	ormation -	Inderstandin	
	nce structure - Close reading	- Ocar	ming	101 3	pecilic III	ornation -	Understandin	'y
Jnit IV WRI								
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Chairman - BoS Dept. of Mech.Eng

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Department	MECHANICAL ENG	SINEER	ING			R 2019	Semester I	E
Course Code	Course Name		lour Nee		Credit	Total	Maximu	ım
		L	т	Р	С	Hours	Mark	s
19ES106	ENGINEERING GRAPHICS	0	0	4	2	60	100	
To learn conve To draw orthog To draw the pro To draw the se To draw the iso Course Outcome(s Recognize the Draw the ortho Draw the project Draw the section	 a): The purpose of learning this course is ntions and use of drawing tools in making raphic projection of points and lines. b) piction of planes and simple solids. ction of solids and obtain the development of solids and obtain the development projection of the given solids. c): At the end of this course, learners will conventions and apply construct basic expraphic projection of points and lines. c): At the end of this course, learners will conventions and apply construct basic expraphic projection of points and lines. c): on of planes and simple solids. b) of solid drawings and development of solid drawings and development of petric projection of the given objects. 	ng engin ent of su I be able engineer	urfac e to: ring	curve	f given so es.	olids.		
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and the second se	e, layout and folding of drawing sheets -		-				nions and	
Jnit I PLANE	CURVES							1
and hyperbola by E	constructions, Curves used in engineer ccentricity method – Construction of Cy tangents and normal to the above curve	cloid -						ab
and hyperbola by E sircle – Drawing of Jnit II PROJE Drthographic projec straight lines (only F	ccentricity method - Construction of Cy	ycloid – s. angle pi	roje	struc	tion of In	volutes of tr	riangle, squar Projection of	ab e a
and hyperbola by E bircle – Drawing of Jnit II PROJE Drthographic project straight lines (only F rue inclinations by Jnit III PROJE	CCCENTRICITY METHOD – CONSTRUCTION OF Cy tangents and normal to the above curve CTION OF POINTS AND LINES tion – principles - Principal planes-First First angle projection) inclined to both the rotating line method. CTION OF PLANES & SOLIDS	ycloid – s. angle pr e princip	con roje pal p	struc ction- plane	tion of In -projectic s - Deter	volutes of tr on of points. mination of t	riangle, squar Projection of true lengths a	rab e a 0 nd
and hyperbola by E circle – Drawing of f Jnit II PROJE Drthographic project straight lines (only F rue inclinations by Jnit III PROJE Projection of planes solids like prisms, p Digect method. Jnit IV PROJE Sectioning of above planes and perpend	CTION OF PLANES & SOLIDS (polygonal and circular surfaces) incline yramids, cylinder and cone when the ax	vcloid – s. angle pr e princip ed to bo is is incl DEVEL the cuttir e of sec	con roje bal p th th linec OPI	struc ction- blane ne pri d to c MEN	-projectic s - Detern incipal pl one of the T OF SU is incline	volutes of tr on of points. mination of t anes. Project principal pl RFACES d to the one	Projection of true lengths a ction of simple anes by Rota	abo e a l 0 nd l 1 e ting l 1 pal
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REFERENCE(S):

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2.	Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
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Dept. of Mech Engg. - ESEC

De	epartment	MECHANICAL ENGINEERING					R 2019		9 Semester	I ES
Co	urse Code	Course Name Hours / Credit		edit Total		Maxin	num			
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4.	N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5.	Luzzader, Warren.J. and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.

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Department	MECHANICAL ENG	GINEER	RING			R 2019	Semester I	ES	
Course Code	Course Name		lour Wee	-	Credit	Credit Total Maxi			
	WORKSHOP PRACTICES	L	т	Р	С	Hours	Mark	S	
19ES107	WORKSHOP PRACTICES	0	0	2	1	30	100		

Course Objective(s): The purpose of learning this course is:

 To provide hands-on training in fabrication of components using carpentry, sheet metal and welding equipment / tools.

- To acquire the skill for making fitting joints and household pipe line connections using suitable tools.
- To develop the skill for preparing the green sand mould.
- To provide hands-on training in assembling and dismantling of petrol engines, gear boxes and pumps.

To develop the skill for making wood/sheet metal models using suitable tools.

Course Outcome(s): At the end of this course, learners will be able to:

- Fabricate simple components using carpentry, sheet metal and welding equipment/tools.
- Make fitting joints and household pipe line connections using suitable tools.
- Prepare green sand mould.
- Assemble and dismantle petrol engines, gear boxes and pumps.
- Make simple models using wood and sheet metal.

Exp. No.	Name of Experiments
1	Forming of simple object in sheet metal using suitable tools (Example: Dust bin / Tray)
2	Fabrication of a simple component using thin and thick plates. (Example: Book rack)
3	Making a simple component using carpentry power tools. (Example: Pen stand/Tool box/ Letter box)
4	Prepare a "V", Half-round or Square joint from the given mild steel flat plate.
5	Construct a household pipe line connections using pipes, Tee-joint, Four-way joint, elbow, union, bend, gateway and taps (or) Construct a pipe connection for domestic application (centrifugal pump) using pipes bend, gate valve, flanges and foot valve.
6	Prepare a green sand mould using solid pattern/split pattern.
7	Dismantling and assembly of Centrifugal Gear Pump / Gear box.
8	Dismantling and assembly of two-stroke and four-stroke petrol engine.
9	a) Preparation of butt joints, lap joints and T- joints by Electric Arc Welding. b) Gas Welding practice.
10	Mini-Project (Fabrication of small components)

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10 Mini-Project (Fabrication of small components).

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS S.No. NAME OF THE EQUIPMENT QUANTITY Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible 1. 15 sets pipes, couplings, unions, elbows, plugs and other fittings 2. Carpentry Vice (fitted to work bench) 15 Nos. 3. Standard woodworking tools 15 Sets. 4. Models of industrial trusses, door joints, furniture joints 5 each Power Tools: (a) Rotary Hammer 2 Nos. (b) Demolition Hammer 2 Nos. 2 Nos. (c) Circular Saw 5. (d) Planer 2 Nos. (e) Hand Drilling Machine 2 Nos. 2 Nos. (f) Jigsaw Arc welding transformer with cables and holders 6 5 Nos. 7. Welding booth with exhaust facility 2 Nos. 8. Welding accessories like welding shield, chipping hammer, wire brush, etc. 5 Sets.

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9.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfits	2 Nos.
10.	Centre lathe	2 Nos.
11.	Hearth furnace, anvil and smithy tools	2 Sets.
12.	Moulding table, foundry tools	2 Sets.
13.	Power Tool: Angle Grinder	2 Nos.
14.	Study-purpose items: Centrifugal pump, Air-conditioner	One each.

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Departmen	t MECHANICAL ENGINE	EERING				R 2019	Semester I	BS
Course Code	e Course Name	Hou	rs / V	Veek	Credit	Total	Maxim	
	e Course Maine	L	т	Ρ	С	Hours	Mark	S
19BS105	CHEMISTRY LABORATORY	0	0	4	2	60	10	0
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	e the student to acquire practical skills abo	out stren	gth of				c titrations.	
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Unde Gain List of Exp No. 1 2 3 4 5 6 7 8 9 10	e the student to acquire practical skills abo erstand the how to estimate hydrochloric a the knowledge about conductance of ions eriments Name of Experiments (A Determination of Total, Temporary & Perm Determination of chloride content of water Determination of chloride content of water Determination of Alkalinity in Water Samp Determination of strength of given hydroch Determination of strength of acids in a mix Conductometric titration of Weak acid vs V Estimation of iron content of the given solu	out streng acid in wa s. Any Ten) manent h r sample nt in wate ole hloric aci kture of a Weak ba ution usi strong ba vinyl alco	gth of ater s aardne by Al er sar id usi acids se. ng po ase. ohol u	ample ess of rgento mple u using tentio	e using pl f water by o metric n using Win I meter. conducti ometer.	H meter. EDTA me nethod. klers Metl vity meter	ethod. hod	

LIST OF EQUIPMENTS:

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S.No	Description of Equipment	Quantity required	Quantity available
01	Potentiometer	10 Nos.	10 Nos.
02	pH meter	10 Nos.	10 Nos.
03	Conductivity meter	10 Nos.	10 Nos.
04	Spectrophotometer	2 Nos.	2 Nos.
05	Oswald viscometer	30 Nos.	30 Nos.

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Chairman - Bos Dept. of Chemistry - ESEC Dept. of Mech Engg. - ESEC

Departme	nt	MECHANICAL ENGI	NEERIN	G			R 2019	Semester I EE
Course Code		Course Name		Hour Wee	k	Credit	Total Hours	Maximum Marks
		LIFE SKILLS - I	L	T	P	С	nours	indi K3
19TP10	6 C 10	LIFE SKILLS - I	1	0	2	0	30	100
Course C	bjective (s): The purpose of learning this	s course	is				A State of the
• To	develop Ir	nter Personal Skills and be an e	effective	tear	n pla	ver.		
• To	develop p	rofessional skills with idealistic	practic	al an	d ma	, oral value	c	
		Communication Skills.	, pruotio	aran	u m		0.	
- 10	develop C	Sommunication Skills.						
Course C	utcomes:	At the end of this course, learn	ners will	be a	ble t	o :		
		ent knowledge of grammar						
	erstand ba							
• Spe	ak and wri	te appropriately applying these	rules.					
		effectively						
 Enh 	ance their	interpersonal relationship build	ing skills	s witl	n ren	lewed sel	f confiden	се
		SYL	LABUS		-			
ffective E	nglish – V	Vritten and Spoken English						
		Grammar - Parts of Speech – 7						
		struction - Vocabulary – Idioms	& Phras	es -	Syn	onyms –	Antonyms	k, se da da da
	1 TT-1	Conversations – Writing						
Art of Con	municati	ractice and improve these skills on & the Hidden Data Involve	s. ed					
		unication - Effective Communic		ctive	e liste	enina –Pa	raphrasin	g - Feedback
Non	Verbal Co	mmunication - Body Language	of self a	and o	other	s		5
• Imp	rtance of	feelings in communication - de	aling wit	h fee	elings	s in comm	nunication	
/orld of To				1.00				
 Sell dev 	eloning en	nent - importance of developing notional intelligence	asserti	ve sł	(IIIS-	developir	ng self cor	fidence –
		Team work - Team vs. Group	- Attribut	es o	fas	uccessful	team B	arriers involved
		Groups – Dealing with People-						
<u> </u>	and ser	Т	OTAL H	IOUI	RS: 4	45 (15 Th	eory +30	Hours Practical)
REF	ERENCE	BOOKS						
1. The	Seven Hal	bits of Highly Effective People -	Stephe	n R.	Cov	ey.		
2. All th	e books ir	n the "Chicken Soup for the Sou	ul" series	5.	*			
3. Man	s search	for meaning – Viktor Frankl						
4. The	greatest m	niracle in the world – OgMandin	0					
5. Goa	- Eliyahu(Goldratt.						
6. Wor	ing with E	motional Intelligence - David G	oleman					

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- 7. Excel in English Sundra Samuel, Samuel Publications
- 8. Developing Communication Skills by Krishna Mohan and Meera Banerji; MacMillan India Ltd., Delhi
- 9. Essentials of Effective Communication, Ludlow and Panthon; Prentice Hall of India.
- 10. Effective Presentation Skills (A Fifty-Minute Series Book) by Steve Mandel
- 11. "Strategic interviewing" byRichaurd Camp, Mary E. Vielhaber and Jack L. Simonetti Published by Wiley India Pvt. Ltd

12. "Effective Group Discussion: Theory and Practice" by Gloria J. Galanes, Katherine Adams , John K. Brilhart

an - BoS Dept. of Mech Engg. EST!

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in the

	MECHANICAL ENGINEE	RING	3			R 2019	Semester I	B
Course Code	Course Name	1.1.22	lour Wee		Credit	Total Hours	Maximum Ma	
	And the second second	L	. т	Р	С	uro		
19BS201	VECTOR CALCULUS AND COMPLEX VARIABLES	3	1	0	4	60	100	*
Course Object	ive(s): The purpose of learning this course is		46.5		_			
 To summer principle 	narize and apply the methodologies involved s of Calculus viz: Vector, Vector Differentiatio	in sol	ving	probl	ems relation	ed to funda	amental	
 To imple electrost 	ment the Complex Analysis, an elegant meth atics.	od in	the	study	of heat flo	ow, fluid dy		
appropria	op enough confidence to identify and model r ate solutions, using the skills learned in their i ng a complex function and solving through co	ntera	ctive	and	supporting	real world genvironm	and offer ent.	
Course Outcor	me(s): At the end of this course, learners will	be ab	ole to	:	UII			
 Character 	erize the calculus of vectors.							
 Apply the Recognized 	e theoretical aspects of vector integral calculu	s in t	heir	core a	areas.			
	ze the differentiation properties of complex fur he complex functions and their mapping in ce			nlev r	lanes			
Use the o	concepts of integration to complex functions in	n cert	ain r	egion	IS.			
	ERENTIATION OF VECTORS			0				12
Vector point func Scalar potential	ction- Directional derivative - Gradient -Diverg	ence	-Cur	1 - So	lenoidal -	Irrotationa	al vector field:	5 -
	GRATION OF VECTORS					1		12
Vork done - Line	Integral - Surface integral- Green's theorem	in a p	lane	- Stoł	ke's Theor	em- Gaus	s divergence	
Unit III ANA	tions involving cubes and parallelepiped.	_	_			1.18.18.1	- 100	10
				unati	Drana	ution of A.		12
	IS- Necessary and Sufficient conditions of	Anoly	tio E					n -
Jetermination of Flow.	ns- Necessary and Sufficient conditions of f Analytic Function using Milne Thompson	Analy metho	tic F od -/	Applic	ations to	the proble	ems of Poter	ntial
Determination of Flow. Unit IV MAP	PING OF COMPLEX FUNCTIONS	metho	od -/	Applic	ations to	the proble	ems of Poter	12
Determination of Flow. Unit IV MAP Physical interpret	Analytic Function using Milne Thompson in PING OF COMPLEX FUNCTIONS tation of mapping- Application of transformation	metho	od -/	Applic	rotations to	the proble	ems of Poter	12
Determination of Flow. Unit IV MAP Physical interpret of multi valued fu	Analytic Function using Milne Thompson of PING OF COMPLEX FUNCTIONS tation of mapping- Application of transformation nctions - Linear fractional Transformation (Bil	metho	od -/	Applic	rotations to	the proble	ems of Poter	12 ion
Determination of Flow. Unit IV MAP Physical interpret of multi valued fu Unit V COM Cauchy's Fundar Singularities - Ca	PING OF COMPLEX FUNCTIONS tation of mapping- Application of transformation nctions - Linear fractional Transformation (Bil IPLEX INTEGRATION nental Theorem - Cauchy's Integral Formula - uchy's Residue Theorem.	on: tra	ansla tran	Applic ition, sform	rotation, r ation).	the proble	ems of Poter	12
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Chairman - BoS Dept. of Maths - ESEC

N. fm Chairman - BoS Dept. of Mech Engg. - ESEC

Department	MECHANICAL ENG	INEE	RING			R 2019	Semester II	BS
Course Code	Course Name		Hour		Credit	Total	Maximu	
19BS206	ENGINEERING MATERIALS	l	L T 3 0	P	C 3	Hours 45	Marks 100 ering application nent system of on to isomorph	S
20000	E(s): The purpose of learning this course is		3 0	0	3	45	100	
	the essential principles of materials science		mech	anica	al and rela	ated engine	ering application	ons.
 Get knowle Acquire kn Get knowle Gain knowle 	e(s): At the end of this course, learners will edge on the various phase diagrams and the owledge on Fe-Fe3C phase diagram, variate edge on mechanical properties of materials ledge on magnetic and dielectric properties d the basics of ceramics, composites and r	neir a bus m and s of m	pplica nicrost their nateria	tions ructu meas als	ires and a	lloys		
Unit I PHAS	SE DIAGRAMS			-140	1.2.01			9
	Hume Rothery's rules – the phase rule - si	ngle c	compo	nent	system -	one-compo	nent system o	
	iagrams - isomorphous systems - the tie					5. 25		
	phase diagram - peritectic phase diagram			arian	t reaction	s – free ene	rgy compositio	on
	systems - microstructural change during c ROUS ALLOYS	ooiing	g.					9
	equilibrium diagram - phases, invariant	react	tions ·	- mic	rostructu	re of slowly	cooled stee	
	hypo and hypereutectoid steels - effect of							
	s - phase transformations - T-T-T-diagram				1000200	rlitic, baintic	and martensi	tic
	tempering of martensite - steels - stainles	ss ste	els –	cast i	irons.			
	NETIC MATERIALS							-
					-			9
	terials-magnetic field and induction-magnetic							-
Magnetic Materia	Is- Dia, Para and Ferro magnetic materials	-Ferr	romag	netis	m – doma	ain theory –	types of energ	ду
Magnetic Materia – hysteresis – ha		-Ferr	romag	netis	m – doma	ain theory –	types of energ	ду
Magnetic Materia - hysteresis – ha Unit IV DIEL	ls- Dia, Para and Ferro magnetic materials rd and soft magnetic materials – Antiferror	s-Ferr	romag etic Ma	netis ateria	m – doma als- ferrite	ain theory – s - Applicati	types of energ on of Ferrites.	ау 9
Magnetic Materia - hysteresis – ha Jnit IV DIEL Dielectric materia Electric Suscepti	Is- Dia, Para and Ferro magnetic materials rd and soft magnetic materials – Antiferror ECTRIC MATERIALS als- Dipole moment- Polarization vector- bility-Polarization-Types of polarization -	-Ferr nagne Diele - Lar	romag etic Ma ctric (ngevin	netis ateria Const -Deb	m – doma als- ferrite tant- Pola bye equat	ain theory – s - Applicati ar and Non- tion – frequ	types of energ on of Ferrites. polar Molecul uency effects	gy 9 les- on
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Magnetic Materia – hysteresis – ha Unit IV DIEL Dielectric materia Electric Suscepti polarization – Int Dielectric Loss– I Capacitors- Insula Unit V NEW Ceramics – types Fiber reinforced applications - sha	Is- Dia, Para and Ferro magnetic materials rd and soft magnetic materials – Antiferror ECTRIC MATERIALS als- Dipole moment- Polarization vector- bility-Polarization-Types of polarization - rernal Field- Clausius mosotty equation-or nsulating materials – Ferroelectric materia ating materials in transformers. MATERIALS and applications – composites: classification plastics – metallic glasses: types , glas pe memory alloys: NiTi alloy, applications	Diele Diele Lar lielec s - A ation, s foi – nar	romag etic Ma ctric (ngevin tric br pplica role o rming nomat	netis ateria Const -Deb eakd tions of ma abili erials	m – doma als- ferrite tant- Pola oye equa lown- Typ of Dielec atrix and ty of alk s: prepara	ain theory – s - Applicati ar and Non- tion – frequ bes of diele tric Material reinforceme bys, melt s tion (bottom	types of energ on of Ferrites. polar Molecul aency effects ctric breakdor s- Dielectrics nt, processing pinning proce	9 les- on wn- in 9 g of
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Chairman - BoS Dept. of Physics - ESEC

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course cour	ooulse nume	L	Т	Р	С	Hours	Ma	arks		
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 Apply p Recogn Design Write c Read a 	ome(s): At the end of this course, learners roblems solving techniques to real world nize and construct common programming , code, and test Python programs using Li ode using dictionaries and functions nd write data from/to files in Python Progr MPUTATIONAL THINKING	prob idior ist, T	lems ns: v Tuple	ariabl	les, loop,	, branch, a	and input/o	utput.		
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ERODE SENGUNTHAR ENGINEERING COLLEGE



(An Autonomous Institution, Affiliated to Anna University) PERUNDURAI, ERODE - 638 057

UG Curriculum and Syllabus

(1 to 8 Semesters)

B.E – BIOMEDICAL ENGINEERING

Choice Based Credit System (CBCS)

REGULATION 2019



1.	Brian Heinold, "Introduction to Programming Using Python", Mount St. Mary s University, 2013.
2.	Michael Dawson, "Python Programming for the Absolute Beginner", 3rd Edition, 2010.
3.	Allen Downey, Green Tea Press Needham, "Think Python, How to Think Like a Computer Scientist", Massachusetts.
4.	Cunningham, sams teach yourself python in 24 hours, Second edition Pearson, 2014

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Chairman - BoS Dept. of Mech Engg. - ESEC

Department	MECHANICAL ENG	INEEF	RING	1		R 2019	Semester II	ES	
Course Code	Course Name	1100-005	ours /eek		Credit	Total	Maximur	ks	
19ES204	PRINCIPLES OF ELECTRICAL AND ELECTRONICS ENGINEERING	L 3	Т 0	P 0	C 3	Hours 45	Marks		
 Understand t Illustrate the Illustrate the Illustrate the Course Outcome 	(s): The purpose of learning this course is the basic concepts of electric circuits and n construction and operation of various dc electric circuits and operation of various ac eleconstruction and operation of various ac eleconstruction and operation of varioussemices: At the end of this course, learners will be	nagnet lectrica conduc le able	al ma al ma ctor c to:	achin achin devic	es. es. ces.				
 Apply the la Examine th Apply the d Analyze the 	undamental laws to electric circuits and co aws of magnetism for the operation of DC in the construction and working principle of diff lrive for different application and speed cor the performance characteristics and application	machir erent a ntrol m	ne. AC n ietho	nach Ids o	nines f DC and	AC motors			
Definition of Voltage applications - Se	TRIC CIRCUITS ge, Current, Electromotive force, Resistand ries and Parallel circuits - Voltage divi RMS value, average value, peak factor and	sion a	and	Curr	ent divis	ion technic	ques - Genera	tion	
	ACHINES	-		-				9	
ntroduction of ma	gnetic circuits - Law of Electromagnetic ind	ductior	ı –Pr	rincip	oles and	operation of	DC Machines		
=MF equation – 1	orque equation - Applications.					1			
	orque equation - Applications. ACHINES		-	-				9	
Unit III AC M. Single Phase and		and Th	hree	pha	se induct	ion motor -			
Unit III AC M. Single Phase and Constructions - W	ACHINES Three Phase Transformer - Single Phase	and Th	hree	pha	se induct	ion motor -			
Unit IIIAC M.Single Phase and Constructions - WUnit IVELECBasic Elements –	ACHINES Three Phase Transformer - Single Phase orking Principle - Applications.	ng the	choi	ice c	f electric	al drives - h	Alternator –	9	
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Departme	t MECHANICAL ENGI	NEER	ING		*	R 2019	Semester	MC
Course Cod	Course Name		lour Wee		Credit	Total	Maxim	
Course Cou		L	Т	Р	С	Hours	Mark	S
19MC201	ENVIRONMENTAL SCIENCE AND ENGINEERING	3	0	0	0	45	100	
 To st To fir To kr 	ective(s): The purpose of learning this course is dy the nature and facts about environment. ding and implementing scientific, technological ow the types of natural resources and the indivi- the knowledge to various social issues by under	and e idual r	ole i	n cor	nserving th	ne resource	es.	ns.
 To str 	dy the integrated themes and biodiversity, natu gement.	iral re	sour	ces, j	pollution c	ontrol and	waste	
Course Out Exter prese Outlir gener Expla resou Find t harve Devel their H Unit I E invironment: f an ecosyst tructure and se-productive iodiversity -	come(s): At the end of this course, learners will d their knowledge in maintaining ecological bala vation of biodiversity. e the role of human being in maintaining a clea ations. n the constituents of environment, precious res	ance a n env ource ganiza amily r IT and ss -C rs - F tem – sthetic	and r ironn is in t ation olanr d hur once -ood - Bioo c val	nake nent i the e and ning p man l opts c chai divers	and usefu nvironmer explain th programm health. of an ecos ins- food sity - valu - Hotspo	I environm nt and cons e various r e and HIV/ system - St webs - ty e of biodiv ts of biodiv	ent for the fut servation of n ain water AIDS and ext ructure and f pes of ecosy ersity - consu	end 10 unctic vstem umptiveats
	NVIRONMENTAL POLLUTION							8
ollution: Cau olid waste m prevention o	es - effects and control measures of Air pollution anagement - Causes - effects -control measure f pollution - Disaster managements - Floods - c	es of u	ırbar	and	l industria	l pollution a l wastes -	and Noise po Role of an inc	llution
	ITRODUCTION TO NATURAL RESOURCES							9
rater - confli nineral resou griculture - fe nergy. Land	es - Use-over exploitation-deforestation - Wate ts over water - Mineral resources - use-expl ces - Food resources - world food problems tilizer- pesticide problems - Energy resources - esources - land degradation - soil erosion - Rol	oitatio chai Rene	nges wab	cau cau	nmental e sed by ag nergy sour	ffects of e griculture · ces - solar	extracting and Effects of r energy - wind	d usin noder d urces.
	OCIAL ISSUES AND THE ENVIRONMENT							9
vater conser	ation - rain water harvesting - global warmin Air (Prevention and control of pollution) Act - V inciple of Green chemistry – Application of Gre	Nater en ch	(pre	venti	ozone la on and co	iyer deplet introl of po	tion - Enviror Ilution) Act - (nment Green
hemistry – P	UMAN POPULATION AND THE ENVIRONME	NT						
hemistry – P Unit V F	wth - variation among nations - Population expl			-		and the second	and the second second	9

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TEXT BOOK(S):

- 1. Anubha Kaushik and C.P. Kaushik, Environmental Science and Engineering, New Age International Publishers, New Delhi (2015)
- 2. Dr. A. Ravikrishan, Envrionmental Science and Engineering., Sri Krishna Hitech Publishing co. Pvt. Ltd., Chennai, 12th Edition (2016)
- 3. Benny Joseph, "Environmental Science and Engineering □, Tata McGraw-Hill, New Delhi, 2006.

REFERENCE(S):

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- 1. Masters, Gilbert M, —Introduction to Environmental Engineering and Science ||, Second Edition, Pearson Education, New Delhi (2012).
- 2. Santosh Kumar Garg, Rajeshwari garg, smf Ranjni Garg Ecological and Environmental Studies || Khanna Publishers, Nai Sarak, Delhi (2014).
- 3. Dharmendra S. Sengar, "Environmental law , Prentice hall of India PVT LTD, New Delhi, 2007.
- 4. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015.
- 5. Rajagopalan, R, "Environmental Studies-From Crisis to Cure , Oxford University Press, 2005.

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N. M. Chairman - Bes Dept. of Mech Engg, = ESEC

Department	MECHANICAL ENGIN	NEEF	RING	i,		R 2019 Semester			
Course Code	Course Name	Hours / Week Credit		Total	Maximum				
1050010	PROBLEM SOLVING AND PYTHON	L	Т	Ρ	С	Hours	Marks		
19ES213	PROGRAMMING LABORATORY		0	0 2	1	30	100		
 To represent To read and 	tions for structuring Python programs. It compound data using Python lists, tuples d write data from/to files in Python. (s): At the end of this course, learners will b				ies.				
 Write, test, 	and debug simple Python programs. Python programs with conditionals and loop		e to: nd ca						

Exp No.	Name of Experiments
1	Find the Greatest among three numbers without using third variable
2	Sum of the Digits of a Number
3	Generation of Prime Numbers
4	Implement a sequential search
5	Create a calculator program
6	Explore string functions
7	Implement Selection Sort
8	Implement Stack
9	Read and write into a file
10	Demonstrate usage of basic regular expression
11	Demonstrate use of advanced regular expressions for data validation.
12	Demonstrate use of List
13	Demonstrate use of Dictionaries
14	Create Comma Separate Files (CSV), Load CSV files into internal Data Structure

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Department	MECHANICAL ENGINEERING				R 2019	Semester II E	
Course Code	Course Name		Hours / Week			Total	Maximum
	ELECTRICAL ENGINEERING	L	T	Р	С	Hours	Marks
19ES216	LABORATORY	0	0	2	1	30	100

Course Objective(s): The purpose of learning this course is:

• To give a practical knowledge on the working of electrical machines including dc machines, induction motors and synchronous motors

· To impart the basics about design and implementation of small electronic circuits

Course Outcome(s): At the end of this course, learners will be able to:

- · Test and validate shunt and compound generator.
- Test and Validate series and shunt motor.
- Test and Validate transformer and induction motors.
- · Acquire knowledge on working of zener diodes.
- Acquire knowledge on working of rectifiers.

Exp No. Name of Experiments

S. ord

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	indine of Experimenta
1	OCC on a dc shunt generator, determination of critical resistance, critical speed, additional resistance required in the field circuit.
2	Load characteristics of DC Shunt generator
3	Load characteristics of DC Compound generator.
4	Load test on DC Series motor
5	Load test on DC Shunt motor.
6	Load test on single phase transformer.
7	Starting of three phase squirrel cage induction motor by star delta switch, load test on three phase squirrel cage induction motor.
8	Load test on three phase slip ring induction motor.
9	Load test on single phase induction motor.
10	OC and SC test on single phase transformer.
11	V-I Characteristics of diodes and Zener diodes.
12	Input and output characteristics of CE configuration of BJT S. Determination of β, input resistance and output resistance.
12	Half wave and full wave restifiers with and without filters. Observe the waveforms on CDO

13 Half wave and full wave rectifiers with and without filters- Observe the waveforms on CRO.

LIST OF EQUIPMENTS FOR THE BATCH OF 30 STUDENTS					
S.No	NAME OF THE EQUIPMENT	Qty			
1.	D. C. Motor Generator Set	2			
2.	D.C. Shunt Motor	2			
3.	Single Phase Transformer	2			
4.	Single Phase Induction Motor	2			
5.	Ammeter A.C and D.C	20			
6.	Voltmeters A.C and D.C	20			
7.	Watt meters LPF and UPF	4			
8.	Resistors & Breadboards				
9.	Cathode Ray Oscilloscopes	4			
10.	Dual Regulated power supplies	6			

No. 19

Nº /m Chairman - BoS Dept. of Mech Engg. - ESEC

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1. A.C. Sign	al Generators	4
2. Transistor	rs (BJT, JFET)	-

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Department	COMMON TO ALL BRANC	CHE	S			R 2019	Semester	- 11
Course Code	de Course Name		ours/	Wee	Credit	Total Hours	Maximum M	arks
		L	Т	P	С			
19TP201	QUANTITATIVE APTITUDE, LOGICAL REASONING AND VERBAL ABILITY -I	0	0	2	0	0	100	
 To expose 	tive (s): The purpose of learning this course is the undergraduate students to such methods naracter, effective communication, aptitude an	and					l nurture quali	ties
 Distinguish Differentia Calculate Present th 	omes: At the end of this course, learners will the pattern of coding and decoding. te between sequence and series. the percentages and averages. eir views effectively and know how to improve the atudent's in unitias and second				D.			
	ne student's in writing and speaking.	SEE	IES	~				06
involving Codin Introduction - S series - Analog	Description of Coding method - Coding path og and Decoding methods. Sequences of real numbers - Number and A y - Odd man out- Power series							abet
UNIT 2 PR	OBLEM ON AGES & PERCENTAGE				-			06
Introduction- ba	asic concept – Ages, usage of percentage and	ave	ages	s- app	lications			
UNIT 3 PR	ESENTATION SKILLS	-	1	-				0
	ntation strategies – Story telling – Visual com	nuni	catio	n.			· ·	
	OUP DISCUSSION							06
Don'ts - Video	ion – Understanding the objective and skills t Modules, fundamentals of placement techr (Do's& Don'ts) – Video Modules.							
	AMMAR	-						06
Determiners ,A	djectives-Degrees of comparisons, Preposition	ns –	Idior	ns &	Phrases			
REFERENCE								
1 Murphy, R	aymond. English in Use - A Self - study Refe dedition. United Kingdom: Cambridge Univers					ok for Interme	ediate Learner	s of
and the second state of the second	man. Word Power Made Easy. New York: Po	Section and	terms of		2.000 C			
3. Baron's Th	e Official Guide for New GMAT Review 2015.	Nev	v Jer	sev:	John Wile	ev &Sons. Inc		
	na, Quantitative Aptitude for Competitive Exa						Fraw-Hill Publi	shing
	ma, How to prepare for Data Interpretation f	or th	ne Ca	AT, F	irst Editi	on, Tata McG	iraw-Hill Publi	shing
6. Dr.R S Age	garwal, Quantitative Aptitude, Seventh Revise	d Ed	ition	, S.C	hand Pub	lishing Comp	any Ltd, 2013	
7. Arun Shari Company I	ma, How to prepare for Quantitative Aptitude Ltd, 2013	for t	he C	AT, F	ifth Editi	ion, Tata McG	Fraw-Hill Publi	shing

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24	MECHANICAL ENGIN	EERIN	١G			R 2019	Semester III	BS
Course Code	Course Name	Hours / Week Credit		Total	Maximum N	/ /lark		
19BS301	TRANSFORM TECHNIQUES AND PARTIAL DIFFERENTIAL EQUATIONS		T	Р	С	Hours		
		3	1	0	4	60	100	
 To understan model and an To implement electromagne To summarize wave equatio To develop en solutions, usin Course Outcome Recognize the Fourier series Formulate a fi Apply the Four each of which Classify a par Apply and 	e and apply the mathematical aspects that n nough confidence to identify and model math ng the skills learned in their interactive and s (s): At the end of this course, learners will be e periodicity of a function and formulate the state of the second state of the second state of the inter transform, which converts the time func represents a frequency component. tial differential equation and able to solve the solve the engineering problems in the area	the stu contri uppor e able same a unctior tion int em.	idy but cal to: as a n is co a	of he te to patt g env a cor defin a sun	eat flow, f the solu erns in re <u>vironment</u> mbination ned in tim n of sine v	fluid mechar ution of one al world and of sine and ne domain. waves of dif	nics and e dimensional d offer approp cosine using	riat
	IER SERIES							1
	ns - General Fourier series - Odd and ever	functi	on	s - ⊦	lalf range	cosine and	sine series -	RC
mean square valu			-					1
	n- Existence Condition -Transforms of Stand	ard Fu	Inc	tions	- Unit ste	ep function.	Unit impulse	
이 방법에서 집에 있는 것은 것이 아이지 않는 것이 아이지 않는 것을 수 있다.	es- Transforms of Derivatives and Integrals -							
ransform of Perio	dic Functions - Inverse Laplace transforms.							
	IER TRANSFORM		8					1
	neorem- Fourier Transform and Inverse Four						ansforms	
	sforms of Simple Functions - Convolution T	neoren	n -	Pars	eval's Ide	entity.		
	AL DIFFERENTIAL EQUATIONS	0.1	190		- Area State	5.45 S.45	A successful to the base	1
	al differential equations – Singular integrals							
	ons – Lagrange's linear equation – Linear pa ficients of homogeneous types.	rual di	lier	enua	a equatio	ns of secon	u anu nigher u	Jiue
	ICATIONS OF PARTIAL DIFFERENTIAL E	OLIAT		NS				1
Classification of So Dimensional Wave	econd Order Quasi Linear Partial Differentia e Equation - One Dimensional Heat Equati Series Solutions in Cartesian Coordinates.	I Equa	tior	ns - F				
			-		-		(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	-
T BOOK(S)								
Larry.C.Andr	ews and Bhimsen.K.Shivamoggi, Integ w Delhi, 2007.	ral Tr	an	sforr	ns for	Engineers,	First Edition	i, P
Learning, Ne				<i>k</i>				ı, P

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RE	FERENCE(S):
1.	E. Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Sons, Inc, Singapore, 2008.
2.	Peter V. O. Neil, Advanced Engineering Mathematics, Seventh Edition, Cenage Learning India Private Ltd, 2012.
3.	C. Ray Wylie and C. Louis Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd, 2003.

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Department	MECHANICAL ENGINE	NGINEERING			R 2019	Semester III	РС									
Course Code	Course Name	Hours / Week		Crodit								Crodit		Total	Maximum M	arke
19ME301	ENGINEERING METALLURGY	L	Т	Р	С	Hours		and								
THESOT		3	0	0	3	45	100	1217								

Course Objective(s): The purpose of learning this course is:

To provide knowledge on physical metallurgy of metals through the study of phase diagrams.

To study the properties and applications of various metals and alloys used in engineering industries.

To expose various heat treatment processes of steels. .

To study the properties and applications of polymers and ceramics. .

To impart knowledge on mechanical properties evaluation and testing methods of engineering materials. .

Course Outcomes: At the end of this course, learners will be able to:

Explain the phase diagrams of different engineering materials.

- Recognize the properties and applications of various metals and alloys.
- Identify appropriate heat treatment processes for the given applications.
- Apply various nonmetals, its manufacturing techniques and various applications.
- Test the mechanical properties of the given materials for real-time applications.

Unit I PHASE DIAGRAMS AND CONSTITUTION OF ALLOYS

Alloys, Solid solutions - Phase diagram, phase rule, lever rule, Binary phase diagram - Isomorphous, eutectic, peritectic, eutectoid reactions - Iron-Carbon phase diagram - Metallography, microstructure.

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Unit II ENGINEERING METALS AND ALLOYS

Classification of Engineering materials - Ferrous metals -Plain carbon steel (low, medium and high carbon steels), microstructure/composition, properties, applications - Alloy steels, effect of alloying additions on steels stainless steels, High Strength Low Alloy Steels (HSLA), maraging, tool steels - Cast iron - grey, white. malleable, spheroidal graphite cast iron, microstructure, properties, applications - Non-ferrous metals -Nickel, Copper, Titanium, Aluminium, Magnesium, Zinc alloys, properties and applications - Bearing materials.

Unit III HEAT TREATMENT OF STEELS

Purpose of heat treatment - Annealing (stress relief, recrystallization, spheroidizing) - Normalizing - Hardening and Tempering, Isothermal transformation diagrams (T-T-T diagrams), Cooling curves superimposed on T-T-T diagrams (martensite and bainite phase formation) -Hardenability, Jominy end quench test, Case hardening processes, carburizing, nitriding, carbontiriding, cyaniding, flame hardening, induction hardening

INTRODUCTION TO POLYMERS AND ENGINEERING CERAMICS Unit IV Polymers - Plastics and elastomers - Thermoplasts and thermosets, properties and applications polyethylene, polypropylene, polyurethane, polystyrene, vinylchloride, polymethyl poly

methacrylate, olyethylene terapthalate, polycarbonate, polyamide, acrylonitrile butadiene styrene, polyamide, polyamideimide, olypropyleneoxide, polypropylene sulphide, polyetheretherketone, polytetrafluroethylene, urea formaldehyde, phenol formaldehyde, polyester, nylon, epoxy) - Rubber and its types - Types of Ceramics and applications.

Unit V MECHANICAL PROPERTIES AND MATERIALS TESTING

Elastic and plastic deformation, slip and twinning - Tensile test, stress-strain behavior of ductile and brittle materials Stress-strain ehavior of elastomers - Viscoelasticity - Compression test - Hardness and testing methods -Impact test - Fatigue test, Stress vs number of cycles (S-N) curve, endurance limit, factors affecting fatigue - Creep test, creep curves – Types of fracture – Fracture toughness – Three crack propagation modes.

TEXT BOOK(S):

William D Callister Jr., Materials Science and Engineering: An Introduction, 7 th Edition, John Wiley & Sons Inc., New York, 2007.

G. E.Dieter, Mechanical Metallurgy, McGraw Hill, 2007.

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3. /	Avner, S.H.,	"Introduction to	Physical Met	allurgy", McG	Graw Hill Book	Company, 1997.
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RE	FERENCE(S):
1.	V. Raghavan, Materials Science and Engineering, Prentice Hall of India, Delhi, 2009.
2.	William Smith and Javed Hashemi, Foundations of Materials Science and Engineering, 5 th Edition, McGraw Hill, New York, 2009.
3.	G. Murray, C. White and W. Weise, Introduction to Engineering Materials, 2nd Edition, Chemical Rubber Company (CRC) Press, Taylor & Francis Group, Florida, 2007.
4.	C.P.Sharma, Engineering Materials-Properties and Applications of Metals and Alloys, Prentice Hall of India, New Delhi, 2004.
5.	U.C.Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012

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0	MECHANICAL ENGIN	NEER	ING			R 2019	Semester II	I PO
Course Code	Course Name	Name Hours / Week Credit			Credit	Total	Maximum I	lark
19ME302 EN	GINEERING THERMODYNAMICS	L	т	Р	С	Hours	Maxingin	naik
- Lipe		3	1	0	4	60	100	
 To provide the know To impart the know To study the therm To learn about pro Course Outcome(s): A Exemplify the basic Apply the first law of Solve the problems 	mentals of thermodynamics and zeroti wledge on first law of thermodynamics vledge on second law of thermodynam odynamic properties of pure substance perties of gas mixtures, psychrometric at the end of this course, learners will be concepts and zeroth law of thermody of thermodynamics to closed and open a related to cycles and cyclic devices u modynamic properties of pure substan	s. es an proce be abl nami syste sing s	nd ei d its esse e to: cs. ems secc	pha s. ond la	se change	nodynamic	CS.	
Jnit I INTRODUC	rties of gas mixtures, psychrometry us TION AND ZEROTH LAW OF THERM oscopic approaches, Definitions and oundings, Properties- intensive and e	MOD d cor	/NA	MICS ts- h	3 leat, work	, thermod	5	
nacroscopic and micro	scopic modes of energy, Thermodyna							
	nperature scale, perfect gas scale.			- a *				1:
	V OF THERMODYNAMICS amics, I law for Closed systems - co	natan	4			a acretor	tuolumo pro	
Steady state flow proce	rocess, adiabatic process, polytropic sses, Steady flow energy equation (SF and diffusers, throttling valves, heat exc	EE),	App	licati	100 TO 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1			ms
		chang	jera.					
Jnit III SECOND L	AW OF THERMODYNAMICS							
Unit III SECOND L Limitations of I law o statements, Heat rreversible and reversib emperature scale, Clau		therm refri not cy	odyi gera ycle,	nami itor, Cari	Rever not engine	sibility e, Thermoo	and irreversil dynamic	
Unit III SECOND L Limitations of I law of statements, Heat Heat rreversible and reversible and reversible and reversible Heat unit IV PROPERTI Thermodynamic prope Pressure-volume (P-v) enthalpy-entropy (h-s) of Propertion	AW OF THERMODYNAMICS f thermodynamics, Second law of the Engine, heat pump and ble processes, Carnot's principles, Car usius inequality, Entropy- principle of e	therm refri not cy ntrop es -	odyi gera ycle, y inc Phạ volu	nami itor, Can creas se c me (Reven not engine e, Availab hange pro	sibility e, Thermoo ility & irrev ocesses, F erature-en	and irreversil dynamic rersibility. Property diagra tropy (T-s) an	usius pility 12 ams d
Jnit III SECOND L Limitations of I law of statements, Heat Heat rreversible and reversible and reversible and reversible Heat generature scale, Clau PROPERTI Jnit IV PROPERTI Thermodynamic property pressure-volume (P-v) Perturber (P-v) enthalpy-entropy (h-s) of state, Van derWaals equals	AW OF THERMODYNAMICS f thermodynamics, Second law of the Engine, heat pump and ole processes, Carnot's principles, Car usius inequality, Entropy- principle of e ES OF PURE SUBSTANCES rties of fluids. Pure substance-phase the pressure-temperature (P-T), temperation diagrams. Steam tables - Problems on	therm refri not cy ntrop es -	odyi gera ycle, y inc Phạ volu	nami itor, Can creas se c me (Reven not engine e, Availab hange pro	sibility e, Thermoo ility & irrev ocesses, F erature-en	and irreversil dynamic rersibility. Property diagra tropy (T-s) an	1: ams d on of
Unit IIISECOND LLimitationsof I law ostatements,Heatirreversibleand reversibletemperaturescale, ClauUnit IVPROPERTIThermodynamicprope- pressure-volume (P-v)enthalpy-entropy (h-s) ostate, Van derWaals eqUnit VGAS MIXTI	AW OF THERMODYNAMICS f thermodynamics, Second law of the Engine, heat pump and ble processes, Carnot's principles, Car- usius inequality, Entropy- principle of en- ES OF PURE SUBSTANCES rties of fluids. Pure substance-phase the pressure-temperature (P-T), tempera- diagrams. Steam tables - Problems on uation and compressibility chart. JRES AND PSYCHROMETRY al gas mixture- mixture of ideal gas, m s law, Thermodynamics	therm refri not cy ntrop es - ature flow a	odyi gera ycle, y inc Phạ: volui and	nami tor, Can creas se c me (' non-	Rever not engine e, Availab hange pro T-v), temp flow proce ct gases,	sibility e, Thermoo ility & irrev ocesses, F erature-en esses. Idea	and irreversil dynamic rersibility. Propertydiagra tropy (T-s) an Il gas - equatio	ility 12 ams
Unit III SECOND L Limitations of I law or Limitations of I law or Statements, Heat Heat rreversible and reversible Heat reversible and reversible Emperature scale, Clau Unit IV PROPERTI Thermodynamic property Proyee pressure-volume (P-v) Enthalpy-entropy (h-s) or state, Van derWaals eq Unit V GAS MIXTU Thermodynamics of ide processere, Amagath Amagath processes - Psychrome EXT BOOK(S):	AW OF THERMODYNAMICS f thermodynamics, Second law of t Engine, heat pump and ble processes, Carnot's principles, Car usius inequality, Entropy-principle of e ES OF PURE SUBSTANCES rties of fluids. Pure substance-phase pressure-temperature (P-T), tempera liagrams. Steam tables - Problems on uation and compressibility chart. JRES AND PSYCHROMETRY al gas mixture- mixture of ideal gas, m s law, Thermodynamics tric chart.	therm refri not cy ntrop es - ature flow a ixture pro	odyi gera ycle, y inc Phạ volu and opert	nami ttor, Carr creas se c me (non-t	Rever not engine e, Availab hange pro T-v), temp flow proce ct gases, Psycl	sibility e, Thermoo ility & irrev ocesses, F erature-en esses. Idea Dalton's lav	and irreversil dynamic rersibility. Property diagra tropy (T-s) an I gas - equation w of partial	1 ams d on of
Jnit III SECOND L imitations of I law or imitations of I law or istatements, Heat Heat reversible and reversible Heat imitations of I law or Imit IV Jnit IV PROPERTI Thermodynamic proper pressure-volume (P-v) intate, Van derWaals eq Jnit V Jnit V GAS MIXTI Thermodynamics of ide processes - Psychrome EXT BOOK(S): P.K.Nag, Engineerin	AW OF THERMODYNAMICS f thermodynamics, Second law of the Engine, heat pump and ble processes, Carnot's principles, Car- usius inequality, Entropy- principle of en- ES OF PURE SUBSTANCES rties of fluids. Pure substance-phase the pressure-temperature (P-T), tempera- diagrams. Steam tables - Problems on uation and compressibility chart. JRES AND PSYCHROMETRY al gas mixture- mixture of ideal gas, m s law, Thermodynamics	therm refri not cy ntrop es - ature flow a ixture pro	odyi gera ycle, y inc Phạ volu and e of p pert	nami ttor, Carn creas se c me (' non-t ies,	Rever not engine e, Availab hange pro T-v), temp flow proce ct gases, Psycl	sibility e, Thermoo ility & irrev ocesses, F erature-en esses. Idea Dalton's lav nrometric	and irreversil dynamic rersibility. Property diagra tropy (T-s) an I gas - equation w of partial	ility ility 1 ams d on o

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RE	FERENCE(S):
1.	Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2016.
2.	J.P.Holman, Thermodynamics, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, 2002.
3.	Borgnakke & Sonnatag, "Fundamental of Thermodynamics", 8th Edition , 2016.
4.	C.P.Arora, Thermodynamics, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2003.
5.	Y. Cengel and Boles, Thermodynamics - An Engineering Approach, Tata McGraw Hill Publishing Company Pvt. Ltd, New Delhi,2003.

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Department	MECHANICAL ENGI	NEEF	RING			R 2019	Semester	ш ме
Course Code	Course Name		lour: Wee		Credit	Total	Maximum	Marks
19ME303	MANUFACTURING TECHNOLOGY - I	L	Т	Ρ	С	Hours	121 2 - 11	
		3	0	0	3	45	100	
 To study the To learn varia To provide th To expose kr sheet metal p To learn about Course Outcome Understand s Select the su Select the su Understand th 	e(s): The purpose of learning this course is: sand and special casting processes sand ca bus metal joining processes and gain weldin e knowledge on various bulk deformation pro- nowledge on sheet metal forming processes parts. ut the various plastics moulding and forming (s): At the end of this course, learners will be and casting and special casting processes itable metal joining process for the given ma itable bulk deformation processes for the given he sheet metal and special forming processes of uitable moulding and forming processes of proc	g ski oces and proc e ab and p ateria ven n es ar	lls. spec esse le to: produ ls an nater nd pro	and i ial fo es an ice ca d its ials a epare	ts applica prming pro- d to make astings. applicatio and its app e simple s	tions. cesses an simple pla ns. plications. heet metal	d to make sm astic part.	nall
		lasti	5 10	uie	given app	ilcations.		00
	NG PROCESSES oduction processes and its classifications		Datt	orn	Types	Matoria	le and Alla	09
Moulding sand - 7 Induction. Fettling	Types, Properties and Testing. Moulding m and cleaning. Sand casting defects. Spe and Investment casting.	nachi	nes	and i	ts types.	Melting fu	rnaces - Cup	oola ai
Unit II META	L JOINING PROCESSES			_	27	1.1		09
welding - Electrode Gas metal arc wele	lding processes and its classifications - Prir es, Fluxes and filler materials. Principle of F ding, Submerged arc welding, Tungsten Ine lding and Friction welding - Weld defects - B	Resis rt Ga	tance s we	e wel Iding	ding - Spo , Plasma	ot, butt and	seam. Princ	ciple of elding,
	DEFORMATION PROCESSES							09
and operations. Ro	and cold working of metals - Forging proces olling - Types of Rolling mills, shape rolling o ypes. Principle of rod and wire drawing.		0.00					
Unit IV SHEE	T METAL FORMING AND SPECIAL FORM	IING	PRC	CES	SES ···	9-1-42-1-220-134	$(g_{\alpha}^{(1)}) = (g_{\alpha}^{(1)}) = (g_{\alpha}^{(1)}$	09
	aring, bending and drawing operations - Stre forming, Rubber pad forming, Metal spinnin plastic forming			1.000		and the second se	and the Statement of the	10.77
	DING AND FORMING OF PLASTICS		_					09
Introduction to pla types, Blow moul and applications o methods.	stics - Moulding of Thermoplastics - Princ ding, Rotational moulding, Thermoformin f Compression moulding and Transfer moul	ng a	nd	Extru	ision. Mo	ulding of T	hermosets -	and i Princip
EXT BOOK(S):					A			
2010.	nufacturing Technology vol. I, Tata McGraw	and server						Delhi,
Limited, New D								
Gowri P. Harih	aran, A.Suresh Babu, "Manufacturing Tech	nolog	y I",	Pear	son Educ	ation, 2008	B	
S. ed	New Service .				S. J.	Chai Dept. of	irman - B Mech Engg.	- ESE

RE	FERENCE(S):
1.	J. P. Kaushish, Manufacturing Processes, Prentice Hall of India Learning Private Limited, New Delhi, 2013.
2.	P.C. Sharma, Manufacturing Technology – I, S Chand and Company Private Limited, New Delhi, 2010.
3.	S K Hajra Choudhury, Elements of Workshop Technology – Vol. I, Media Promoters & Publishers Private Limited, Mumbai,2013
4.	Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education, 2006
5.	Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing" Eight Edition, Prentice – Hall of India, 1997.

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Department	MECHANICAL ENGIN	IEER	ING		10	R 2019	Semester III	PC
Course Code	Course Name		ours Wee		Credit	Total	Maximum	
19ME304	FLUID MECHANICS AND MACHINERY		т	Ρ	С	Hours	Marks	
TOMESOA		3	0	0	3	45	100	
 To study the To expose va To learn the To impart kn To gain know Course Outcome Estimate the Evaluate the Illustrate the Model law. Analyze the particular statements 	e (s): The purpose of learning this course is: fluid laws, properties and measurements. arious fluid flow measuring devices and calcu concept of boundary layer theory over bodie owledge on various types of hydraulic turbing vledge on working principles and performance es: At the end of this course, learners will be flow properties and pressure head using fun discharge and loss of energy in flow through impact of boundary layer over bodies and me performance of hydraulic turbine for a given a	allate s and es an able dame odel t odel t	l per d per alysi to: ental s. the f	form erforr s of f laws luid s	dimensio nance cur fluid pump s of fluid n	nal analysi ves. vs. nechanics.		Ides
	Derformance of hydraulic pumps for a given a		atior	1.	9 1. 1029		14	9
	anics -Laws of Fluid Mechanics-Properties of	572	d an	d its	applicatio	n-Types o	f fluid Types o	-
	nt of pressure-U-tube and differential manom						255 N	
	attern-law of conservation of Mass, Energy, I						5	
	D DYNAMICS AND FLUID FLOW OVER CO	5000 8550 U.S.A.D	0.01110-016	1911				9
Forces acting or	n a fluid element- Eulers and Bernoulli th	neore	m /	Applie	cation in	internal a	nd external fl	ows
measuring instru	ments - Momentum equation applications for	or be	nd i	n pip	oes Major	losses an	d Minor losse	s in
pipes using stand	ard charts and tables pipes in series and pip	es in	para	allel.	Identificat	ion of lami	nar and turbule	ent
	duits, flow in circular pipe - Darcy Weisbach							
Unit III EXTE	RNAL FLOW OVER BODIES AND DIMENS	SION	AL /	ANA	LYSIS	i du cuid	<i>c</i> .	9
aero foil. Need fo of similitude - Dim	odies: Boundary layer theory-Boundary lay r dimensional analysis dimensional analys nensionless parameters- application of dimen	is u	sing	Bucl	kingham p	i theorem	- Similitude ty	
Reynolds and Fro	and the second					-	10 M	
	RAULIC TURBINES							9
Francis turbine, K	ne Classification -Types of head and efficience aplan turbine - working principles and velocit tities performance curves.				and the gradient and the			
	RAULIC PUMPS							9
Definition -Centrif Losses and effici	ugal pump Classification Construction worki encies-Multistage Centrifugal pump-Specific ing pump Classification Working Principle Co	spe	ed	Primi	ng and c	avitation e	ffects of centr	
TEXT BOOK(S):			4					
Ninth edition	A Textbook of Fluid Mechanics and Machine , 2014.	ry, La	axmi	Pub	lications (P) Ltd., Ne	w Delhi, Revis	ed
	d Seth, S.M. "Hydraulics and Fluid Mechanic	cs", S	tand	lard	Book Hou	se, New D	elhi 2013.	
B. Kumar K. L.,	"Engineering Fluid Mechanics", Eurasia Pub	lishin	g Ho	ouse	(p) Ltd., N	ew Delhi 2	016.	
REFERENCE(S):	in the second					-		
	son , Donald F Young, Theodore H Okiishi ar	nd W	ade	W. H	luebsch. f	undament	als of Fluid	

 Mechanics, John Wiley & Sons, Sixth edition 2009.

 2.
 Pijush K Kundu and Ira M Cohen, Fluid Machines, Academic Press, Burlington, United states of merica, 2010.

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3.	Yunus Cengel and John Cimbala, Fluid Mechanics Fundamentals and Application, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi 2009.
4.	Robert and W Fox, Introduction to Fluid Machines, John Wiley Eastern Pvt. Ltd., New Delhi, 6th edition ,2006.
5.	Victor L. Streeter, K.W. Bedford and Wylie E. Benjamin , Fluid Mechanics, Tata McGraw Hill Publishing Company Pvt Ltd., New York, Revised Ninth Edition 1997.

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	MECHANICAL ENG	R 2019	Semester	III PO				
Course Code	Course Name	Course Name Hours / Cree			Credit	Total	Total Maximum	Marl
19ME305			Т	Р	С	Hours		i iviai i
TSINESUS	STRENGTH OF MATERIALS	3	0	0	3	45	10	D
 To study and e conditions thro To learn two d To gain knowle To impart know conditions. To learn the de Course Outcome(e) Evaluate the se Examine the se 	 s): The purpose of learning this course is estimate the mechanical properties of ma bugh experiments. imensional stress systems and stresses edge on shear force and bending stress of wledge on finding slope and deflection of eformation of shaft under torsion and deflection of s): At the end of this course, learners will tresses and strains in regular and compotites in two dimensional systems and the force, bending moment and shear s 	terials in thin o distribu beams ection be abl site str hin cyli	cylin tion anc of cl e to: uctu ndei	ders in dif d buc osed res s rs.	and spher ferent bea kling of co helical sp ubjected t	rical shells. Ims under Iumns for rings. o axial load	various load various bou	s.
 Examine the st 	ope and deflection of beams and bucklin tresses induced in shaft and closed coil h	elical s	prin	colun gs su	nns with d ibjected to	ifferent bou torsion.	undary cond	tions.
	terial properties. Stresses and strains du							therm
	composite bars-uniformly varying cross						e and brittle	
materials-Hooke-la	w-Factor of safety Poisson-ratio. Elastic	consta					e and brittle	
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Depa	rtment	MECHANICAL ENGIN	R 2019	Semester III PC				
Course Co 19ME30	e Code	Course Name		Hours / Week		Credit	Total	Maximum Marks
	E206	FLUID MECHANICS AND MACHINERY	L	т	Р	С	Hours	
	E306	LABORATORY		0	2	1	30	100
To m To pe To pe To pe • Exal • Mea • Inter • Eval	easure the erform cha erform cha erform cha outcome mine the f issure the r rpret the c luate the p	e the principles of fluid mechanics. e energy losses in a pipe flow. aracteristic study on impulse, reaction and axi aracteristic study on positive displacement pu aracteristic study on non-positive displacement es: At the end of this course, learners will be a luid flow and coefficient of discharge in fluid f major and minor losses associated in a pipe fl haracteristic study on impulse, reaction and a performance of positive displacement pumps. performance of non-positive displacement pumps.	mps able low ow. axial	to: devic	ces.			
Exp No.	Name of	Experiments		-				
1	Experime apparatu	ental verification of Bernoullis theorem in a pip s.	be flo	ow a	nd vi	sualize the	e flow usin	g Reynolds
2	Measure	ment of flow rate using venturimeter and orifi	cem	eter	and	calculate	the coef	ficient of

2	discharge.
3	Determination of loss of head in different pipes (major loss) and fittings (minor loss) for various flow rates
4	Performance test on tangiantial flow impulse (Pelton wheel) turbine against constant head.
5	Performance test on Francis turbine against constant head.
6	Performance test on reaction (Kaplan) turbine.
7	Performance characteristics of a reciprocating pump.
8	Performance characteristics of a gear pump.
9	Performance test on centrifugal pump.
10	Performance test on submersible pump

70	LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS	
S. NO.	NAME OF THE EQUIPMENT	Qty.
1	Orifice meter setup	1
2	Venturi meter setup	1
3	Rotameter setup	1
4	Pipe Flow analysis setup	1
5	Centrifugal pump/submergible pump setup	1
6	Reciprocating pump setup	1
7	Gear pump setup	- 1
8.	Pelton wheel setup	_ 1
9	Francis turbine setup	1
10	Kaplan turbine setup	1

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Department	MECHANICAL ENGINEER	RING		1-1-		R 2019	Semester III	EE
Course Code	Course Name	Ηοι	ırs/M	Veek	Credit	Total	Maximum Ma	arks
		L	Т	Ρ	С	Hours		
19TP301	QUANTITATIVE APTITUDE, LOGICAL REASONING AND VERBAL ABILITY -II	0	0	2	0	30	100	
 To expo 	tive(s): The purpose of learning this course is ose the undergraduate students on methods a trammar, effective communication, Verbal ability	and p					their Knowledge	ein
 Plot the Perform Evaluate factors. Improve Develop 	the performance in receptive skills while liste the student's productive skills in writing and s	s and and a ning	d Dat nalyz and	ta ana zing a	nalytical	reasoning o	of key issues and	90
					Aleada F)	reduction to	0
ntroduction - E	Basic concepts - Arithmetic operations - Equat e test - Overview of the wide variety of Directi	tion s	roble	ig me ems –	Direction	– Plotting	diagrams	
	IMBER SYSTEMS & DATA INTERPRETATIO					0		0
of highest com	Definition- Classification on Numbers -Power mon factor - Concept of least common mult ation – To analyze the data from various applie	iple -	- Div	nd rer isibilit	nainders y - Numb	- Short cut per of zeros	process - Conc s in an express	cep ion
	TENING AND READING (RECEPTIVE SKIL					1997		0
JNIT 4 WF Business Ema asking for com complaining - nitiating - Resp ruture plans -	nd semantic relationships. RITING AND SPEAKING (PRODUCTIVE SKI ils - Notes - Memos to colleagues or friend ments - Requesting information - Agreeing f Describing - Summrizing - Recommending bonding - Giving personal information - Talkin Expressing opinion - Speculating - Organiz	s - C to rec - Pe g abo ing a	Giving ques ersua out p a larg	ts - E ading reser ger u	Explaining Turn-tak nt circums nit of dis	ing - Apologiz ing - Susta stances, pa course - G	zing - Reassurir aining interactions st experiences a siving information	ng on and
	justifying opinions - Speculating - Comparing	g and	con	trasti	ng - Agre	eing and di	sagreeing.	0
Team work – II	mportance of team work – Leadership skills ople- Group decision making.	Attrib	outes	of a	successfi	ul team – B	arriers involved	
Heinle, a pa 2. Murphy, Ra English.IVe 3. Lewis, Nor 4. Baron's Th 5. Abhijit Guh Publishing 6. Arun Sharr Company	, Russell and Michael Black. Pass Cambridge art of Cengage Learning, Delhi, 2003. aymond. English in Use - A Self - study Refer ed. United Kingdom: Cambridge University Pri- man.Word Power Made Easy. New York: Poo e Official Guide for New GMAT Review 2015. a, Quantitative Aptitude for Competitive Exan Company Ltd, 2012 ma, How to prepare for Data Interpretation for	ence ess. : ket E New ninati	and 2012 3ooks v Jers ions, CAT,	Prac s. 199 sey: C Four First	tice Book 1. John Wile th Edition, ⁻	for Interme y &Sons, Ir , Tata McG Tata McGra	ediate Learners nc. sraw-Hill aw-Hill Publishin	of
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Department	MECHANICAL ENG	SINEEF	RING			R 2019	Semester III	PC
Course Code	Course Name	100.0	lours Wee		Credit	Total Maximum M		arks
19ME307	STRENGTH OF MATERILAS	L	Т	Р	С	Hours		
TOWE SUT	LABORATORY	0	0	2	1	30	100	
 To study the m 	 s): The purpose of learning this course i echanical properties of materials when s s): At the end of this course, learners will 	subject			erent types	s of loading		
 Perform Tensic 	on and Shear stress test on Solid materia		10.					
 Perform Torsio Perform Hardn 	n and impact test on Solid materials. ess test on Solid materials.							
	nation test on Beams.							

· Perform Compression and Tension test on Helical springs.

Exp No. Name of Experiments

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_xp N0.	indine of experiments
1	Tension test on a mild steel rod.
2	Double shear test on Mild steel and Aluminium rods.
3	Torsion test on mild steel rod.
4	Impact test on metal specimen.
5	Hardness test on metals - Brinnell Hardness Number.
6	Hardness test on metals - Rockwell Hardness Number.
7	Hardness test on metals – Vicker's Hardness Number.
8	Deflection test on beam.
9	Compression test on helical spring.
10	Tension test on helical spring.

S. No	NAME OF THE EQUIPMENT	Qty.
1	Universal Tensile Testing machine with double 1 shear attachment – 40 Ton Capacity	1 No.
2	Torsion Testing Machine (60 NM Capacity)	1 No.
3	Impact Testing Machine (300 J Capacity)	1 No
4	Brinell Hardness Testing Machine	1 No.
5	Rockwell Hardness Testing Machine	1 No.
6	Vicker's Hardness Testing Machine	
7	Spring Testing Machine for tensile and compressive loads (2500 N)	1 No.

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8. Arun Sharma, How to prepare for Quantitative Aptitude for the CAT, Fifth Edition, Tata McGraw-Hill Publishing Company Ltd, 2013

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Department	MECHANICAL ENG	NEERI	NG		1.0	R 2019	Semester	Ш		
Course	Course Name		Hours / Week				Credit	Total Hours	Maximum Marks	Ľ
Code		L	т	P	C	nouro	Marka			
19HS301	COMMUNICATION SKILLS LABORATORY	0	0	4	2	30 10				
 To involve t To improve To focus the To enhance 	(s): The purpose of learning this course the students in effective listening activitie the oral communication skills in proper n e effective reading of general and technic and comprehend the written text. LSRW skills.	s. nanner				71				
 Understand the communicate of the communicate of the communicate of the communicate of the communication of the communicat	: At the end of this course, learners will ne technical talks. to his peer group properly. the general and technical text. orts and job application in clear manner.	be able	e to:							
Unit I LISTEN		4						6		
Listening and its	importance -Listening strategies - Liste	n to a	proce	ess ir	formation	- give info	rmation, as pa			
simple explanation	on - Being an active listener: giving verb	al and	non-	verba	al feedbac	k - taking le	ecture notes			
Unit II SPEAKI			3		1.1			6		
basics - pronund	formation - ask for personal information ciation practice - conversation starters: idemic readings and lectures									
Unit III READIN								6		
Strategies for eff	ective reading - Read and recognize di	fferent	type	s of t	exts - Pre	edicting cor	tent using ph			
and title - Read	for details - Use of graphic organizer	rs to re	eview	/ and	aid com	prehension	- Understan	ding		
	e and use of connectors in a passage-	speed i								
Unit IV WRITIN	e and use of connectors in a passage-	speed i						6		
Plan before writin descriptive parag	e and use of connectors in a passage-	ce, sup s and e	exam	ples	- Write a	n opinion p		/rite a		
Plan before writin descriptive parag	e and use of connectors in a passage- a ng - Develop a paragraph: topic sentend raph – Write a paragraph with reasons essays-descriptive-narrative- issue-bas	ce, sup s and e	exam	ples	- Write a	n opinion p		/rite a		
Plan before writin descriptive parag writing - Types of Unit V INTEGR Task based Inst	e and use of connectors in a passage- a ng - Develop a paragraph: topic sentend raph – Write a paragraph with reasons essays-descriptive-narrative- issue-bas	ce, sup s and e ed-argu	exam umer	iples ntativ	- Write a e-analytic	n opinion p al	paragraph – E	/rite a E-mai		
Plan before writin descriptive parag writing - Types of Unit V INTEGR Task based Inst Reading a newsp TEXT BOOK(S):	ee and use of connectors in a passage- ang - Develop a paragraph: topic sentend raph – Write a paragraph with reasons essays-descriptive-narrative- issue-bas ATION OF LSRW ruction : watching a video –Listing, S paper and creating topic based videos	ce, sup s and e ed-argu orting,	exam umer orde	ntativ ering,	- Write a e-analytic: comparir	n opinion p al ng and ana	aragraph – E	/rite a E-mai 6 eas		
Plan before writin descriptive parag writing - Types of Unit V INTEGR Task based Inst Reading a newsp TEXT BOOK(S):	e and use of connectors in a passage-s G ng - Develop a paragraph: topic sentend raph – Write a paragraph with reasons essays-descriptive-narrative- issue-bas ATION OF LSRW ruction : watching a video –Listing, S	ce, sup s and e ed-argu orting,	exam umer orde	ntativ ering,	- Write a e-analytic: comparir	n opinion p al ng and ana	aragraph – E	/rite a E-ma 6 eas		

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3	Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010
RE	FERENCE(S):
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	MECHANICAL ENGINE	R 2019		9 Semester IV				
Course Code	Course Name	Hours / Week		Credit	Total	Maximum	n Marks	
		L	Т	Р	С	Hours		
19BS403	3 NUMERICAL METHODS AND STATISTICS 3 1 0 4 60 100		0					
Course Objec	tive(s): The purpose of learning this course is:							
 interpolation To summar differential To apply the To develop solutions, u 	and the methods to solve polynomial equations n numerically rize and apply the methodologies involved in so equations e concepts testing of hypothesis in their core an enough confidence to identify and model math sing the skills learned in their interactive and so me(s): At the end of this course, learners will b	olving reas ema	g pro	blem patte envi	s related	to ordinary	and partia	
 Demonstrat Obtain the s Apply basic science/eng 	e equations into algebraic, transcendental or sir te and obtain the differentiation and integration solutions of all types of differential equations, n statistical inference techniques, including conf gineering problems. experiment for an appropriate situation using Al	of fu ume iden	inctio ricall ce in	ons u y. Iterva	sing the r Is, hypoth	umerical to	echniques	e them
		100.221.00						
	UTION OF EQUATIONS							12
Unit I SOL Solution of algeb		aphs Iss-J	son r lorda	nethc an me	od - Soluti	on of syste en values	em of linea of a matrix	r
Unit I SOL Solution of algeb equations: Gaus Power method.	UTION OF EQUATIONS praic and transcendental equations: Newton- R	ISS-J	lorda	nethc in me	od - Soluti	on of syste en values	em of linea of a matrix	r
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Text	Boo	ks(S):
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2.	Jain M.K, Iyangar S.R.K and Jain R.K, Numerical Methods For Scientific and Engineering Computation, New Age International (P) Ltd, New Delhi, 2005.
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Course Code Course Name 19ME401 ENGINEERING METROLOGY AND MEASUREMENTS Course Objective(s): The purpose of learning this course is: To study the concepts of measurement and characteristics To learn the procedure for various linear and angular measurement of gear and thread To provide knowledge on measurement of gear and thread To study the use of laser and advances in metrology for lir To expose the measuring procedure to measure the mech Course Outcome(s): At the end of this course, learners will be Explain the basic concept of measurement and characteris Practice the appropriate linear and angular dimensions usi Examine the major terminologies for the gear, screw thread Apply the advanced techniques in metrology to calculate th Explain the suitable type of instrument used to measure the Unit I CONCEPT OF MEASUREMENT Introduction: Definition, Objectives, Elements of Measuring Syste - Characteristics of measuring instrument: Sensitivity, Stability, In Reliability, Backlash, Repeatability and Reproducibility – Calibr errors - Care of Measuring Instruments. Unit I LINEAR AND ANGULAR MEASUREMENTS Linear Measurements: Vernier Caliper, Vernier Height and Depti gauge, limit gauge and its classification - Comparator: Mechanic Measurements: Bevel protractor, Sine bar, Angle Decker, Autocor Unit II FORM MEA	suremer d termin near geo nanical p able to: stics of n ing preci d and ro he geom e mecha tem, Acc Interchar ration - E	ek P 0 umer ologie metri aram neasu sion undn etric anical uracy ngeat Errors	es using s ic dimensi eters usir uring instr measuring ess meas dimension paramete y and Pre- pility, Ran s in Meas	ions. ng suitable ruments g instrume surement ns. ers cision – U ge of accu surement: s	instruments. ents Jnits and Stand uracy, Readab Static and dyr	07 darc ility, nam 09
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terferometer: NPL Flatness, Laser, Michelson - Computer Air						
system - Coordinate Measuring Machine: Basic concept, Type surface Roughness Measurement - Straightness Measurement - Metrology.						ies
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leasurement of Force - Principle, analytical balance, platform ba ydraulic dynamometer. Measurement of Power: Linea rinciple, use of elastic members, Bridgeman gauge, Mcleod gau imetallic strip, thermocouples, metal resistance thermometer, p	ar and uge, Pira	Ro ani ga	otational	- Press	sure Measurer	
XT BOOK(S):						_
Bewoor, Vinay Kulkarni, Metrology & Measurement, Tata Mc Delhi, 2009.	Graw H	il Pul	blishing C	ompany P	vt. Ltd., New	

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Department	MECHANICAL EN	GINEE	RING	6		R 2019	Semester IV	P
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 Understand the Recognize the c Resolve the pro Understand the 	: At the end of this course, learners w applications of Brayton cycle and Ran components and compute the performa- blems involving steam nozzles and ste classification, working and performance oling load and select suitable refrigeration	kine cy ance of eam tur ce of air	cle. inter bines com	nal co s. ipres:	sors.			
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	 Modifications of Brayton cycle with in 							olar
and the second se	e, modifications with reheater and rege	enerato	r. Pro	blem	solving u	ising Mollie	er chart.	
And the second	AL COMBUSTION ENGINES							1
	engines - Classification - Components						the state of the second state of the state of the	
	ram - Fuel supply systems - Ignition Sy							
	ation, Heat balance sheet preparation-	Air-tuei	ratio	calc	ulation- K	nocking an	d detonation.	4
	NOZZLES AND TURBINES	friction		Haal		atia auna	e of wotod	1
low. Impulse and re	gh nozzles-Shapes of nozzles, effect o action principles- Compounding of Tur ulations- Governors.							
Jnit IV AIR CO	MPRESSOR							1
Classification and wo	orking principle-Work of compression v	with and	d with	out c	learance,	volumetric	efficiency,	
sothermal efficiency	and isentropic efficiency of reciprocat	ing air d	comp	resso	ors. Multis	tage air co	mpressor	
and inter cooling, We	ork of multistage air compressor. Rotai	ry comp	oress	ors- (Centrifuga	I, vane and	d roots blowers	S .
	ERATION AND AIR-CONDITIONING							1:
Norking principle of reatment only), and	refrigeration cycle Effect of superheat vapour absorption system- Ammonia, comparison between vapour compres SHF, ESHF, Air conditioning systems.	water, I sion an	_ithiu	m bro	omide wa	ter system	s (Elementary	
EXT BOOK(S): Kothandaraman.		Domilium	- alu ana			. in T.	anna al En sin	
	C.P., Domkundwar.S. and A.V.E cons, Fifth edition, 2002.	Domkur	idwa	r., /	A course	e in Th	ermal Enginee	rin
	rigeration and Air Conditioning" Tata I	Ma 0		200	0			

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	MECHANICAL ENGINEE	RING					R 2019	Ser	nester	IV	PC
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	ngle point tool nomenclature, tool life and its						a literative state and the second		10 miles	perti	ies
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Unit I FUNDA	MENTALS OF MECHANISMS							12
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	ns of four bar mechanism, Mechanical adva							slider
	rank mechanisms. Common Mechanisms -							
	TIC ANALYSIS OF MECHANISMS							12
Relative velocity of	kinematic link, Rubbing Velocity of kinema	tic pair	, Co	nstru	uction of v	elocity and	acceleration	
	al method (Relative Velocity Method), Four	bar m	ech	anisr	n, slider o	crank mech	anisms and	
complex mechanisr	n.							
Unit III CAM AN	ID FOLLOWER MECHANISMS						÷	12
Motion, Uniform Ac	ninology, Classifications, Types of follower acceleration and Retardation Motion and Cy- er and flat faced follower.	motion cloidal	- Ur Mot	niforr ion- (n velocity Construct	Motion, Si tion of cam	mple Harmoni profile - Knife	С
	ND GEAR TRAIN							12
Gears - Terminolog	y, Law of gearing, Length of path of contact	t, Leng	gth c	f arc	of contac	ct, contact	ratio-	
Interference and un	dercutting. Gear trains- Speed ratio, train version speed calculation by tabular method.							
Unit V FRICTIO	N DRIVES	1000		e.		E		12
creep and Centrifug	n clutch, types -single plate, Multi plate and gal effect of belt, length of open and cross at belt drives - V Belt drives.	d cone belt dri	cluto ves,	h. F Max	lat Belt D kimum po	rives Veloc wer transm	ity, slip, itted, ratio of	à
TEXT BOOK(S):				-		1		
	heory of Machines, Tata McGraw Hill Publi	shina (Com	nany	Put I td	New Delh	2014	2.2
	Mallick, A.K., "Theory of Mechanisms and M							d.,
and the state of t	Kinematics of Machinery", MacMillan Publis	hers P	vt L	td., T	ech-max	Education	al resources, 2	2011
REFERENCE(S):		14		-				
	heory of Machines and Mechanisms, Khar					ni, 2005.		
2. Sadhu Singh, T	heory of Machines, Pearson Education, Se	econd I	Editi	on, 2	2012.			

3. Rao J S and Dukkipati, Mechanism and Machine Theory, Wiley- Eastern Ltd., New Delhi, 2006.

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 Beven T, Theory of Machines, Third Edition, CBS Publishers and Distributors, New Delhi, 2010.
.J. J. Uicker, G. R. Pennock and J. E. Shigley, Theory of Machines and Mechanisms, Oxford University Press, New York, 2011.

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Course Code Course Name Hours / Week Credit Credit Total Hours Maximum Mark 19ME405 THERMAL ENGINEERING LABORATORY L T P C Maximum Mark 19ME405 THERMAL ENGINEERING LABORATORY L T P C Maximum Mark 0 0 2 1 30 100 Course Objective(s): The purpose of learning this course is: To learn the port timing and valve timing diagram of internal combustion engines. To study the performance, retardation and emission characteristics of internal combustion engines. To study the performance of refrigeration and air conditioning systems. Course Outcome(s): At the end of this course, learners will be able to: Draw the port timing and valve timing diagram of two stroke and four stroke internal combustion engines. • Measure the flash point, fire point, calorific value, viscosity and calculate the performance with emission characteristics of IC engines. • Evaluate the performance of IC engine on retardation. • Evaluate the performance of IC engine on retardation. • Evaluate the performance of IC engine on retardation. • • Evaluate the performance of IC engine on the calorific value and viscosity of the given oil sample. • • • Calculate the performance of IC engine on tetardati	Depart	ment		R 2019	Semester IN	/ ME						
19ME405 THERMAL ENGINEERING LABORATORY L T P C Hours 0 0 2 1 30 100 Course Objective(s): The purpose of learning this course is: To learn the port timing and valve timing diagram of internal combustion engines. To impart the knowledge on flash point, fire point, calorific value and viscosity of the fuel sample. To study the performance, retardation and emission characteristics of internal combustion engines. To provide the knowledge on working of two stage reciprocating air compressor. To study the performance of refrigeration and air conditioning systems. Course Outcome(s): At the end of this course, learners will be able to: • Draw the port timing and valve timing diagram of two stroke and four stroke internal combustion engines. • Measure the flash point, fire point, calorific value, viscosity and calculate the performance with emission characteristics of IC engines. • Evaluate the performance of two stage reciprocating air compressor. • Evaluate the performance of two stage reciprocating air compressor. • Calculate the COP of refrigeration and air conditioning systems. * Measure the flash point, fire point, calorific value and viscosity of the given oil sample. • 1 Experimental study on port timing and valve timing diagram of IC engines. • 2 Measure the flash point, fire point, calorific value and viscosity of the given oil sample. • 3 Experimental study of performance and e	Course	Code	Course Name	F			Credit					
LABORATORY002130100Course Objective(s): The purpose of learning this course is: To learn the port timing and valve timing diagram of internal combustion engines. To impart the knowledge on flash point, fire point, calorific value and viscosity of the fuel sample. To study the performance, retardation and emission characteristics of internal combustion engines. To provide the knowledge on working of two stage reciprocating air compressor. To study the performance of refrigeration and air conditioning systems.Course Outcome(s): At the end of this course, learners will be able to: • Draw the port timing and valve timing diagram of two stroke and four stroke internal combustion engines.• Measure the flash point, fire point, calorific value, viscosity and calculate the performance with emission characteristics of IC engines. • Evaluate the performance of IC engine on retardation. • Evaluate the performance of two stage reciprocating air compressor. • Calculate the COP of refrigeration and air conditioning systems.X No. Name of Experiments1Experimental study on port timing and valve timing diagram of IC engines.2Measure the flash point, fire point, calorific value and viscosity of the given oil sample.3Experimental study of performance test on 4-Stroke Petrol engine.4Experimental study of performance and emission characteristics on 4-Stroke diesel engine.5Heat balance test on 4-Stroke diesel engine.6Morse test on multi-cylinder petrol engine.7Retardation test on 4-Stroke diesel engine.8Experimental study on performance of two stage reciprocating air compressor. <th colspan="2">19ME405</th> <th>THERMA</th> <th>L ENGINEERING</th> <th>L</th> <th>Т</th> <th>Р</th> <th>С</th> <th>Hours</th> <th>waximum i</th> <th>viarks</th>	19ME405		THERMA	L ENGINEERING	L	Т	Р	С	Hours	waximum i	viarks	
To learn the port timing and valve timing diagram of internal combustion engines. To impart the knowledge on flash point, fire point, calorific value and viscosity of the fuel sample. To study the performance, retardation and emission characteristics of internal combustion engines. To provide the knowledge on working of two stage reciprocating air compressor. To study the performance of refrigeration and air conditioning systems. Course Outcome(s): At the end of this course, learners will be able to: • Draw the port timing and valve timing diagram of two stroke and four stroke internal combustion engines. • Measure the flash point, fire point, calorific value, viscosity and calculate the performance with emission characteristics of IC engines. • Evaluate the performance of IC engine on retardation. • Evaluate the performance of IC engine on retardation. • Evaluate the performance of two stage reciprocating air compressor. • Calculate the COP of refrigeration and air conditioning systems. xp No. Name of Experiments 1 Experimental study on port timing and valve timing diagram of IC engines. 2 Measure the flash point, fire point, calorific value and viscosity of the given oil sample. 3 Experimental study of performance test on 4-Stroke Petrol engine. 4 Experimental study of performance and emission characteristics on 4-Stroke diesel engine.	ISINE	403	LAE	BORATORY	0	0	2	1	30	100		
xp No. Name of Experiments 1 Experimental study on port timing and valve timing diagram of IC engines. 2 Measure the flash point, fire point, calorific value and viscosity of the given oil sample. 3 Experimental study of performance test on 4-Stroke Petrol engine. 4 Experimental study of performance and emission characteristics on 4-Stroke diesel engine. 5 Heat balance test on 4-Stroke diesel engine. 6 Morse test on multi-cylinder petrol engine. 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor.	To imp To stud To pro To stud Ourse O Draw t engine Measu charac Evalua Evalua	bart the know dy the perfor vide the know dy the perfor Dutcome(s) : he port tim s. re the flash teristics of 10 te the perfor te the perfor	vledge on flash mance, retarda wledge on work mance of refrig that the end of f ing and valve point, fire point C engines. mance of IC en mance of two s	point, fire point, calo ation and emission c king of two stage rec geration and air cond this course, learners timing diagram of , calorific value, visc ngine on retardation. stage reciprocating a	orific value haracteris ciprocating ditioning sy will be ab two strok osity and air compre	and tics of air of ster le to calcu ssor	l visc of inte comp ms. : nd fo ulate	osity of th ernal com pressor. pur stroke	bustion er	ngines.		
 Experimental study on port timing and valve timing diagram of IC engines. Measure the flash point, fire point, calorific value and viscosity of the given oil sample. Experimental study of performance test on 4-Stroke Petrol engine. Experimental study of performance and emission characteristics on 4-Stroke diesel engine. Heat balance test on 4-Stroke diesel engine. Morse test on multi-cylinder petrol engine. Retardation test on 4-Stroke diesel engine. Experimental study on performance of two stage reciprocating air compressor. 	1/el		and the second		g ayatema.	-					4.4	
 Measure the flash point, fire point, calorific value and viscosity of the given oil sample. Experimental study of performance test on 4-Stroke Petrol engine. Experimental study of performance and emission characteristics on 4-Stroke diesel engine. Heat balance test on 4-Stroke diesel engine. Morse test on multi-cylinder petrol engine. Retardation test on 4-Stroke diesel engine. Experimental study on performance of two stage reciprocating air compressor. 									ul		1.1	
 3 Experimental study of performance test on 4-Stroke Petrol engine. 4 Experimental study of performance and emission characteristics on 4-Stroke diesel engine. 5 Heat balance test on 4-Stroke diesel engine. 6 Morse test on multi-cylinder petrol engine. 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor. 										1	1.1	
 4 Experimental study of performance and emission characteristics on 4-Stroke diesel engine. 5 Heat balance test on 4-Stroke diesel engine. 6 Morse test on multi-cylinder petrol engine. 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor. 								e given oil	sample.		1	
 5 Heat balance test on 4-Stroke diesel engine. 6 Morse test on multi-cylinder petrol engine. 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor. 												
 6 Morse test on multi-cylinder petrol engine. 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor. 					n characte	ristic	s on	4-Stroke	diesel eng	jine.	1 mil	
 7 Retardation test on 4-Stroke diesel engine. 8 Experimental study on performance of two stage reciprocating air compressor. 							1.					
8 Experimental study on performance of two stage reciprocating air compressor.	1.				2	1						
						1	-1					
		xperimental	study on perfor	mance of two stage	reciproca	ting	air co	ompresso				

10 Experimental study on determination of Coefficient of Performance of Air-conditioning system.

S. No	NAME OF THE EQUIPMENT	Qty.
1	I.C Engine – 2 stroke and 4 stroke model	1 set
2	Apparatus for Flash and Fire Point	1 No.
3	4-stroke Diesel Engine with mechanical loading.	1 No
4	4-stroke Diesel Engine with hydraulic loading.	1 No.
5	4-stroke Diesel Engine with electrical loading.	1 No.
6	Multi-cylinder Petrol Engine	1 No.
7	Single cylinder Petrol Engine	1 No.
8	Data Acquisition system with any one of the above engines	1 No.
9	Steam Boiler with turbine setup	1 No.
10	Single/two stage reciprocating air compressor	1 No.
11	Refrigeration test rig	1 No.
12	Air-conditioning test rig	1 No.

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Limit System- Tolerance, Limits, Deviation, Actual Deviation, Upper Deviation, Lower Deviation, Allowance, Bas Size, Design Size, Actual Size. Fits- Types, Tolerances of Form and Position- Form and Position Variatio cometrical Tolerance, Tolerance Zone, Indicating Geometrical Tolerances. Indication of Surface Roughness, Standard Abbreviations and Symbols used in industries. Unit II SECTIONAL VIEWS 05 Sections- Hatching of Sections, Cutting Planes, Revolved or Removed Section, Sectional Views- Full Section, Half Sections and Auxiliary Sections- Conventional Representation-One-view, Two-view and three viewdrawings. Unit III INTRODUCTION TO MACHINE ELEMENT DRAWINGS 05 Drawing standards and Designation of Bolts, nuts, screws, keys, pins, Rivets, Welded Joints- Dimensioning of Welds, Belt Driven Pulleys, Chain and Gears Drives. Unit IV ASSEMBLY DRAWINGS AND SECTIONAL VIEWS 08 Preparation of manual parts drawing and assembled sectional views from orthographic part drawings, Automobile components - stuffing box, Machine Tool Parts plummer block, Joints knuckle joints, Couplings Protected type flanged coupling, Bearings swivel bearing, Preparation of Bill of materials and tolerance data sheet. Unit V REAL PRODUCTS TO MACHINE DRAWING CONVERSION 07 Preparation of manual parts drawing and assembled sectional views from real time products- Internal combustion engine parts, connecting rod, couplings - universal coupling, machine tool parts - tailstock, Automobile components screw jack, stuffing box - Commercial products - Preparation of Bill of materials and tolerance data sheet. EXT BOOK(S): N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014	Department	MECHANICAL ENGIN	IEER	ING	3		R 2019	Semeste	r IV	PC
19ME406 MACHINE DRAWING LABORATORY L T P C Hours Course Objective(s): The purpose of learning this course is: 0 0 2 1 30 100 Course Objective(s): The purpose of learning this course is: 0 0 2 1 30 100 Course Objective(s): The purpose of learning this course is: 10 recognize the drawing notations of standard machine elements. 10 10 10 10 100 100 100 100 100 To draw the detailed drawing of given components. Course Outcome(s): At the end of this course, learners will be able to: 10 10 100	Course Code	Course Name	IFCO NIAMO			Credit	Total			lark
0 0 2 1 30 100 Course Objective(s): The purpose of learning this course is: 10 use limits, fits and tolerances in real world problems. 50	19ME406		L	т	Р	С	Hours	Waxing		ark
To use limits, fits and tolerances in real world problems. To apply different sectional views in drawings. To draw the assembly drawing of standard machine elements. To draw the detailed drawing of given components. Course Outcome(s): At the end of this course, learners will be able to: Use limits, fits and tolerances in real world problems. Sketch the sectional views of simple elements. Select and draw the standard mechanical elements like bolt, nut, screw etc. Select the assembly drawing of automobile components. Sketch the detailed drawing of automobile components. Sketch the detailed drawing of automobile components. Sketch the detailed arawing of automobile components. Sketch the detailed drawing of automobile components. Sketch the detailed arawing of automobile components. Unit 1 LIMITS, FITS AND TOLERANCES 0 Off and the assembly drawing of automobile components. Unit 1 System - Tolerance, Limits, Deviation, Actual Deviation, Upper Deviation, Lower Deviation, Allowance, Bas Size, Design Size, Actual Size. Fits- Types, Tolerances of Form and Position - Form and Position Variatio sometrical Tolerance, Tolerance Zone, Indicating Geometrical Tolerances. Indication of Surface Roughness, Standard Abbreviations and Symbols used in industries. Unit 11 SECTIONAL VIEWS 0 Offers. Sections - Hatching of Sections, Cutting Planes, Revolved or Removed Section, Sectional Views-Full Section, Half Sections and Designation of Bolts, nuts, screws, keys, pins, Rivets, Welded Joints-Dimensioning of Welds, Belt Driven Pulleys, Chain and Gears Drives. Unit 11 INTRODUCTION TO MACHINE ELEMENT DRAWINGS Offerstrand machine Tool Parts plummer block, Joints knuckle joints, Couplings Protected type langed coupling, Bearings	151412400	MACHINE DRAWING LABORATORT	0	0	2	1	30	1	00	1
Limit System- Tolerance, Limits, Deviation, Actual Deviation, Upper Deviation, Lower Deviation, Allowance, Bas Size, Design Size, Actual Size. Fits- Types, Tolerances of Form and Position- Form and Position Variatio cometrical Tolerance, Tolerance Zone, Indicating Geometrical Tolerances. Indication of Surface Roughness, Standard Abbreviations and Symbols used in industries. Unit II SECTIONAL VIEWS 05 Sections- Hatching of Sections, Cutting Planes, Revolved or Removed Section, Sectional Views- Full Section, Half Sections and Auxiliary Sections- Conventional Representation-One-view, Two-view and three viewdrawings. Unit III INTRODUCTION TO MACHINE ELEMENT DRAWINGS 05 Drawing standards and Designation of Bolts, nuts, screws, keys, pins, Rivets, Welded Joints- Dimensioning of Welds, Belt Driven Pulleys, Chain and Gears Drives. Unit IV ASSEMBLY DRAWINGS AND SECTIONAL VIEWS 08 Preparation of manual parts drawing and assembled sectional views from orthographic part drawings, Automobile components - stuffing box, Machine Tool Parts plummer block, Joints knuckle joints, Couplings Protected type langed coupling, Bearings swivel bearing, Preparation of Bill of materials and tolerance data sheet. Unit V REAL PRODUCTS TO MACHINE DRAWING CONVERSION 07 Preparation of manual parts drawing and assembled sectional views from real time products- Internal combustion components - stuffing box, stuffing box - Commercial products - Preparation of Bill of materials and tolerance data sheet. EXT BOOK(S): N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014	 To use limits, fi To apply differed To recognize the To draw the assist of the second Use limits, fits at Sketch the second Select and draw Select the assist 	ts and tolerances in real world problems. ent sectional views in drawings. ne drawing notations of standard machine ele sembly drawing. tailed drawing of given components. e(s): At the end of this course, learners will b and tolerances in real world problems. tional views of simple elements. w the standard mechanical elements like bol embly drawing of automobile components.	e abl	e to:				•*		
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Unit IV ASSEMBLY DRAWINGS AND SECTIONAL VIEWS 08 Preparation of manual parts drawing and assembled sectional views from orthographic part drawings, Automobile components - stuffing box, Machine Tool Parts plummer block, Joints knuckle joints, Couplings Protected type flanged coupling, Bearings swivel bearing, Preparation of Bill of materials and tolerance data sheet. 07 Unit V REAL PRODUCTS TO MACHINE DRAWING CONVERSION 07 Preparation of manual parts drawing and assembled sectional views from real time products- Internal combustic engine parts, connecting rod, couplings - universal coupling, machine tool parts - tailstock, Automobil components screw jack, stuffing box - Commercial products - Preparation of Bill of materials and tolerance data sheet. 07 EXT BOOK(S): N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014 08	Drawing standar	rds and Designation of Bolts, nuts,	scre	ews,	ke	ys, pins,	Rivets,	Welded	Joir	nts-
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engine parts, connecting rod, couplings - universal coupling, machine tool parts - tailstock, Automobi components screw jack, stuffing box - Commercial products - Preparation of Bill of materials and tolerance data sheet. EXT BOOK(S): N.D. Bhatt, Machine Drawing, Charotar Publishing House Pvt. Ltd., 2014	Unit V REAL	PRODUCTS TO MACHINE DRAWING CO	NVE	RSI	ON	di na da c	*	dise .		07
F.S.Gill, A TEXIDOOK OF Machine Drawing, Natson books, 2013	engine parts, co components screv sheet. EXT BOOK(S): N.D. Bhatt, Ma	nnecting rod, couplings - universal coup v jack, stuffing box - Commercial products -	ling, Prepa	mao aratio	chine on of	tool p Bill of ma	arts - ta	ilstock, Au	utom	nobi
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2. K.C. John, Textbook of Machine Drawing, PHI Learning Pvt. Ltd., 2009

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Department	MECHANICAL ENGINEERING				R 2019	Semester IV	M			
Course Code	Course Name		Hours / Week				Credit	Total	Maximur	n
19ME407	MANUFACTURING TECHNOLOGY	L	т	Р	С	Hours	Marks			
	LABORATORY	0	0	2	1	30	100			
To learn the baTo know the grid	e(s): The purpose of learning this course is: sic machining operations using lathe machin nding machine operations.	ne.								
	ing on machining operations through milling on drilling operations. for making a product using various machin					ting.				

- •
- Produce components as per the given drawing using lathe machine. Perform surface finish operation using grinding machines. Make components using milling, gear hobbing and slotting machines. •
- Perform operations using drilling machines. .
- Make a product using machining operations. .

Exp No. Name of Experiments

- 1 Exercise on turning, threading, taper turning and boring.
- Exercise on surface grinding, cylindrical grinding and internal grinding. 2
- 3 Exercise on milling, gear hobbing and Slotting.
- Exercise on drilling, tapping and reaming. 4
- To make one of the following product: gear box/direct indexing/pump/press tool/progressive 5
 - die/screw jack/single cavity mould.

1	LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS	
S. No	NAME OF THE EQUIPMENT	Qty.
1	Turret and Capstan Lathes	1 No each
2	Horizontal Milling Machine	1 No.
3	Vertical Milling Machine	1 No
4	Surface Grinding Machine	1 No.
5	Cylinderical Grinding Machine	1 No.
6	Radial Drilling Machine	1 No.
7	lathe Tool Dynamometer	1 No.
8	Milling Tool Dynamometer	1 No.
9	Gear Hobbing Machine	1 No.
10	Tool Makers Microscope	1 No.
11	CNC Lathe	1 No.
12	CNC Milling machine	1 No.
13	Gear Shaping machine	1 No.
14	Centerless grinding machine	1 No.
15	Tool and cutter grinder	1 No.

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Department	MECHANICAL ENGINEER	RING				R 2019	Semester IV	EE
Course Code	Course Name	Ho	urs/V	Veek	Credit	Total Hours	Maximum M	arke
Course Coue	Course Name	L	т	Р	С	Totarriours		
19TP401	QUANTITATIVE APTITUDE, LOGICAL REASONING AND VERBAL ABILITY - III	0	0	2	0	30	100	
 To expo 	tive(s): The purpose of learning this course is se the undergraduate students on methods ar rammar, effective communication, Managerial	nd p						in
Demons taken to Evaluate factors. To unde To excel To know UNIT 1 DA Introduction to	me(s): At the end of this course, learners will trate various principles involved in solving mar solve Aptitude Questions. e critically the real life situations by resorting an rstand the importance of Non-Verbal Community in Verbal Communication Skills and being efficiency of improving the presentation Skills. TA SUFFICIENCY, SIMPLE AND COMPOUN Data Sufficiency - Overview of the wide varied	them nd a nicati fectiv ND II ety o	natica nalyz ion a ve in i NTEF f Dat	al prot ing an nd its it. REST ia Sul	nalytical i clues.	reasoning of k	ey issues and	
how to determi and Compound	ne what information is sufficient to solve a giv I Interest – Principal – Rate of Interest –Amou	ven p	oroble	em –	Commor			tere
Introduction - B	UAL REASONING & BLOOD RELATION asic concepts - Odd man out - Next series - M	Airro	' ima	ge an	d water i	mage Introduc	ction - Basic	0
1744 and 1944	of relation - Tree diagram – Relations							
V 92	N-VERBAL COMMUNICATION		-					0
	Non-Verbal Communication – Gesture – Post	ure -	- Pos	itive a	and Nega	ative Non-Verb	bal Clues.	
	RBAL COMMUNICATION	-		rhal () o ma ma u mi	action Tine t	la Ouereema f	0
importance or v	Jorhol Communication Time and Tricks to las	prov	e ve	rbal C	ommuni	cation - Tips i	to Overcome r	
	/erbal Communication – Tips and Tricks to Im void filler in Verbal Communication							rom
MTI – Tips to a	Verbal Communication – Tips and Tricks to Im void filler in Verbal Communication ESENTATION SKILLS					in the second second		
MTI – Tips to a UNIT 5 PR	void filler in Verbal Communication	rcise						_

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Department	MECHANICAL EN	GINEEF	RING			R 2019	Semester IV	ES
Course Code	Course Name		lour Wee		Credit	Total Hours	Maximum	
19ES406	INTERNET OF THINGS	L	т	Р	С		Marks	
	INTERNET OF THINGS	3	0	0	3	45	45 100	
 To understan To identify the To understan To understan): The purpose of learning this course d what internet of thing is. e various elements of IoT system d the various means of communication d cloud computing &its relevance in Ion pes of data analytics and data visualized	n from N T						arne
and challenges w	nile implementing IoT solutions	ation too	ois a	na m	ake stude	ents aware o	r security conce	err

Course Outcomes: At the end of this course, learners will be able to:

- Explain what Internet of things is.
- Describe components of IoT Architecture and platforms of IoT Ecosystem.
- Describe and choose sensors and actuators.
- Describe and implement Edge Network.
- Describe Big data analytics, transform data and draw meaningful conclusions, identify the DIY open source electronic platforms.

Unit I INTRODUCTION TO IoT

Definition of IoT- Evolution of IoT- IoT and related terms- Business scope.

Unit II ELEMENTS OF IoT

Introduction to Elements of IoT- Basic Architechture of an IoT Application Sensors & Actuators- Edge Networking (WSN) – Gateways- IoT Communication Model- WPAN & LPWA.

Unit III COMMUNICATION AND CONNECTIVITY TECHNOLOGIES

Cloud Computing in IoT- IoT Communication Model- Cloud Connectivity.

Unit IV DATA ANALYTICS AND IOT PLATFORMS

Big Data Analytics- Data Visualization- IoT Platforms.

Unit V CONCERNS AND FUTURE TERNDS, HANDS-ON PROJECTS

Different Players of IoT- Security Concerns and Challenges- Future Trends- Standards Internet of Things(IoT). DIY Kits – IFTTT and other apps. Applications of IOT in Manufacturing, Automotive and Power Industries.

TEXT BOOK(S): 1. "The Internet of Things" by Samuel Greengard 2. "The Fourth Industrial Revolution" by Klaus Schwab

REFERENCE(S):

1.	"Getting started with Internet of Things" by Cuno Pfister
2.	"Learning Internet of Things" by Peter Waher
3.	"Precision: Principles, Practices and Solutions for the Internet of Things" by Timothy Chou
4.	"The Second Machine Age: Work, Progress and Prosperity in a Time of Brilliant Technologies" by Erik Brynjolfsson and Andrew McAfee

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Department	MECHANICAL ENGIN	IEER	ING			R 2019	Semester V	/ PC
Course Code	Course Name		lour Wee		Credit	Total	Maximu	m
0.11.6		L	т	Ρ	С	Hours	Marks	5
19ME501	DESIGN OF MACHINE ELEMENTS	3	1	0	4	60	100	
 To learn the To study the To provide To provide loads. To study the To study t	ive (s): The purpose of learning this course is: the design procedure of machine elements subject the design procedure of shafts and couplings. The knowledge on the design of bolted and welder the knowledge on the design of helical, leaf and the selection procedure of sliding and rolling courses. At the end of this course, learners will be chine elements subjected to simple and variable aft and couplings for various engineering applic ted and welded joints subjected to static load. ical, leaf and torsional springs subjected to course	ected d join torsi ntact able le loa ation	ts. onal bear to: ads. s. t and	spri ings.	ings subj	ected to co		iriable
	able bearings for axial and radial loading condi	tions	from	n mar	nufacture	rs "catalogue	9.	
1. (B)/10	EADY AND VARIABLE STRESSES				~	1.0		12
	the design process - Design of straight and Design for variable loading - Soderberg, Goo							ess
- Theories of fa		umai	i, Ge	erber	methous		ieu silesses	
		-					2	12
		Dee		f sini	d flamma	ounling D	anian of flowib	
coupling.	s based on strength, rigidity and critical speed.	Des	ign c	or rigi	d hange d	coupling - De	esign of nexib	e
		_						12
and the state of the	ESIGN OF JOINTS					<i>.</i>		1.1.1.1
	ed joints - stresses due to static loading, eccen							
and the second se	oints - Strength of parallel and traverse fillet we SIGN OF SPRINGS	elded	JOIL	its - t	=ccentrica	ally loaded jo	oints.	12
					0: 1			12
	nnections and design parameters. Design of he ngs. Design of leaf and torsional springs under							r.
	SIGN OF BEARINGS	en en Mer	aus tu	147 (A)	ather and	the start	and and a start of	12
	ection criteria - Design of journal bearings - De	sian	of ro	lling	contact b	earing Ball a	and roller bear	
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	· · · · · · · · · · · · · · · · · · ·	<u>.</u>						
TEXT BOOK(S):	1		1			1. J. M.	
	ndari, Design of Machine Elements, Tata McGr	aw-H	ill Pu	ublisł	ning Com	pany Pvt. Lt	d., New Delhi	0
	Mechanical Engineering, PSG College of Tech m, 2013.	nolog	gy, C	Desig	n Data B	ook, M/s.Ka	ai kathir	
REFERENCE(3):	A	-					
1. J. E. Shigi	ey and C. R. Mischke, Mechanical Engineer Pvt. Ltd., New Delhi, 2011.	ing C	Desig	gn, T	ata McG	iraw-Hill Pu	blishing	
2 B.C. Juvi	all and K. M. Marshek, Fundamentals of Mach	nine (om	one	nt Design	John Wiley	18 Sons New	

- Delhi, 2011. 3. R. L. Norton, Design of Machinery, Tata McGraw-Hill Publishing Company Pvt. Ltd., New Delhi, 2004.
- 4. M. F. Spoutts, T. E. Shoup and I. E. Hornberger, Design of Machine Elements Pearson Education, 2006.

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Department	MECHANICAL ENG	INEER	ING			R 2019	Semester V	P							
Course Code	Course Name		lour Wee		Credit	Credit	Credit	Credit	Credit	Credit	Credit	Credit	Total	Maximun	1
and the second second		L	Т	Ρ	С	Hours	Marks								
19ME502	DYNAMICS OF MACHINES	3	0	0	4	45	100								
 To impart know To provide know To study the wo To learn the con To learn the con Course Outcomes: Perform dynam Estimate the basis Compute the ra Evaluate the na 	s): The purpose of learning this course is verified in dynamic analysis of simple med wedge on balancing of rotating and recip orking principle of governor and gyroscop ncept of free and forced vibration. Incept of transverse and torsional vibration At the end of this course, learners will b ic analysis of simple mechanism and devilancing mass for rotating and reciprocation inge of speed for governor and gyroscop itural frequency of single degrees of free	chanisr procati pe. on. e able sign of ing ma nic effect dom sy	to: flyw sses ct of yster	heel by u ship n sul	using the fand aero	force and co plane free and for	rced vibration.								
 Calculate the na 	atural frequency of transverse and torsio	nal vib	ratio	n of :	single, two	o and three	rotors system.								
Unit I DYNAM	IC FORCE ANALYSIS OF MECHANIS	MS		17	1000			09							
	sition, Condition for dynamic analysis, D							sm							
	sis. Turning moment diagram for stea	am &	IC E	ingin	e. Energy	stored in fly	wheel,								
	eel rim, Flywheel in punching press.		-			· · · · · · · · · · · · · · · · · · ·									
Unit II BALAN					Carlon Carlos		11.11.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	09							
	balancing and dynamic balancing, Balar														
coupled locomotives	ancing of reciprocating mass Swaying co	upie, i	racu	ive ic	fice, nam	mer blow. c	balancing of								
and the second se						- Paros Al		09							
	ogy, Working principle, Types - Watt, Po	rter an	d Pro		overnor	Characterist	and the second sec	100							
	ting, Ichoronisn, Stability. Gyroscope- Gy														
on aero planes and				ALC: NO.											
Unit IV FUNDA	MENTAL OF VIBRATION							09							
	ology, Classification, elements of vibration														
	mping) - Damping ratio and logarithmic	decren	nent.	Ford	ce dampe	d vibration -	Magnification								
1	ation and transmissibility.	100			Cal trained										
	VERSE AND TORSIONAL VIBRATION							09							
	n of shafts and beams Shaft carrying sev orsional vibration-Torsionally equivalent														
encer of includ off a	ersienal vibratien-refsienally equivalent	onan,	ang				e rotor system.								
EXT BOOK(S):		-			1967 - 197	an sharadayin									
	heory of Machines, Tata McGraw Hill Pu	blishin	a Co	mpa	nv Pvt. Lt	d. New Del	hi. 2014.	-							
2. John J Uichker	and Joesph E. Shigley, Theory of Machi Ltd., New Delhi, 2005.														
REFERENCE(S):		1			A Security										
							A COLORADO								
	kar Mechanism and Machine Theory D	rentico	Hall	of	dia Now	Delhi 2000		_							
1. Ashok G Ambel 2. R. L. Norton, Ki	kar, Mechanism and Machine Theory, Pinematics and Dynamics of Machinery,		100000000000000000000000000000000000000		and the second se			_							
 Ashok G Ambel R. L. Norton, Ki New Delhi, 200 	nematics and Dynamics of Machinery,	Tata M	lcGr	aw ł	Hill Publis										

R. L. Norton, Kine New Delhi, 2005. Machinery, Tata McGraw Hill Publishing Company Pvt. Ltd, N. S. N. and

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Department	MECHANICAL ENG	CHANICAL ENGINEERING				R 2019	Semester V	PC
Course Code	Course Name		lour Wee	1000	Credit	Total	Maximum	
	HEAT AND MASS TRANSFER	L	т	Ρ	С	Hours	Marks	
19ME503	HEAT AND MASS TRANSFER	3	0	0	3	45	100	

- To impart the knowledge of conduction heat transfer mechanisms.
- To provide the knowledge on the principles of free and forced convection.
- To study the performance of various types of heat exchange. .
- To impart the knowledge on black body radiation and grey body radiation. .
- To learn about diffusion and convective mass transfer. .
- Course Outcomes: At the end of this course, learners will be able to:
- Apply the heat conduction equation to compute the rate of heat transfer in simple and composite systems Assess the convection phenomena and select appropriate correlation to determine the rate of heat transfer in free and forced convection
- Compare the thermal performance of various types of heat exchangers using LMTD and NTU
- approach
- Determine the rate of radiation heat transfer in black and grey bodies.
- Find the mass transfer rate in diffusion and convective mass transfer applications.

Unit I CONDUCTION

Basic concepts - Mechanism of Heat transfer. Conduction - Fourier's Law, General differential equation in Cartesian and cylindrical coordinates, one dimensional steady state heat conduction, conduction through plane wall, cylinders and spherical systems. Composite Systems. Extended surfaces. Transient heat conduction -Lumped systems, Infinite and semi-infinite solids, Use of Heisler charts.

Unit II CONVECTION

Basic Concepts - Heat transfer coefficients, boundary layer concept. Types of convection - Forced convection, dimensional analysis, non-dimensional numbers, external flow, flow over plates, cylinders and spheres, internal flow, laminar and turbulent flow, combined laminar and turbulent. Free convection - Dimensional Analysis, flow over vertical plate, horizontal plate.

Unit III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS

Modes of boiling - Nusselt's theory of condensation, types of condensation - correlations in boiling and condensation. Heat exchangers - Types, heat exchanger analysis, fouling factor, LMTD (Logarithmic mean temperature difference) and Effectiveness - NTU (number of transfer units) Method - Overall Heat Transfer Coefficient.

Unit IV RADIATION

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Laws of Radiation- Stefan-Boltzmann Law, Kirchhoff's Law - Black body radiation - Grey body radiation - Shape factor algebra - Electrical analogy - Radiation shields.

Unit V MASS TRANSFER

Basic concepts - Diffusion mass transfer - Fick's law of diffusion, Steady state molecular diffusion. Convective mass transfer, momentum, heat and mass transfer analogy, convective mass transfer correlations.

TEXT BOOK(S):

- R. C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New Age International private 1. limited, New Delhi, 2010.
- 2. Yunus A.Cengel, Heat and Mass Transfer: a Practical Approach, Tata McGraw Hill publishing Company private limited, New Delhi, 2007.

REFERENCE(S):

J. P. Holman, Heat Transfer, Tata McGraw Hill publishing Company private limited, New Delhi, 2009.

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2.	C. P. Kothandaraman and S. Subramanyan, Fundamentals of Heat and Mass Transfer, New Age International private limited, New Delhi, 2014.
3.	Frank P. Incropera, Fundamentals of Heat and Mass Transfer, John Wiley, New Delhi, 2007.
4.	R. K. Rajput, Heat and Mass Transfer, S Chand and Company, New Delhi, 2009.

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Department	MECHANICAL ENGINE	ERINO	G			R 2019	Semester V	PC
Course	Course Name		lours Wee		Credit	Total Hours	Maximu Marks	
Code		L	Т	Р	C C			-
19ME504	NON - DESTRUCTIVE TESTING	3	0	0	3	45	100	
To learn To provid To provid To provid To study To study Course Outcon Select ap Explain th Select an Apply rad Choose th Unit I SUF Soncepts of Non- f NDT technique irrect and remote roperties of liquid f penetrants to p Unit II MA lagnetic Particle	ve (s): The purpose of learning this course i different surface inspection techniques. le knowledge on magnetic particle testing. It knowledge on ultrasonic testing method. le knowledge on radiography testing method various special non destructive testing method various special non destructive testing method propriate surface inspection techniques for the magnetic particle testing method for ferror d explain the suitable testing method for testing iography testing methods for different suitable he suitable special non-destructive technique RACE TECHNIQUES Destructive testing (NDT) - Discontinuities a explain inspection and Aides-Liquid Penetra d penetrants and developers - Preparation of arts - Fluorescent penetrant test. GNETIC PARTICLE TESTING Testing (MPT) Principles, applications - Ma fet fluorescent particle technique, demagnet	l. be able the con us mat ting int ble appl for varie and De ations (nt Test of test n agnetiz	npon erials ernal licatio ous a fects ASM ing (I nater	in va E, AS PT) ials -	cts. tions. arious mar STM, AWS Principles Advantag hods, mag	nufacturing S) - Visual - Types ar es and limi	or Optical Tend itations - Appli icles, - Dry p	estin catio 0 artic
strumentation a Jnit III ULT trasonic Testing spection metho	Principle, Instrumentation and application nd applications of Eddy Current Testing (EC RASONIC TESTING g (UT) Principle, Types and characteristics ds-Pulse echo, Transmission and Phased eam inspection of welds, Calibration of AS Applications.	of Ultr	ason tec	ic wa	aves, Atte	enuation, C T), Types	Couplants, Pros	obes gar
state strength with land in contrast of it statistic for any state	DIOGRAPHY TESTING	Start & Rep	10.100	1.11.11.1	it also see a	1997		0
adiographic tes cattering-Filters ormation, Expos quivalence. Pen	ting (RT) Principle, Sources of X-rays an and screens, imaging modalities - Film radi ure factors, film handling and storage Inv etrometers, Safety in radiography, Applicatio ECIAL TECHNIQUES	iograph verse s	iy an	d Dig	ital Radio	graphy - F	Problems in sh	rption nado raphi
coustic Emission ed Thermograp rocedure and isadvantages.	Testing (AET) Principle - Advantages an hy (IRT), Contact and non-contact inspe applications, LASER Shearography - Ty	ction r	netho	ods,	Pressure	and Leak	Testing - T	estin
EXT BOOK(S):				10	7/11	and the second se		-
	Jayakumar T, Thavasimuthu M, Practical	Non-D	estru	ictive	Testing,	Narosa P	ublishing, 199	7.
EFERENCE BO		-1-0	100		2			1
	le,Non-Destructive Testing, McGraw Hill Boo			17	1			
	nd Vernon John, Non Destructive Testing, M				of Matal	Matala		
 V-17, Non-I ark, Ohio, USA, 	Destructive Evaluation and Quality Control, A 2001	America	an Sc	ciety	or Metals	, Metals		
ky '	الحج المراجع			2		N.A	mit	P.

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S. No	NAME OF THE EQUIPMENT	Qty.
1	Cam follower setup.	1 No.
2	Motorised gyroscope.	1 No.
3	Governor apparatus - Watt, Porter, Proell and Hartnell governors.	1 No
4	Whirling of shaft apparatus.	1 No.
5	Dynamic balancing machine.	1 No.
6	Two rotor vibration setup.	1 No.
7	Spring mass vibration system.	1 No.
8	Torsional Vibration of single rotor system setup.	1 No.
9	Gear Models	1 No.
10	Kinematic Models to study various mechanisms.	1 No.
11	Turn table apparatus.	1. No.
12	Transverse vibration setup of cantilever	1 No.
13	Micrometer	1 No.
14	Vernier Caliper	1 No.
15	Vernier Height Gauge	1 No.
16	Vernier depth Gauge	1 No.
17	Slip Gauge Set	1 No.
18	Gear Tooth Vernier	1 No.
19	Sine Bar	1 No.
20	Floating Carriage Micrometer	1 No.
21	Profile Projector / Tool Makers Microscope	1 No.
22	Mechanical / Electrical / Pneumatic Comparator	1 No.
23	Autocollimator	1 No.
24	Temperature Measuring Setup	1 No.
25	Force Measuring Setup	1 No.
26	Torque Measuring Setup	1 No.
27	Surface finish measuring equipment	1 No.
28	Bore gauge	1 No.
29	Telescope gauge	1 No.

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Department	MECHANICAL ENGIN	EERI	NG			R 2019 Semester V		
Course Code	Course Name		lour Wee	100000	Credit	Tot	Tot Maximum	
19ME505	DYNAMICS & METROLOGY AND MEASUREMENTS LABORATORY	L	т	Р	С	al Hour s	Maximui Marks	s
		0	0	4	2	60	100	

To impart knowledge in dynamic analysis of simple mechanism and design of flywheel.

• To study the working principle of governor and gyroscope.

To study the heat transfer phenomena of conduction

· To study the heat transfer phenomena predict the relevant coefficient using implementation

To study the performance of refrigeration cycle / components

Course Outcomes: At the end of this course, learners will be able to:

· Perform dynamic analysis of simple mechanism and design of flywheel.

Compute the range of speed for governor and gyroscopic effect of ship and aero plane

Conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials

· Conduct tests on natural and forced convection heat transfer apparatus and radiation apparatus

Conduct tests to evaluate the performance of refrigeration and air-conditioning test rigs.

Exp NO.	Name of Experiments
1	Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2	Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.
3	 a) Determination of Mass moment of inertia of Fly wheel and Axle system. b)Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus. c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4	Motorized gyroscope – Study of gyroscopic effect and couple.
5	Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6	Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7	 a) Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination. b) Multi degree freedom suspension system – Determination of influence coefficient.
8	 a) Determination of torsional natural frequency of single and Double Rotor systems Undamped and Damped Natural frequencies. b)Vibration Absorber – Tuned vibration absorber.
9	Vibration of Equivalent Spring mass system – undamped and damped vibration.
10	Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
11	a) Balancing of rotating masses. (b) Balancing of reciprocating masses
12	 a) Transverse vibration of Free-Free beam – with and without concentrated masses. b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies. c) Determination of transmissibility ratio using vibrating table.
13	Calibration and use of measuring instruments – Vernier caliper, micrometer, Vernier height gauge – using gauge blocks.
14	Calibration and use of measuring instruments – depth micrometer, bore gauge, telescopic gauge.
15	Measurement of linear dimensions using Comparators.
16	Measurement of angles using bevel protractor and sine bar.
17	Measurement of screw thread parameters – Screw thread Micrometers and Three wire method "(floating carriage micrometer).
18	Measurement of gear parameters – disc micrometers, gear tooth vernier caliper.
	Non-contact (Optical) measurement using Toolmaker s microscope / Profile projector and Video measurement system.
20	Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments.
	Machine tool metrology – Level tests using precision level; Testing of straightness of a machine tool guide way using Autocollimator, spindle tests.
22	Measurement of force, torque and temperature:

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Departm	nent	MECHANICAL ENG	SINEEF	RING	i		R 2019	Semester	v
Course C	ode	Course Name		Hours / Week		Credit	Total	Maximu	ım
19ME5	EOC	MPUTER AIDED MODELLING	L	Т	Ρ	c	Hours	Marks	
ISMES		LABORATORY	0	0	2	1	30	100	
To p mod	provide knowled lelling software.	e purpose of learning this course ge and skills to draw orthographic e for creating three dimensional a	c projec						с
• To p CAE • To p	ponents using C provide knowledg) software.	AD Software. ge on generating 3D assembly m ge on three dimensional model of	odels c	of fev	v ma	chine eler	ments using		
		ledge to prepare the technical do	oumon	to fo	r tho	aivon oor	nnononte ur	ing coffwore	
Soft Cons Crea	ware. struct the three o ate the animatior	ensional assembly models of few dimensional assembly models of n of simple mechanisms using C/ al documents for the given compo	machir AD soft	ne el ware	emer	nts using (U	
xp No. Na	me of Experim	ente		-					
		phic view of machine componen	ts from	the	aiver	isometri	c drawings		
2 Co	nstruct a three of	limensional assembly model of b	earing		giver	loometri	o uruningo.	1 1 1 M	
3 Ge		limensional shaft and coupling as			del b	y conside	ering tolerand	ce in each	1
		ensional assembly model of Pist	on and	Con	necti	na Rod.			
- 5 Bu		nsional assembly model of power							
6 Cre		ensional assembly model of two				sion syste	em.		
7 Co	nstruct a three o	limensional assembly model of c	ontrol v	alve			ter to children		
		imensional assembly model of Ji							
sof	tware.	ensional assembly model of simp						g using mod	elin
10 Pre	epare technical of	ocuments for an I.C. Engine Ass	sembly	by u	sing	3D Via so	oftware.	an and a second state of the	10000

S. No	NAME OF THE EQUIPMENT	Qty.
1	Computer Server	1
2	Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server	30
3	A3 size plotter	1
4	Laser Printer	
5	Any High end integrated modeling and manufacturing CAD / CAM software	15 Licenses
6	Licensed operating system	Adequate
7	Support for CAPP	Adequate

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Department	MECHANICAL ENGINEE	RING	3			R 2019	Semester	V
Course Code	Course Name			/eek	Credit	Total Hours	Maximum Ma	ark
19TP501	QUANTITATIVE APTITUDE , LOGICAL REASONING & VERBAL ABILITY- IV	IANTITATIVE APTITUDE , LOGICAL		С 0	30	100	1	
Course Obiec	tive (s): The purpose of learning this course	is:				1		-
	o strategies for vocabulary development.							
	the undergraduate students to such methods	s and	prac	ctices	that help	, develop and	d nurture qualit	ies
such as ch	aracter, effective communication, aptitude an	nd hol	ding	ethica	al values			
	e the time during each activity in their career	_						
	mes: At the end of this course, learners will t							
Calculate fraction mu	percentages in real life contexts , find any per ultiplication and increase / decrease a given v	rcenta	age c	of a gi	ven who	le using their	knowledgeof	
	olutions the Ratio, Proportions and Variation.	vnole	by a	perc	entage.			
	e percentage gain or percentage loss.							
	eir performance in the verbal ability sections	of dif	ferer	t con	petitive	examinations.		
Manage th	e time for various activities in day to day life.	-						
UNIT 1 PE	RCENTAGES & AVERAGES							0
	efinition and Utility of percentage - importanc						e calculations	13
	centage values through additions - fraction to	nerce	entac	ne cor	oversion	table		
							3	
Introduction - a	verage of different groups - addition or remov						placement of	
some of the ite	verage of different groups - addition or remover ms.	val of	item	s and	change		placement of	0
some of the ite	verage of different groups - addition or removes ms. TIO, PROPORTIONS AND VARIATION & P	ROFI	item	s and	change	in average re		0
some of the ite UNIT 2 RA Introduction- R	verage of different groups - addition or removes ms. TIO, PROPORTIONS AND VARIATION & P atio- properties-dividing a given number in	ROFI	item	s and ND LC ratio	change DSS - comp	in average re arison of ratio	os - proportior	ıs -
some of the ite UNIT 2 RA Introduction- R useful results	verage of different groups - addition or removes ms. TIO, PROPORTIONS AND VARIATION & P atio- properties-dividing a given number in on proportion- continued proportion - relati	ROFI the g	item	s and ND LC ratio g the	change DSS - comp quantitio	in average re arison of rational es more than	os - proportion 1 two – variat	ns - ion.
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Chairman - BoS Dept. of Mech Engg. - ESEC

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Department	MECHANICAL E	MECHANICAL ENGINEERING					Semester	V
Course Code	Course Name	Hours / Week Credit		Great		Total	Maximum	
-1921		L	т	Р	С	Hours	Mark	s
19HS501	CAREER SKILLS	0	0	2	1	30	100	

 To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E. Degree Course through periodic exercise.

Course Outcomes: At the end of this course, learners will be able to:

Understand and comprehend any given problem related to mechanical engineering field.

METHOD OF EVALUATION:

The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

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Chairman - BoS Dept. of Mech Engg. - ESEC

Course Code Course Name Hours / Week Credit L Total Hours Maximum Marks 19ME601 DESIGN OF TRANSMISSION SYSTEMS 3 1 0 4 60 100 Course Objective (s): To learn the design procedure of betal and rope drives. To learn the design procedure of bevel and worm gear drives. To learn the design procedure of bevel and worm gear drives. To learn the design procedure of the bevel and worm gear drives. To study the design procedure of this course, learners will be able to: Design of bevel and worm gear drives. Draw the kinematic and ray diagrams for multi stage gear boxs. Design of spur and helical gear drives. Design of students for design for LC engine Components. 15 Need for power transmission - Types and classification of transmission systems, Applications, Limitations. Belt drives - Types, materials and construction, Selection of flat and V-belts from manufacturer's catalogue. Wire Ropes- Construction, Rope lay, Stresses in wire rope, Failure of ropes 10 Spur and Helical gears. Unit I DESIGN OF SPUR AND HELICAL GEARS 10 Spur and Helical gears. Unit II DESIGN OF BEVEL AND WORM GEARS 15 Bevel Gear- Introduction, Gear design, Force analysis, Tooth stresses - Beam strength calculation - Failure in gears. 15 Bevel Gear- Introduction, Types, Geometry, Angle relations, Basic dimensions, Force analysis. Worm Gear - Introduction, Types, Geometry, Basic dimensions, Force analysis. Worm Gear - Introduction, Types, Geometry, Basic dimensions, For	Department	MECHANICAL ENGIN	EER	ING			R 2019	Semester	vi
Code L T P C 19ME601 DESIGN OF TRANSMISSION SYSTEMS 3 1 0 4 60 100 Course Objective (s): The purpose of learning this course is: To take design procedure of spur and helical gear drives. To learn the design procedure of multi stage gear box. To take the design procedure of multi stage gear box. To familiarize the students for design of LC engine components. To familiarize the students for design of LC engine components. To familiarize the students for design of LC engine components. To familiarize the students for design of LC engine components. Design of belt and rope drives. Design of belt and rope drives. Design of Spur and helical gear drives. Design of Retchet & Pawl, Geneva mechanisms and LC. Engine Components. Unit I DESIGN OF FLEXIBLE ELEMENTS Meed for power transmission - Types and classification of transmission systems, Applications, Limitations. Belt drives - Types, materials and construction, Selection of fait and V-belts from manufacturer's catalogue. Wire Ropes Construction, Rope lay, Stresses in wire rope, Failure of ropes Unit II DESIGN OF SPUR AND HELICAL GEARS Sur and Helical gears. Introduction, Gear design, Force analysis, Tooth stresses - Beam strength calculation - Failure in gears. Introduction, Types, Geometry, Angle relations, Basic dimensions, Force analysis. Worm Gear - Efficiency - Heat removal calculations. Introduction frumery figs reading speed. Unit IV DESIGN OF MECHANISMS AND LC. ENGINE MACHINE COMPONENTS 10		Course Name	1			Credit		-	
Course Objective (s): The purpose of learning this course is: To study the design procedure of spur and helical gear drives. To learn the design procedure of bevel and worm gear drives. To study the design procedure of bevel and worm gear drives. To familiarize the students for design of 1.C engine components. Course Outcomes: At the end of this course, learners will be able to: • Design of bevel and worm gear drives. • Draw the kinematic and ray diagrams for multi stage gear boxes. • Design of not bevel and worm gear drives. • Design of facthet & Pawl, Geneva mechanisms and 1.C. Engine Components. Unit I DESIGN OF FLEXIBLE ELEMENTS Need for power transmission - Types and classification of transmission systems, Applications, Limitations. Belt drives - Types, materials and construction, Selection of flat and V-belts from manufacturer's catalogue. Wire Ropes- Construction, Rope lay, Stresses in wire rope, Failure of ropes Unit II DESIGN OF SPUR AND HELICAL GEARS Spur and Helical gears- Introduction, Gear design, Force analysis, Tooth stresses - Beam strength calculation - Failure in gears. Unit II DESIGN OF BEVEL AND WORM GEARS Unit II DESIGN OF BEVEL AND WORM GEARS ID 15 Bevel Gear- Introduction, Types, Geometry, Angle relations, Basic dimensions, Force analysis. Worm Gear - Introduction, Types, Geometry, Angle relations, Basic dimensions of	Code		L	т	Р	С	nours	marks	
To study the design procedure of belt and rope drives. To learn the design procedure of spur and helical gear drives. To learn the design procedure of bevel and worm gear drives. To study the design procedure of multi stage gear box. To familiarize the students for design of 1C engine components. Course Outcomes: At the end of this course, learners will be able to: Design of belt and rope drives Design of bevel and worm gear drives. Design of bevel and helical gear drives. Design of bevel and worm gear drives. Design of Ratchet & Pawl, Geneva mechanisms and 1.C. Engine Components. Unit I DESIGN OF FLEXIBLE ELEMENTS 15 Need for power transmission - Types and classification of transmission systems, Applications, Limitations. Belt drives - Types, materials and construction, Selection of flat and V-belts from manufacturer's catalogue. Wire Ropes- Construction, Rope lay, Stresses in wire rope, Failure of ropes Unit II DESIGN OF SPUR AND HELICAL GEARS 10 Spur and Helical gears- Introduction, Gear design, Force analysis, Tooth stresses - Beam strength calculation - Failure in gears. Unit III DESIGN OF BEVEL AND WORM GEARS 15 Bevel Gear- Introduction, Types, Geometry, Angle relations, Basic dimensions, Force analysis. Worm Gear-Introduction, Types, Geometry, Angle relations, Basic dimensions, Force analysis. Worm Gear-Introduction, Types, Geometry, Basic dimensions - Forces on worm and worm wheel - Mode of failures - Efficiency - Heat removal calculation - Ray diagram - Kinematics layout. Design of multi stage gear boxes, Calculation of number of teeth and overlapping speed. Unit V DESIGN OF MECHANISMS AND I.C. ENGINE MACHINE COMPONENTS 10 Gear Box - Geometric progression - Standard step ratio - Ray diagram - Kinemat	19ME601	DESIGN OF TRANSMISSION SYSTEMS	3	1	0	4	60	100	
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Unit IV DESIGN OF GEAR BOXES 10 Gear Box - Geometric progression - Standard step ratio - Ray diagram - Kinematics layout. Design of multi stage gear boxes, Calculation of number of teeth and overlapping speed. 10 Unit V DESIGN OF MECHANISMS AND I.C. ENGINE MACHINE COMPONENTS 10 Design of Ratchet & pawl mechanism and Geneva mechanism Design of IC engine components such Geneva as piston, connecting rod and crank shaft. 10 TEXT BOOK(S): 1. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, 2010. 2. R. L. Norton, Design of Machinery, Fifth Edition, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2011.	Introduction, Typ	bes, Geometry, Basic dimensions - Forces on							
gear boxes, Calculation of number of teeth and overlapping speed. 10 Unit V DESIGN OF MECHANISMS AND I.C. ENGINE MACHINE COMPONENTS 10 Design of Ratchet & pawl mechanism and Geneva mechanism Design of IC engine components such Geneva as piston, connecting rod and crank shaft. 10 TEXT BOOK(S): 1. V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, 2010. 2. R. L. Norton, Design of Machinery, Fifth Edition, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2011.	Unit IV DE	ESIGN OF GEAR BOXES						1.1	10
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 as piston, connecting rod and crank shaft. TEXT BOOK(S): V. B. Bhandari, Design of Machine Elements, Tata McGraw Hill Publishing Company Pvt Ltd., New Delhi, 2010. R. L. Norton, Design of Machinery, Fifth Edition, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2011. 	Unit V DES	SIGN OF MECHANISMS AND I.C. ENGINE M	ACI	INE	CON	PONEN'	TS	A star Dirty games (1)	10
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 2010. R. L. Norton, Design of Machinery, Fifth Edition, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2011. 	TEXT BOOK(S	·):					a"		
Delhi, 2011.	2010.	ndari, Design of Machine Elements, Tata McG	raw	Hill P	ublis	hing Com	pany Pvt L	td., New Dell	ni,
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	REFERENCE(S	5):		-	-		And Barry	Territory	

1.	B. J. Hamrock, B. Jacobson and S. R. Schmid, Fundamentals of Machine Elements, Third Edition, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2014.
2.	T. J. Prabhu, Design of Transmission Elements, Mani Offset, Chennai, 2008.
3.	S. G. Kulkarni, Machine Design, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2010.

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	MECHANICAL ENGINI	EER	ING			R 2019	Semester	v
Course	Course Name	570	lour Wee	11355	Credit	Total Hours	Maximur Marks	n
Code		L	Т	Р	С	induid	marks	6
19ME602	GAS DYNAMICS AND JET PROPULSION	S DYNAMICS AND JET PROPULSION 3 0 0 3 45				100		
 To resol Rayleigh flo To unde To apply To desci Course Outco Illustrate Resolve flow. Interpret Explain Demons 	rstand the fundamental principles of compress we the problems on isentropic flow through var w. rstand the effect of flow properties on normal s the basic gas dynamics theories for aircraft P ribe the working of solid propellant and liquid p mes: At the end of this course, learners will be the fundamental principles of compressible flo the problems on isentropic flow through varial the effect of flow properties on normal shock. the basic gas dynamics theories for aircraft pro trate the working of solid propellant and liquid DMPRESSIBLE FLOW FUNDAMENTALS	iable ropu rope able ow. ole a	area k. Ision Ilant e to: area	a duc syste duct	ems. et engines s, Fanno ms.	flow and l	Rayleigh	09
	ompressible flow - Integral and differential for	rms	of c	onse	rvation er	nuations ve	elocity of sou	
	various regimes of flow, wave propagation,							
agnation entha	lpy, stagnation temperature, stagnation pressu	ire a	nd s	tagna	ation dens	ity - critical		
	ies, reference Mach number. Effect of Mach n	umb	er or	l com	pressibilit	:y.		
Unit II FL	OW THROUGH VARIABLE AREA DUCTS				10. B			09
f Mach number	rough variable area ducts - effect of area cha , impulse function, mass flow rate equations, convergent and De lavel nozzle.							
	OW THROUGH CONSTANT AREA DUCTS							09
	t area ducts with friction (Fanno flow) Gov	ernir	na e	quati	ons, fanr	o curves a	and Fanno f	low
quations, variat	ion of flow properties, variation of Mach num e stagnation temperature change (Rayleigh Flo	iber w) -	with Gov	n du ernin	ct length g equatio	. Flow in ns,Rayleigh	constant a	rea
nd Rayleigh flow	v equation, variation of flow properties, maxim	unn	course, one care of			cigit now.		
nd Rayleigh flow	OW WITH NORMAL SHOCK	unn	1/1/6-3	1.1		cigit now.		09
nd Rayleigh flov Unit IV FL overning equatoressure and er npossibility of shock in Fanno a		pre: dtl	ssure equi	e, sta ation	atic tempe - Ran	erature, der kine Huge	nsity, stagnat	ion on.
nd Rayleigh flow Unit iV FLo overning equation ressure and en possibility of s nock in Fanno a	DW WITH NORMAL SHOCK ions - variation of flow properties like static ntropy across the normal shock - Pran shock in subsonic flows, flow in convergent	pre: dtl	ssure equi	e, sta ation	atic tempe - Ran	erature, der kine Huge	nsity, stagnat onoit equationshock - norm	ior on nal
nd Rayleigh flow Unit iV FLow overning equation FLow ressure and er Flow npossibility of sector Flow nock in Fanno a Flow Unit V AIF ircraft propulsion Flow cram jet and P Flow nd hybrid prop	DW WITH NORMAL SHOCK tions - variation of flow properties like static ntropy across the normal shock - Pran shock in subsonic flows, flow in convergent and Rayleigh flows.	pres dtl and h jet ust a catio	equa dive eng ugm n of	e, sta ation ergen ines. entat rocke	etic tempe - Ran t nozzle Performa ion in tu et engines	erature, der kine Hugo with normal ance of turl irbo jet er s. Propellar	nsity, stagnat onoit equation shock - norm boo jet engine ogine. Ram ots - solid, liq	ion on. nal 09 s - jet, uid
nd Rayleigh flow Unit IV FLow Governing equation FLow ressure and erressure and erressibility of schock in Fanno a Unit V AIF ircraft propulsion ircraft propulsion orrust, thrust power cram jet and P	OW WITH NORMAL SHOCK ions - variation of flow properties like static atropy across the normal shock - Pran shock in subsonic flows, flow in convergent and Rayleigh flows. CRAFT AND ROCKET PROPULSION on - types of jet engines, energy flow through wer, propulsive and overall efficiencies - thru ulse jet engines. Rocket Propulsion - Classific ellants, rocket engines thrust equation, effect	pres dtl and h jet ust a catio	equa dive eng ugm n of	e, sta ation ergen ines. entat rocke	etic tempe - Ran t nozzle Performa ion in tu et engines	erature, der kine Hugo with normal ance of turl irbo jet er s. Propellar	nsity, stagnat onoit equation shock - norm boo jet engine ogine. Ram ots - solid, liq	ion on. nal 09 jet, uid
nd Rayleigh flov Unit IV FLo Soverning equators ressure and erressure and erressure and erressure and erressure and erressure and erressure and ressure and ressure and propulsion incraft propulsion incraft propulsion incraft propulsion incraft propulsion formance. TEXT BOOK(S) 1. Patrick H.	OW WITH NORMAL SHOCK ions - variation of flow properties like static atropy across the normal shock - Pran shock in subsonic flows, flow in convergent and Rayleigh flows. CRAFT AND ROCKET PROPULSION on - types of jet engines, energy flow through wer, propulsive and overall efficiencies - thru ulse jet engines. Rocket Propulsion - Classific ellants, rocket engines thrust equation, effect	pres dtl and h jet ist a catio ctive	eng ugm n of jet	e, sta ation ergen ines. entat rocke veloc	etic tempe - Ran t nozzle v Performa ion in tu et engines city,specifi	erature, der kine Hugo with normal ance of turl irbo jet er s. Propellar ic impulse.	nsity, stagnat onoit equation shock - norm boo jet engine ogine. Ram ots - solid, liq	ion on. nal 09 jet, uid

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RE	FERENCE(S):
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2.	George P. Sutton and Oscar Biblarz, Rocket Propulsion Elements, 8th edition, John Wiley & Sons Inc., New York, 2010.
3.	S. M. Yahya, Fundamentals of Compressible Flow with Aircraft and Rocket Propulsion, 4th edition, New Age International private Limited, 2014.
4.	E. Rathakrishnan, Gas Dynamics, 5th edition, PHI Learning Private Limited, 2013.

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Department	MECHANICAL ENG	NEEF	RING		94 - 13	R 2019	Semester VI	PC
Course Code	Course Name	ŀ	lour		Credit	Total	Maximum	-
19ME603	FINITE ELEMENT ANALYSIS	L	Т	Р	С	Hours	Marks	
191412003		3	0	0	3	60	100	
 To provide k To study hea To provide k Course Outcomes: Apply the nu Apply one di Apply finite e 	nowledge in 1D elements. nowledge in 2D elements. at conduction problems using finite eleme nowledge on higher order and iso param At the end of this course, learners will be merical methods to formulate the simple mensional finite element method to solve element method for plane stress, plane si	etric e e able finite e bar, train a	to: elem bear nd a	ents. nent p m and axisyr	oroblems. d truss typ nmetric co	nditions.		
 dimensional 	emperature distribution of one and two di finite elements. merical methods to formulate the higher						ing one and two)
Unit I INTRODU	JCTION			- 10			1 2 2	0
natural and essentia	pe of finite element methods - strain vs o al boundary conditions - Rayleigh Ritz - (apes, types, size, location and numbers.	Galerk						
	IENSIONAL (1D) ELEMENTS			_				0
stiffness matrix, load truss element- prob	types-global, local and natural. shape fund d vector, boundry condition and assemble lems in 2D truss. Introduction to beam elemented	ly of g	lobal					
	IENSIONAL (2D) ELEMENTS	ormula	ation	Cor	atant Ctra	in Triongula		0
	inear triangular element-Finite element fo strain - axisymmetric elements - probler		ation	- Cor	istant Stra	ain Triangula	ar (CST) elemen	nt
	ANSFER APPLICATIONS	110.		-	1			0
	ID and 2D triangular element heat condu 1D and 2D triangular element heat condu element.						e boundary	
	ORDER AND ISOPARAMETRIC ELEM				14			09
convergence requir eight nodded Isopar quadrature method- EFERENCE(S):	of polynomial-linear, simplex, complex a ements. Iso, Sub and Super parametric rametric rectangular element using nature problems. Element Method in Engineering, Elsevier	c elem al coo	nent. rdina	Sha ate sy	pe functio	ons for a 2-	D four nodded	
 David V. Hutton, F Delhi,2005. 	Fundamentals of Finite Element Analysis	, Tata	Mc	Graw				ew
John Wiley, New I								
 T. R. Chandrupat Delhi, 2002. 	and A. D. Belegundu, Introduction to I	-inite l	Elem	ients	Engineen	ing, Pearso	n Education, Ne	:vv

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Department	MECHANICAL ENG	INEEF	ING			R 2019	Semester VI	PC
Course Code	Course Name	1.11	lour Wee		Credit	Total Maximum		
10115001	COMPUTER AIDED ANALYSIS	L	т	Р	С	Hours	Marks	
19ME604	LABORATORY	0	0	2	1	30	100	

- To introduce knowledge on the FEA software as a tool for truss and beam analysis
- To provide knowledge on applications having plane stress, plane strain and axisymetric conditions using FEA software.
- To impart knowledge in dynamic analysis using FEA software.
- To learn about temperature distribution for heat conduction using FEA software.
- To impart knowledge on coupled field analysis using FEA software.
- Course Outcomes: At the end of this course, learners will be able to:

• Analysis of trusses and beams using FEA software.

- · Apply plane stress, plane strain and axisymetric conditions using FEA software.
- · Dynamic analysis of simple structure using FEA software.
- Find temperature distribution for heat conduction using FEA software.
- Thermo-mechanical analysis of simple structure using FEA software.

Exp No.	Name of Experiments
1	Structural analysis of simple and composite trusses.
2	Structural analysis of cantilever beam, simply supported beam and fixed beam under different boundary conditions.
3	Stress analysis of a simple machine element.
4	Stress analysis under plane strain condition.
5	Stress analysis of pressure vessel subjected to an internal pressure
6	Dynamic analysis of a rotating shaft subjected to twisting moment.
7	Modal analysis of Cantilever, Simply supported and Fixed beams under different boundary conditions.
8	Harmonic analysis of Cantilever, Simply supported and Fixed beams under different boundary conditions.
9	Heat transfer analysis of 2D and 3D components under different boundary conditions.
10	Coupled field analysis.

	LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS	
S. No	NAME OF THE EQUIPMENT	Qty.
1	Computer Work Station	15
2	Color Desk Jet Printer	01
3	Multibody Dynamic Software Suitable for Mechanism simulation and analysis	15 licenses
4	C / MATLAB	5 licenses

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Department	MECHANICAL ENGI	R 2019	Semester VI	PC				
Course Code	Course Name	1.	lour Wee	1996 (1996)	Credit	Total Maxim		 m
		L	т	P	С	Hours	Marks	
19ME605	HEAT TRANSFER LABORATORY	0	0	2	1	30	100	

- To study the heat transfer phenomena of conduction
- To study the heat transfer phenomena predict the relevant coefficient using implementation
- To study the performance of refrigeration cycle / components

Course Outcomes: At the end of this course, learners will be able to:

- · Conduct tests on heat conduction apparatus and evaluate thermal conductivity of materials
- Conduct tests on natural and forced convection heat transfer apparatus and radiation apparatus
- · Conduct tests to evaluate the performance of refrigeration and air-conditioning test rigs

Exp No.	Name of Experiments				145	2.1
1	Guarded plate apparatus			5 14		200
2	Lagged pipe apparatus		0		1.1	1.2
3	Natural convection-vertical cylinder apparatus			1	1.0	1
4	Forced convection inside tube apparatus	1 1 1878				
5	Composite wall apparatus				_	
6	Thermal conductivity of insulating powder apparatus		2		Sec. 1987.	-4
7	Pin-fin apparatus	1.1.1.1.1				
8	Stefan-Boltzmann apparatus				2019 C	
9	Emissivity measurement apparatus					
10	Parallel/counter flow heat exchanger apparatus					

S. No	NAME OF THE EQUIPMENT	Qty.
1	Guarded plate apparatus	1 No.
2	Lagged pipe apparatus	1 No.
3	Natural convection-vertical cylinder apparatus	1 No.
4	Forced convection inside tube apparatus	1 No.
5	Composite wall apparatus	1 No.
6	Thermal conductivity of insulating powder apparatus	1 No.
7	Pin-fin apparatus	1 No.
8	Stefan-Boltzmann apparatus	1 No.
9	Emissivity measurement apparatus	1 No.
10	Parallel/counter flow heat exchanger apparatus	1 No.

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Department	MECHANICAL E	NGINEEF	NGINEERING				Semester VI	EEC	
Course Code	Course Name		Hours / Week C		Week			Maximum	
		L	т	Р	с	Total Hours	Marks		
19ME606	MINI PROJECT	0	0	2	1	3	100		

To develop skills to formulate a technical project.

To give guidance on the various tasks of the project and standard procedures.

To teach use of new tools, algorithms and techniques required to carry out the projects.

- To give guidance on the various procedures for validation of the product and analyse the cost effectiveness
- To provide guidelines to prepare technical report of the project.

Course Outcomes: At the end of this course, learners will be able to:

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- · Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Design and Fabricate the prototype and analysis the cost- effectiveness.
- Prepare report and present oral demonstrations

Methodology of the Project work:

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- The student will identify and select a problem based on comprehensive literature survey.
- The student should submit a proposal and get it approved by the Head of the department.
- Three reviews will be conducted by Project review committee.

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• Students will be evaluated by the committee during the review and suggestions will be offered by members. The report for Mini-project has to be submitted by the students at the end of the semester for assessment.

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Department	MECHANICAL ENG	SINEERING				R 2019	Semester VI	EEG
Course Code	Course Name	Hours / Credit		Great		Maximum	Maximum	
		L	т	Р	С	Hours	Marks	
19ME607	COMPREHENSIVE REVIEW	0	0	2	0	30	100	

• To encourage the students to comprehend the knowledge acquired from the first Semester to Sixth Semester of B.E. Degree Course through periodic exercise.

Course Outcomes: At the end of this course, learners will be able to:

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• Understand and comprehend any given problem related to mechanical engineering field.

METHOD OF EVALUATION:

The students will be assessed 100% internally through weekly test with objective type questions on all the subject related topics

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Department	MECHANICAL ENGINEE	RING	,			R 2019	Semester VI	EEC
Course Code	Course Name	Ηοι	rs/W	/eek	Credit	Total	Maximum M	arks
		L	Т	P	С	Hours		
19TP601	QUATITAIVE APTITUDE ,LOGICAL REASONING AND RECRUITMENT PROCESS	0	0	2	0	30	100	
	tive (s): The purpose of learning this course							
	nd understand the unseen passages with ap	propri	ate s	peed.				
	ely deal with different kinds of structures	-		H				
	the undergraduate students to such method					, develop	and nurture qu	alities
	aracter, effective communication, aptitude ar mes: At the end of this course, learners will				al values.			_
	ate the situations like motion in as straight lin				treams	Trains Ra	ces and clocks	
	te Pipes and Cisterns	, DC			ucanis,	rrains, rta		
	ne Counting techniques, Permutation and Co	ombin	ation	Rec	ursion an	d generat	ina functions	
	the distributions of probability with respect					- J	3	
	e vocabulary and the way of communication							
	d manage the different difficult situations.						and the second	2
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	Basic concepts -Concepts on working w	ith di	fferer	nt eff				
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Chairman - BoS

Department	MECHANICAL ENGINEERING					R 2019	Semester	V
Course Code	Course Name			Hours / Week		Total	Maxim	num
4050704	ENGINEERING ECONOMICS	L	Т	Р	С	Hours	Mark	s
19ES701		3	0	0	3	45	100	
 To introduce organizations. To acquire know To emphasis the diseconomies To acquaint in provide the diseconomies To obtain know Course Outcomes: Explain the mic Make use of the disecond t	s): The purpose of learning this course is the concepts of micro, macroec wledge on laws of demand & supply and he systematic evaluation of the costs, bre pricing methods, payback and competition dedge on macro economics, various taxe At the end of this course, learners will be ro economic environment for creating a f e major concepts and techniques of engin ost of multiple projects by using the meth ate facilities and/or systems. opriate engineering economics analysis n urn, payback, break-even, benefit-cost ra valuate the issues in macro-economic an	metho eakevel on in m e able favoura neering ods lea	ods o oder finar to: able g eco arne (s) f	of for int fo ncial busin onon d, ar	ecasting t r return o arket struc accountin ness envir nic analys d make a	he demand n economics og procedure ronment. is in real tim n quantitative	s e application e decision	IS.
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	D AND SUPPLY	anizati	on	-				0
	nd and Supply - Law of diminishing Margi Forecasting Methods - Indifference curve		lity -	Law	of Dema	nd and Sup	ply - Elasticit	y of
Unit III PRODUC	CTION AND COST			-	all search and the search and the		And and a second second	0
	n - Returns to Scale - Law of Variable Pro curves - Economies and Dis-economies						ts and Cost	3
Jnit IV MARKET	STRUCTURE							0
	Perfect Competition - Monopoly - Monopo Budgeting IRR - ARR - NPV - Return on I		-	Street Street	and the second se		icing - Metho	ds
Jnit V INTROD	UCTION TO MACRO ECONOMICS AND	FINA	NCI	AL A	CCOUN	TING	uped a	0
	Calculation Methods - Problems - Inflatior cal and monetary policies.	n - Defl	atio	n - B	usiness C	Cycle - Taxes	s - Direct and	
EXT BOOK(S):		215						
A Ramachandra	a Aryasri and V V Ramana Murthy, Eng fill Publishing Company Limited, New De	ineerir Ihi, 200	ng E 06.	Econo	omics an	d Financial	Accounting,	
	ul and G S Gupta, Managerial Economics			and	Casas T	ata MaCrau		

 V L Samuel Paul and G S Gupta, Managerial Economics Concepts and Cases, Tata McGraw Hill Publishing Company Limited, New Delhi, 1981.

RE	FERENCE(S):
1.	R Kesavan, C Elanchezhian and T Sunder Selwyn, Engineering Economics and Financial Accounting, Laxmi Publication (P) Ltd, New Delhi, 2005.
2.	S N Maheswari, Financial and Management Accounting, Sultan Chand Publications
3.	V L Samuel Paul and G S Gupta, Managerial Economics-Concepts and Cases

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N. Ain Chairman Dept. of Mech Engg. - ESES

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Department	MECHANICAL ENGINEERING					R 2019	Semester	VI
Course Code	Course Name	1.11	lour Wee		Credit	Total	Maximu	ım
10115704		L	Т	Р	С	Hours	Mark	s
19ME701	MECHATRONICS	3	0	0	3	45	100	

- To introduce the concept and working of sensors used in mechatronic system.
- To study different types of actuators used in mechatronic system.
- To provide knowledge on feedback mechanism for improving the reliability of mechatronic system.
- · To impart knowledge on working of microcontroller in mechatronic systems
- To learn the Programmable Logic Controller (PLC) used in mechatronic systems

Course Outcomes: At the end of this course, learners will be able to:

- Select the different types of sensor for various mechatronics applications.
- Identify suitable actuator used in mechatronic system.
- Design a feedback controller for mechatronics system.
- Develop a controller using the microcontroller for mechatronic system.
- Write a program for PLC used in mechatronic systems

Unit I SENSORS

Components of mechatronics system, Sensor - terminology and Mathematical equation -Potentiometer, Linear Variable differential transformer, strain gauge, Piezoelectric sensor, Optical encoder, Hall effect sensor, Thermistor, Thermo-couple, Light sensor.

Unit II ACTUATOR

Terminology, mathematical equation of Mechanical Actuation system - cam, gear, belt & chain, Ball screw, Mechanical aspects of motor selection. Pneumatic & hydraulic Actuation system. Electrical actuation system -lay & solenoid, working & control of Brush & brushless DC motor, working & control of Stepper & servo motor.

Unit III FEEDBACK CONTROL

Transfer Function, Mathematical Modeling of Mechanical & Electrical system, Electrical analogy, Electromechanical system, First order system, second order system, Proportional control, derivative control, Integral control, PID control, Controller tuning, Concept of stability.

Unit IV MICROCONTROLLER

Architecture of 8051- I/O Pins, Ports and Circuits, memory, counter, Timer, Interrupt, Instruction set- Moving data, Logical, arithmetic operation, Jump & call instruction, LCD & Keyboard Interfacing. Examples -Windscreen wiper motion, Car engine management.

Unit V PROGRAMMABLE LOGIC CONTROLLER

Basic Structure - Input / Output Processing - Programming - Mnemonics - Timers, Internal relays and counters -Shift Registers - Master and Jump Controls - Data Handling - Analogue Input / Output - Selection of PLC. Examples -Pick and place robot. Car park barrier system.

TEXT BOOK(S):

1.	W. Bolton, Mechatronics, Pearson Education, New Delhi, 2012.	
2.	Godfrey Onwubolu, Mechatronics: Principles and Applications Butterworth-Heinemann Ltd, 2005.	e S

REFERENCE(S):

1.	Nitaigour Premchand Mahalik, Mechatronics : Principles, Concepts and Applications, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2008
2.	Krishna Kant, Microprocessors & Microcontrollers, Prentice Hall of India, 2007.

^{3.} K. P. Ramachandran, G. K. Vijayaraghavan, and M. S. Bala-Sundram, Mechatronics: Integrated Mechanical Electronic Systems, Wiley India Pvt. Ltd., New Delhi 2008.

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Chairman - BoS Dept. of Mech Engg. - ESEC

Department	MECHANICAL ENGINEERING					R 2019	Semester	VI
Course Code	Course Name		lour Wee		Credit	Total	Maximu	ım
4050700		L	Т	Р	С	Hours	Mark	s
19ES702	RESEARCH METHODOLOGY	2	2	0	4	60	100	1

• To impart scientific, statistical and analytical knowledge for carrying out research work effectively.

Course Outcomes: At the end of this course, learners will be able to:

- · Get knowledge about the purpose, need and techniques of research.
- · Get knowledge about the experimental design concepts.
- Get knowledge about the various method of data collection.
- Get knowledge about the statistical techniques.
- Get knowledge about the report writing of research work.

Unit I INTRODUCTION TO RESEARCH

The hallmarks of scientific research – Building blocks of science in research – Concept of Applied and Basic research – Quantitative and Qualitative Research Techniques – Need for theoretical frame work – Hypothesis development – Hypothesis testing with quantitative data. Research design – Purpose of the study: Exploratory, Descriptive, Hypothesis Testing.

Unit II EXPERIMENTAL DESIGN

Laboratory and the Field Experiment – Internal and External Validity – Factors affecting Internal validity. Measurement of variables – Scales and measurements of variables. Developing scales – Rating scale and attitudinal scales – Validity testing of scales – Reliability concept in scales being developed – Stability Measures.

Unit III DATA COLLECTION METHODS

Interviewing, Questionnaires, etc. Secondary sources of data collection. Guidelines for Questionnaire Design – Electronic Questionnaire Design and Surveys. Special Data Sources: Focus Groups, Static and Dynamic panels. Review of Advantages and Disadvantages of various Data-Collection Methods and their utility. Sampling Techniques – Probabilistic and nonprobabilistic samples. Issues of Precision and Confidence in determining Sample Size. Hypothesis testing, Determination of Optimal sample size

Unit IV MULTIVARIATE STATISTICAL TECHNIQUES

Data Analysis – Factor Analysis – Culster Analysis -Discriminant Analysis – Multiple Regression and Correlation – Canonical Correlation – Application of Statistical(SPSS) Software Package in Research.

Unit V RESEARCH REPORT

Purpose of the written report – Concept of audience – Basics of written reports. Integral parts of a report – Title of a report, Table of contents, Abstract, Synopsis, Introduction, Body of a report – Experimental, Results and Discussion – Recommendations and Implementation section – Conclusions and Scope for future work.

REFERENCE(S):

- 1. C.R.Kothari, Research Methodology, WishvaPrakashan, New Delhi, 2001.
- 2. Donald H.McBurney, Research Methods, Thomson Asia Pvt. Ltd. Singapore, 2002

REFERENCE(S):

- 1. Donald R. Cooper and Ramela S. Schindler, Business Research Methods, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2000
- 2. G.W.Ticehurst and A.J.Veal, Business Research Methods, Longman, 1999.
- 3. Ranjit Kumar, Research Methodology, Sage Publications, London, New Delhi, 1999.
- 4. Raymond-Alain Thiertart, et.al., Doing Management Research, Sage Publications, London, 1999

Chairman - BoS Dept. of Mech Engg. - ESEC

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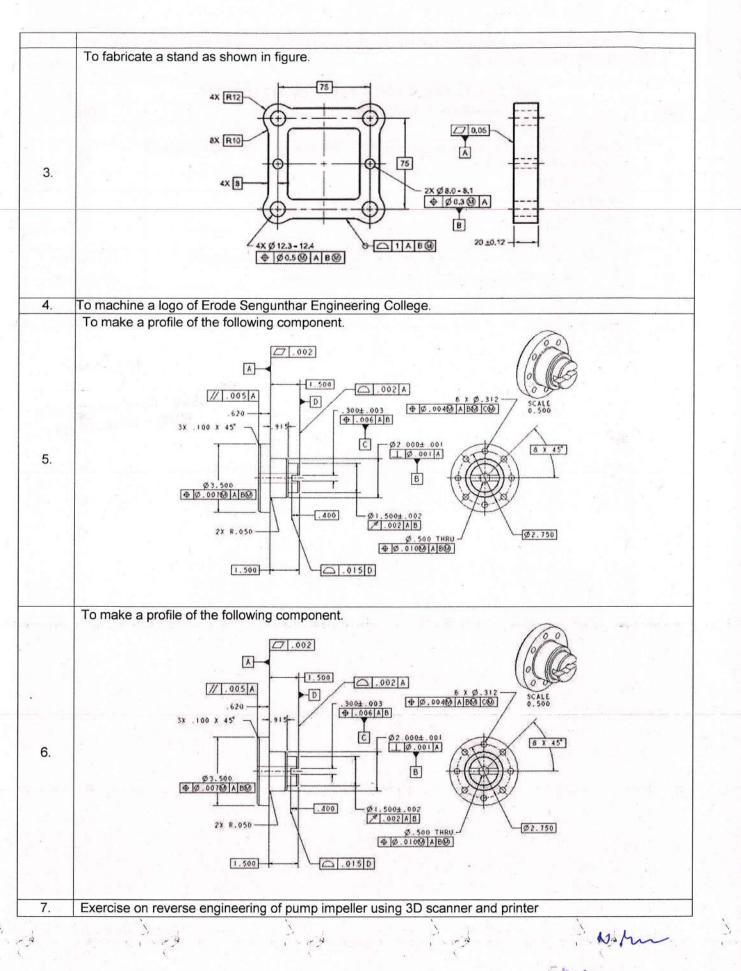
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Course Code Course Name Hours / Week Credit Total Maximum Marks 19ME702 COMPUTER AIDED MANUFACTURING LABORATORY L T P C Hours Maximum Marks 10 0 2 1 30 100 Fourse Objective (s): The purpose of learning this course is: Imachine components using computer aided manufacturing software. Imachine components using computer aided manufacturing software. Imachine components using computer aided manufacturing process. In provide k nowledge on modeling and creating tool path of machine. To expose part programming knowledge on CNC ralling machine. In the working of wire cut EDM for cutting various shapes. Image: Create the part program for the machining component using CNC lathe. In orpart knowledge on developing the prototype by additive manufacturing process. Image: Create the part program for the machining component using CNC lathe. In ormatic the too top ath of producing intricate shapes. Image: Create the part program for the machining component using CNC lathe. In Formulate the component using additive manufacturing process. Image: Create the part program for the machining component using CNC lathe. In permostrate the component using additive manufacturing process. Image: Create the part program for the machining component using CNC lathe. In Maximum Maximum Maximum Market the part program for the machining component using CNC lathe. Image: Create the part program for the machining component using CNC lathe.	Depar		MECHANICAL ENGINEERING		10	~ /		R 2019	Semester	VI
19ME702 COMPUTER AIDED MANUFACTURING 1 1 1 1 LABORATORY 0 0 2 1 30 100 counter added manufacturing software. To provide knowledge on modeling and creating tool path of machine components using computer added manufacturing software. To impart part programming knowledge on CNC lathe. To expose part programming knowledge on CNC lathe. To study the working of wire cut EDM for cuting various shapes. To impart knowledge on developing the prototype by additive manufacturing process. To provide knowledge on for the machining component using CNC athle. Create the part program for the machining component using CNC athling. Create the part program for the machining component using CNC athle. Create the part program for the machining component using CNC athle. Create the part program for the machining component using CNC athle. Demonstrate the component using additive manufacturing process. To make a protected type fanged coupling to transmit the power from dia20mm shaft. Image: transmit the power from dia20mm shaft. 1. Image: transmit the power from dia20mm shaft. Image: transmit the power from dia20mm shaft. 1. Image: transmit the power from dia20mm shaft. Image: transmit the power from dia20mm shaft. 2. Image: transmit transmit the power from dia20mm shaft. <tdi< th=""><th>Course</th><th>Code</th><th>Course Name</th><th></th><th></th><th></th><th>Credit</th><th></th><th>P. 16 2 (Sec. 9) (10 (Sec. 9)</th><th></th></tdi<>	Course	Code	Course Name				Credit		P. 16 2 (Sec. 9) (10 (Sec. 9)	
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Redesign and make an extruder assembly of a 3D printer to hold three filaments using design for Additive manufacturing principles.

S. No	NAME OF THE EQUIPMENT	Qty.
1	Computer Server	1
2	Computer nodes or systems (High end CPU with atleast 1 GB main memory) networked to the server	30
3	A3 size plotter	1
4	Laser Printer	1
5	CNC Lathe	1
6	CNC milling machine	1
7	Any High end integrated modeling and manufacturing CAD / CAM software	15 Licenses
8	CAM Software for machining centre and turning centre	15 Licenses
9	Licensed operating system	Adequate
10	Support for CAPP	Adequate

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Department	MECHANICAL ENGINEERING					R 2019	Semester	VI
Course Code	Course Name	1.5	lour Wee	200	Credit	Total	Maximu	ım
	MECHATRONICS LABORATORY	L	Т	Р	С	Hours	Mark	S
19ME703	WIEGHATRONICS LABORATORY	0	0	2	1	30	100	

- To impart knowledge on modeling and simulation of mechatronics system.
- To provide knowledge on design of fluid power circuit in mechatronic system.
- To understand the working of microcontroller and PLC in mechatronic systems through Experiments.
- To expose knowledge on force, acceleration and displacement measurements.

• To gain the knowledge for controlling the position, velocity and force in mechatronics system.

Course Outcomes: At the end of this course, learners will be able to:

- Developmathematical model of mechatronics system.
- Simulate fluid power circuit using Simulation software.
- Develop mechatronics system using microcontroller & PLC.
- Measure the force, acceleration and displacement of a system using microcontroller program.
- Control the position, velocity and force of mechatronics system.

Exp No.	Name of Experiments
1	Modeling and simulation of mechatronics system using MATLAB.
2	Modeling and design of PID controller for Mechatronics system.
3	Study and simulation of various hydraulic and pneumatic components using FLUIDSIM software.
4	Design and testing of fluid power circuits for automatic opening and closing for doors and to control its velocity and direction.
5	Position and speed control of DC Motor using Microcontroller Board
6	Speed control of Stepper Motor using Microcontroller Interface Board
7	Measurement of force, acceleration and displacement using Virtual instrumentation.
8	Design of Programmable logic Controller based timer controller for multiple pneumatic cylinder Sequencing in assembly operations.
9	Position and velocity control of pick and place robot arm for loading and unloading Application using Robot Programming language.
10	Measurement and control of temperature of an application using Virtual instrumentation

REFERENCE(S):

1.	W. Bolton, Mechatronics, Pearson Education, New Delhi, 2012.	
2.	Godfrey Onwubolu, Mechatronics: Principles and Applications Butterworth-Heinemann Ltd, 2005.	

REFERENCE(S):

1.	Nitaigour Premchand Mahalik, Mechatronics : Principles, Concepts and Applications, TataMcGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2008
2.	Krishna Kant, Microprocessors & Microcontrollers, Prentice Hall of India, 2007.
3.	K. P. Ramachandran, G. K. Vijayaraghavan, and M. S. Bala-Sundram, Mechatronics: Integrated Mechanical Electronic Systems, Wiley India Pvt. Ltd., New Delhi 2008.

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S. No	NAME OF THE EQUIPMENT	Qty.
1	Basic Pneumatic Trainer Kit with manual and electrical controls/ PLC Control each	1
2	Basic Hydraulic Trainer Kit	1
3	Hydraulics and Pneumatics Systems Simulation Software	10
4	8051 - Microcontroller kit with stepper motor and drive circuit sets	2
5	Image processing system with hardware & software	1

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Department	MECHANICAL ENGINEERING					R 2019	Semester	VI
Course Code	Course Name		lour Wee	1000	Credit	Total	Maximu	Im
40845704		L	т	Р	С	Hours	Mark	s
19ME704	PROJECT WORK PHASE I	0	0	2	1	30	100	

- To develop skills to formulate a technical project.
- To give guidance on the various tasks of the project and standard procedures.
- To teach use of new tools, algorithms and techniques required to carry out the projects.
- To give guidance on the various procedures for validation of the product and analyse the cost effectiveness.
- To provide guidelines to prepare technical report of the project.

Course Outcomes: At the end of this course, learners will be able to:

- Formulate a real world problem, identify the requirement and develop the design solutions.
- Identify technical ideas, strategies and methodologies.
- Utilize the new tools, algorithms, techniques that contribute to obtain the solution of the project.
- Test and validate through conformance of the developed prototype and analysis the cost effectiveness.
- Prepare technical report and oral presentations.

Methodology of the Project work:

- The student will identify and select a problem based on comprehensive literature survey.
- The student should submit a proposal and get it approved by the Head of the department.
- Three reviews will be conducted by Project review committee.
- Students will be evaluated by the committee during the review and suggestions will be offered by members.

N. Am Chairman - BoS Dept. of Mech Engg. - ESEC

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Department	MECHANICAL ENGINEERING					R 2019	Semester	VII
Course Code	Course Name		lour Wee	-	Credit	Total	Maximu	m
19ME801	PROJECT WORK PHASE II	L	Т	Р	С	Hours	Mark	s
TOWLOOT	PROSECT WORK PHASE II	0	0	0	6	90	100	
To give gu effectiven To provide Course Outcomes	se of new tools, algorithms and techniques idance on the various procedures for valid ess. guidelines to prepare technical report of the a: At the end of this course, learners will be	ation on the pro- the able	of the ject. to:	e pro	duct and	analyse the	cost	
 Identify tech Utilize the r Test and va effectivenes Prepare tech 	real world problem, identify the requirement inical ideas, strategies and methodologies. new tools, algorithms, techniques that co- lidate through conformance of the develop s. nnical report and oral presentations.	ontribu ed pro	te to toty	p obt	tain the s nd analys	colution of the cost		

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Department	MECHANICAL ENGINE	ERING				R 2019	Semester II	HS
Course Code	Course Name	Wee		-	Credit	Total Hours	Maximum Marks	
		L	Т	Ρ	С			
19HX201	ENGLISH FOR ENGINEERS	3	0	0	3	45	100)
 To develop To enhance To improve To develop Course Outcome 1. Improve the 2. Develop lis 3. Acquire the 4. Enhance the 5. Communice 	the usage of grammar in English lang o listening skills which will enable to lis the reading skill to comprehend tech writing skills to express thoughts free o speaking skills to speak fluently in re- es: At the end of this course, learners eir language usage in LSRW skills. Stening skills to understand sentence s e ability to understand different written he writing skills to express the ideas of the stening skills to express the ideas of the stening skills to express the ideas of the stening skills to express the ideas of the stening skills to express the s	ten lectur inical writ ily. al contex will be ab tress and texts.	tings ts. ole to d into	s. o: onati		nd differen	t types of texts	9
Voice(Active & substitution - F	Passive) - Reported speech - Condition	onals - C	olloc	catio	ns - Disco	ourse mark	ers - One word	
Unit II LISTE								9
Listening for s	pecific information - Identifying senten	ce stress	- R	hythi	m - Intona	ition		
Unit III 🐁 READ	DING							9
Reading graph structure of a to	s and charts - Skimming and scanning ext	texts – I	dent	tifyin	g topic se	ntences - l	Jnderstanding	the
Unit IV WRIT	ING	5 (R)						9
	n, Letter and Resume - Recommendat and movie) - Transcoding (interpreting					ent and su	rvey) - Writing	
Unit V SPEA		-		<u> </u>	_			9
Language Fun opinions	ask - Turn taking (initiating and respon ctions: suggesting - comparing and co	ding app ntrasting	ropri - E>	iately (pres	y) - Negot ssing - fin	tiating - Exe ding out fa	changing - cts, attitudes ar	nd
TEXT BOOK(S):	ive English by KN Shoba ,Lourdes Jo	avani Ra	ven	Put	lished by	Cambrida	e university	
Revised Edit		avannina	yen	Tur	maneu by	Jambridge	e university	
REFERENCE(S):								
¹ Jeremy Comf Speaking Ski	ort, Pamela Rogerson, Trish Stott, and Ils for Business English, Cambridge: C	l Derek L ambridge	Jtley e Un	, Spe ivers	eaking Ef	fectively an 2002.	d Developing	
	inning and Beverly Holmstrom, Study om: Cambridge University Press, 2004		AC	ours	e In Read	ding for Aca	ademic Purpos	es.
3 rphy, Raymor	nd. English Grammar in Use – A Self-S	tudy Ref	eren	ice a	nd Practi	ce Book Fo	or Intermediate	
	sh .Ived. United Kingdom: Cambridge	Universit	y Pr	ess.	2012.		8.2.962.8.8	1
4 Seely, John. (2005.	Oxford Guide to Effective Writing and S	Speaking	. Ind	ian e	ed. New D	Delhi: Oxfor	rd University Pr	ess.

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Department	MECHANICAL ENGIN	EERING				R 2019	Semester II	HS
Course	Course Name	Hou Wee			Credit	Total Hours	Maximum Marks	
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19HX202	HINDI	3	0	0	3	45	100	
 To help s To teach 	ive (s): The purpose of learning this co students to acquire the basics of Hindi them how to converse in Hindi on vari earners acquire the ability to understan	ous occasio		nica	al text in H	lindi		
1. An ability	nes: At the end of this course, learners y to communicate effectively with: (a) I indi language (c) Proper vocabulary				Hindi (b)	Clarity on t	the basic sound	s
Unit I HIND	ALPHABET	1						9
Bindu&Visarg -Ta	able of Alphabet -Vocabulary.							9
Bindu&Visarg -Ta Unit II NOUI Genders (Mascul		o, u,)- Mase	culir	ne &	Feminin	e - Reading	Exercises.	9
Bindu&Visarg -Ta Unit II NOUI Genders (Mascul Unit III PROI Categories of Pro Relative pronou	NS IN HINDI ine & Feminine Nouns ending in a ,e,i,	person (yo	u &	hon	orific) - D	Definite & In	definite pronour	9 15
Bindu&Visarg -Ta Unit II NOU Genders (Mascul Unit III PROI Categories of Pro Relative pronou Gentences.	NS IN HINDI ine & Feminine Nouns ending in a ,e,i, NOUNS AND TENSES onouns - Personal Pronouns - Second	person (yo	u &	hon	orific) - D	Definite & In	definite pronour	9 ns /e
Bindu&Visarg -Ta Unit II NOUI Genders (Mascul Unit III PROI Categories of Pro Relative pronou Gentences. Unit IV CLAS Parts of body - Re	NS IN HINDI ine & Feminine Nouns ending in a ,e,i, NOUNS AND TENSES onouns - Personal Pronouns - Second ns - Present tense - Past tense - Futur SSIFIED VOCABULARY elatives - Spices- Eatables- Fruit & Veg	person (yo e tense - A	u & ssei	hon rtive	orific) - E & Negat	Definite & In ive Sentenc	definitė pronour es - Interrogativ	9 ns /e 9
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Chairman - BoS Dept. of Mech Engg. - ESEC

N. 100

Department	MECHANICAL EN	R 2019	Semester II	HS				
Course	Course Name		lour: Wee		Credit	Total Hours	Maximum Marks	
Code		L	т	Р	С			
19HX203	JAPANESE	3	0	0	3	45	100	
Course Objectiv	ve (s): The purpose of learning this cour	se is to	-	1				
	tudents acquire the basics of Japanese I							
	them how to converse in Japanese in va							
	the students the Japanese cultura	00508010000000825-85920	Constantine (989(1 = 2 - 7 (6-54)	Salars			
	nes: At the end of this course, learners w fluency in Japanese	ill be abl	e to	com	municate	effectively	with:	
	the basic sounds of the Japanese lang	uage						
3. Proper vo								
Unit I Intro	duction							9
	panese - Japanese script - Pronunciation							
	n,tsu,ga - Letters combined with ya,yu,yo a N2 ja arimasen - S ka - N1mo - N1 no							
	nonetic and semantic resemblances betw					Japanese	vocabulary	
	bulary & Grammar 語彙と文法							9
ntroduction - Kor	e - Sore - are - Kono N1 - Sono N1 - ar	no N1 - s	o des	s - sc	ja arima	sen - S1 ka	a - S2 ka - N1 i	
11 and an line like	alex			NO				no
NI-SO des ka k	oko - soko - asoko - kochira - sochira - a	achira - N	11 wa	INZ ((Place) de	s - dhoko-	N1 no N2 - Kar	nji-
10 - imaji-fun de	s - Introduction of verb - V mas - V mase	en - V ma	ashith	na-V	masen de	shitha - N1	I(Time) ne V - N	nji-
10 - imaji-fun de	oko - soko - asoko - kochira - sochira - a s - Introduction of verb - V mas - V mase tho N2 / S ne Kanji-10 - Technical Japar	en - V ma	ashith	na-V	masen de	shitha - N1	I(Time) ne V - N	nji-
10 - imaji-fun de kara N2 des - N1	s - Introduction of verb - V mas - V mase tho N2 / S ne Kanji-10 - Technical Japar	en - V ma	ashith	na-V	masen de	shitha - N1	I(Time) ne V - N	nji- N1
10 - imaji-fun de kara N2 des - N1 Unit III Noun	s - Introduction of verb - V mas - V mase tho N2 / S ne Kanji-10 - Technical Japar & Types 名詞とタイプ	en - V ma iese Voc	ashith abula	ary (2	masen de 5 Numbe	shitha - N1 rs) - Dictior	I(Time) ne V - N nary Usage.	nji- N1
10 - imaji-fun de kara N2 des - N1 Unit III Noun N1(Place) ye ikim kimasu - kayerin wo shimasu ka - N Word / Sentence	s - Introduction of verb - V mas - V mase tho N2 / S ne Kanji-10 - Technical Japan & & Types 名詞とタイプ as - ki mas - kayerimasu - Dhoko ye mo nasu - N1(Personal or Animal) tho V iths Nan & Nani - N1(Place) de V - V masen wa go nan des ka - N1(Person) ne age	ikimaser su - S yo. ka - V ma mus - N	ashith abula n - iki N1 asho 1(Pe	mase wo` - Oo	masen de 5 Numbe endheshith V (Transit . Kanji-10) ne mora	shitha - N1 rs) - Diction na - N1(vel ive) - N1 w , N1(tool aimus - mo	I (Time) ne V - N nary Usage. nicle) de ikimas /o shimus - Nar - means) de V V shimashitha	nji- N1 9 u ni
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Departn	nent	ENGLISH						Semester	1
Course		Course Name		Hours / Week			Total Hours	Maximum Marks	
Code			L	Т	Ρ	С	· Hours	indi Ka	
19HX2	04	FRENCH	3	0	0	3	45	100	di i
•	To help s	s): The purpose of learning this cou tudents acquire the basics of French	n languag					l in the second	
•		them how to converse in French in v		Constant I to be a	500.50 <u>-</u> 80.55		ALC: NO.	the first state	
Course C		At the end of this course, learners wudents will become familiar with the				language	and start of	conversing in	-
Unit I		Français						No.	6
réma cédi		Iphabets) - Les Accents Français (son nom dans le français (spelling week)							
Unit II		s, month & year (Nombre, mois						the second second	6
es noms o	de mois de	l'année (Months) - Numéro 1 à 100	(Number	s 1 to	o 100) GRAM	MAIRE :Co	njugaison	
Unit III	Languag	e Skills & Grammar (Compétenc	es lingui	stiqu	les e	t gramm	aire)	ALK ALL	10
Vationalité	s (National	(Transport) - Noms de Professions (ities) ECOUTER : (Listening) Écoute PARLER (Speaking)Présntation - mé les	er I - alpha	abet	asso	ciéà des p	prénoms fra	ançais -	40. 19. 19.
Unit IV		ar (et grammaire)				in the second			12
communs (Pronouns) Common	- Noms communs masculins et de fe verbs)COUTER :couter et crier les p d'utilisateurs d'interlingua (alter ego)	rnoms - C	Obse	rver l	es dessin	s et couter	les dialogues	, IF
Unit V	Speakin	a attisateurs a interinigua (alter ego)		1. Year					
Sur .	0 000 000	g & Writing (Parler et écrire)							11
Narration d	du temps -		nversatio	n ent	re de	ux amis -	Jouer la so		11
Narration d Narration ÉCOUTER	du temps - Ecouter le	g & Writing (Parler et écrire) et l'endroit où on vit - Son âge et da La France en Europe PARLER :Co	nversatio	n ent	re de	ux amis -	Jouer la so		11
Narration d Narration ÉCOUTER	du temps - :Ecouter le	g & Writing (Parler et écrire) et l'endroit où on vit - Son âge et da La France en Europe PARLER :Co	nversation RIRE :Écri	n ent reun	re de e car	ux amis - te postale	Jouer la so		11

1	Alter ego+ Niveau a1
2	Grammaire Progressive du Français
3	Collins Easy Learning French Verbs& Practice
4	Français Linguaphone
5	Françaisl.Harrisonburg: The Rosetta Stone: Fairfield Language Technologies

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Chairman - BoS Dept. of Mech Engg. - ESEC

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Department	MECHANICAL ENGI	SINEERING				R 2019	Semester	١
Course Code	Course Name	ł	lour We		Credit	t Total Maxim		
Commission of the local data		L	Т	Ρ	С	Hours	Marks	
19MEX01	COMPUTER AIDED DESIGN	3	0	0	3	45	100	

- To provide knowledge on fundamentals of CAD and geometric transformations.
- To understand the various geometric modeling concepts.
- To identify the common visual realism algorithms.
- To impart the knowledge on parts assembly logics and consideration factors.
- To study the available data exchange formats for CAD model transportation.

Course Outcomes: At the end of this course, learners will be able to:

- Explain the fundamentals of CAD and geometric transformations concepts.
- Describe the various representation of geometric curves, surfaces and solids.
- Identify the importance of visual realism algorithms.
- Identify the significant factors in computer aided assembly.
- Explain the geometrical model data exchanging formats to transfer CAD Models between various platforms.

Unit	FUNDAMENTALS
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Product cycle, Sequential and Concurrent Engineering, CAD - Architecture, Tools, applications - Coordinate systems - Two and Three dimensional Transformations - Translation - Scaling – Reflection - Rotation, Windowing - clipping and Viewing.

Unit II GEOMETRIC MODELING

Representation of curves - Hermite, Bezier, B-Spline and rational curves - Surface Modeling – surface patch -Bezier and B spline surface. Solid Modelling - Boundary representation and Constructive Solid Geometry.

Unit III VISUAL REALISM

Coherence - types. Hidden line removal algorithm - Priority and Area oriented algorithms. Hidden Surface removal algorithm - Depth buffer and Warnock's algorithms. Hidden solid removal algorithm, Ray Tracing algorithm, shading and Coloring - types. Computer Animation.

Unit IV ASSEMBLY OF PARTS

Assembly modeling - Interference of Positions and orientations - CAD Tolerance Analysis - geometrical Mass Properties - degree of freedom - Constraints and Simulation concepts.

Unit V DATA EXCHANGE FORMATS

Database Management System - CAD Standards File types - IGES, PDES, PARASOLID, ACIS, Data - Database - Structures - Types, DXF, STL and STEP Files. Communication Standards - File Transfer between CAD and CAM package.

REFERENCE(S):

1.	Ibrahim Zied, CAD/CAM-Theory and Practice, Tata McGraw Hall Publishing Company Pvt.Ltd., New Delhi, 2009.
2.	P.Radhakrishnan, CAD-CAM-CIM, New Age International Publishers, New Delhi 2000.
3.	Donald Hearn, M. Pauline Baker, Computer Graphics, Prentice Hall of India, New Delhi, 2005.
I.	Donald Hearn, M. Pauline Baker, Computer Graphics, Prentice Hall of India, New Delhi, 2005.
5.	William M. Neumann, Robert F. Sproul, Principles of Computer Graphics, Tata McGraw Hall Publishing Company Pvt Ltd., New Delhi, 2005.
6.	Mikell P. Groover, Emory W. Zimmers, CAD/CAM, Computer-Aided, Design, and Manufacturing

 Mikell P. Groover, Emory W. Zimmers, CAD/CAM Computer-Aided Design and Manufacturing, Prentice Hall of India, New Delhi, 2007.

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Department	MECHANICAL ENGINEERING					R 2019	Semester	۷
Course Code	Course Name	ł	Hours / Week		Credit	Total	Maximum	E.
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19MEX02	MECHANICAL VIBRATIONS	3	0	0	3	45	100	

- To study the fundamental concept of vibration of single degree of freedom (DOF) system.
- To provide knowledge on vibration of Two DOF system.
- To impart knowledge on vibration of Multi- DOF system.
- To learn the governing equation of vibration of continuous systems.
- To study various instruments and control methods used in vibration analysis.

Course Outcomes: At the end of this course, learners will be able to:

- Explain basic elements of vibration of single DOF system.
- Calculate the natural frequency of vibration of Two DOF system.
- Estimate the natural frequency of vibration of Multi DOF system.
- Perform vibration analysis for vibration of continuous systems.
- Select suitable instruments and control method for measurement and control of vibration.

Unit I FUNDAMENTALS OF VIBRATION

Basic concepts - One degree of freedom - Free vibration -undamped and viscous damping system. Forced vibration - harmonically excited vibration - Equation of motion, Response of damped system under harmonic force, Response of Damped system under base excitation and rotating unbalance - Duhamels Integral - Impulse response function.

Unit II TWO DEGREE FREEDOM SYSTEM

Equation of motion - Free and Forced vibration Analysis- Coordinate Couplings and Principal Coordinates - Transfer function approach - Lagranges equation.

Unit III MULTI-DEGREE FREEDOM SYSTEM

Influence Coefficients and stiffness coefficients- Flexibility Matrix and Stiffness Matrix - Eigen Values and Eigen Vectors-Matrix Method, Matrix Iteration Method -Approximate Methods: Dunkerley, Rayleighs and Holzer Method.

Unit IV VIBRATION OF CONTINUOUS SYSTEMS

Introduction- Transverse vibration of string- Longitudinal vibration of shaft - torsional vibration of shaft- lateral vibration of beam- Rayleigh Method, Rayleigh - Ritz method.

Unit V VIBRATION MEASUREMENT AND CONTROL

Transducer - Vibration Pickups - Frequency Measuring Instruments - Vibration exciter - dynamic Testing Machine - Machine Condition Monitoring and diagnosis. Control of vibration- control of Natural frequencies - Introduction to damping - vibration Isolation - Vibration Absorber

REFERENCE(S):

1.	S.S.Rao, Mechanical Vibrations, Pearson Education, 2011.
2.	Thomson W.T. Theory of Vibration with Applications, CBS Publishers and Distributors, New Delhi, 2006.
3.	A.K. Mallik, Principles of Vibration Control, Affiliated East-West Press Pvt. Ltd, 2004.
4.	R.N. Iyengar, Elements of Mechanical Vibration, I K International Publishing House Pvt.Ltd, New Delhi, 2007
5.	S.Graham Kelly and Shashidar K.Kudari, Mechanical Vibrations, Tata McGraw-Hill Publishing Company Ltd New Delhi, 2007.

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Department	MECHANICAL ENGINEERING					R 2019	Semester	۷
Course Code	ourse Code Course Name Hours / Week		Credit	Total	Maximum			
Charles and	APPLIED HYDRAULICS AND	L	Т	Ρ	С	Hours	Marks	
19MEX03	PNEUMATICS 3 0 0 3		45	100				

To impart knowledge on various types of hydraulic pumps and actuators.

- To learn about various hydraulic components and its functions.
- To provide knowledge about the selection of hydraulic components.
- To study about various types of pneumatic components and servo systems.

To learn fluid power circuit design methods and its applications.

Course Outcomes: At the end of this course, learners will be able to:

- Identify suitable hydraulic pumps and actuators for different applications.
- Choose the suitable hydraulic components for various applications.
- Select the suitable fluid power components for various applications. .
- Choose the suitable pneumatic components for different applications. •
- . Design fluid power circuit for given applications

Unit I HYDRAULIC PUMPS AND ACTUATORS

Introduction to fluid power system- Applications of Pascal's Law- Hydraulic pumps - Pumping theory, classification - Gear pump, Vane pump, piston pump, lobe pump, construction and working principles - Fluid power Actuators-Single acting, Double acting, cushioning and telescopic cylinder, construction and working principles. Gear Motors, Vane motors.

Unit II HYDRAULIC COMPONENTS

Direction control valve - check valve, shuttle valve, 3/2, 4/2 and 4/3 way valve and solenoid valve - Actuation methods. Pressure control valves-pressure relief valve, compound pressure relief valve, pressure reducing valve, unloading valve, sequence valve, counterbalance valve. Flow control valves- types. Accumulators and intensifier -Types. 09

Unit III SELECTION OF HYDRAULIC COMPONENTS

Selection factors-Selection of pumps. Actuators- cylinders, motors versus load-Piston rod buckling. Selection of Hydraulic pipe and hoses, valves, reservoir, filters, Accumulators and intensifiers

PNEUMATIC COMPONENTS Unit IV

Compressors- Filter, Regulator, Lubricator (FRL) unit, mufflers. Valves- direction control valves - shuttle valve, two way air piloted valve, push button valve, quick exhaust valve, lever control valve and solenoid valve - Pneumatic actuators. Servo system - Hydro mechanical, Electro hydraulic and proportional valve.

Unit V **DESIGN OF FLUID POWER CIRCUIT**

Fluid power circuits- Speed control circuits, synchronizing circuit, sequential circuit and design for simple application using cascade and stepper sequencer method. Application of Accumulator and Intensifier circuit.

REFERENCE(S):

1.	Anthony Esposito, Fluid power with applications, Pearson Education, New Delhi, 2011
2.	S.R Majumdar, Oil hydraulics, Tata McGraw Hill publishing company Pvt. Ltd. New Delhi,2004
3.	S.R.Majumdar, Pneumatic systems-Principles and maintenance, Tata McGraw Hill publishing company Pvt. Ltd., New Delhi, 2008.
4.	S.Ilango Introduction to Hydraulics and Pneumatics, Prentice Hall of India Pvt. Ltd., New Delhi, 2007.
5.	Andrew Parr, Hydraulics and Pneumatics, Jaico Publishing House, 2006.

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Department	MECHANICAL ENG	NEER	ING			R 2019	Semester	1		
Course Code	Course Name	F	Hours / Week				Credit	Total	Maximum	5
19MEX04	COMPOSITE MATERIALS AND	L	Т	P	C	Hours	Marks			
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19MEX05	WELDING TECHNOLOGY		C	Hours	Marks	_		
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	Book, Volume 6, American Society for Me	SER WORK	2000				and the second second	
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1	Course Code	Course Name	ŀ	lour		С	redit	Total	Maximum	
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Department	MECHANICAL ENG	MECHANICAL ENGINEERING				R 2019	Semester	V				
Course Code	Course Name			Hours / Week				Credit		Total	Maximum	
a strange to		L	T	Р	С	Hours	Marks					
19MEX07	AUTOMOBILE ENGINEERING	2	0	2	3	45	100					

- To impart knowledge on the constructional details and principle of operation of various automobile components.
- To provide knowledge on the working of fuel supply system in various automobiles.
- To learn the function of various components in transmission and drive lines of a vehicle.
- To study the concept and working of steering, brakes and suspension systems in automobile.
- * To impart knowledge on electrical and electronic systems of automobiles.

Course Outcomes: At the end of this course, learners will be able to:

- Demonstrate the operating principles and constructional details of various automobile components.
- Classify two main types of fuel supply systems and explain its working.
- Explain the function of components in transmission and drive lines of a vehicle.
- Identify and explain the types of steering system, suspension system and braking system.
- Interpret the functioning of electrical and electronic systems in automobiles .

Unit I VEHICLE STRUCTURE AND ENGINES

Types of Automobiles - vehicle construction, chassis, frame and body. Engines Supercharger, turbo chargers, engine emission control by 3 Way catalytic controller. Alternative energy resources Liguefied petroleum gas, Bio Diesel. 09

Unit II FUEL SUPPLY SYSTEMS

Spark ignition engine Carburetor-Types simple carburettor, solex carburettor, carter carburetor. Electronic fuel injection system, mono-point and multi Point injection systems. Compression iginition engine-Inline fuel injection system, Common rail direct fuel injection system.

Unit III TRANSMISSION AND DRIVE LINES

Clutch types single plate clutch, multi plate clutch. Gearbox synchromesh gear box, sliding mesh gear box, constant mesh gear box. Fluid flywheel, torque convertors, propeller shaft, slip joint, universal Joints, differential and rear axle hotchkiss drive and torque tube drive

STEERING, BRAKES AND SUSPENSION Unit IV

Wheels and Tyres Construction. Steering geometry and types of steering gearbox rack and pinion steering gear, recirculating ball type gear and Power steering construction and working principle. Suspension systems types rear suspension and front suspension. Braking systems-types disc brake, drum brake, hydraulic brake and air brake. 09

Unit V ELECTRICAL AND ELECTRONIC SYSTEMS

Electrical systems, battery types, construction and working principle of lead acid battery. Generator, starting motor and drives. lighting, ignition (Battery, Magneto Coil and Electronic type), regulators, cut outs. Common rail direct fuel injection system. Different electronic control unit used in the engine management, block diagram of the engine management system..

REFERENCE(S):

1.	Kirpal Singh, Automobile Engineering Volume.1 and 2, Standard Publishers, New Delhi, 2009.
2.	Crouse and Anglin, Automotive Mechanism, Tata McGraw Hill Publishing Company PVT Ltd, New Delhi, 2003.
3.	Newton, Steeds and Garet, Motor vehicles, Butterworth Publishers, 2000.
4.	S. Srinivasan, Automotive Mechanics, Tata McGraw Hill Publishing Company Pvt Ltd New Delhi, 2003.
5.	Joseph Heitner, Automotive Mechanics, East-West Press, 2006.
6.	H. M. Sethi, Automobile Technology, Tata McGraw Hill Publishing Company Private Limited, New Delhi, 2007.

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Department	MECHANICAL ENGIN	MECHANICAL ENGINEERING						۷
Course Code	Course Name	Hours / Week		L.Penit			Maximum	
19MEX08	INTERNAL COMBUSTION ENGINES	L	Т	Р	C	Hours	Marks	
		3	0	0	3	45	100	

- To learn about the combustion phenomenon in spark ignition engines.
- To learn about the combustion phenomenon in compression ignition engines.
- To study the causes, effects and control of pollutants from an Internal Combustion engine. .
- To provide the knowledge of alternate fuels in Internal Combustion engines.
- To impart the knowledge on recent developments in Internal Combustion engines.

Course Outcomes: At the end of this course, learners will be able to:

- Examine the combustion phenomenon in spark ignition engines.
- Examine the combustion phenomenon in compression ignition engines.
- Distinguish the causes, effects and control of pollutants from an IC engine. .
- Identify the uses of alternate fuels in Internal Combustion engines.
- Illustrate the recent developments in Internal Combustion engines.

Unit I SPARK IGNITION ENGINES

Spark ignition engine- Mixture requirements, carburetors, fuel injection systems, mono point and multipoint injection, stages of combustion, normal and abnormal combustion, factors affecting knocking-combustion chambers.

Unit II COMPRESSION IGNITION ENGINES

States of combustion in Compression Ignition Engine - combustion knock in compression ignition engines, methods of controlling knock. Direct and indirect injection systems. Combustion chambers. Fuel spray behaviourspray structure, spray penetration and evaporation. Air motion-turbocharging 09

Unit III POLLUTANT FORMATION AND CONTROL

Pollutant -formation of Oxides of Nitrogen in spark ignition and compression ignition engines, hydrocarbon emission - carbon monoxide formation - particulate emissions. Measurement of exhaust emissions- Non dispersive infrared gas analyzer, gas chromatography, chemiluminescent analyser and flame ionization detector, smoke meters. Methods of controlling emissions- Catalytic converters and particulate traps. Exhaust gas recirculation and Selective catalytic Reduction

ALTERNATIVE FUELS Unit IV

Bio-fuels, alcohol, hydrogen, natural gas and liquefied petroleum gas, bio gas, properties, suitability, engine modifications, merits and demerits as fuels. 09

Unit V RECENT TRENDS

Lean Burn Engines - stratified charge engines, homogeneous charge compression ignition, plasma Ignition. Variable valve timing, multi-valving, tuned manifolding, camless valve gearing, Variable compression ratio engines

REFERENCE(S):

1.	V. Ganesan, Internal Combustion Engines, Tata McGraw Hill Publishing Company Private limited., New Delhi, 2012
2.	John B. Heywood, Internal Combustion Engine Fundamentals, Tata McGraw Hill Publishing Company Private limited., New Delhi,2008
3.	R. B. Mathur and R. P. Sharmal Internal Combustion Engines, Dhanpat Rai Publications, 2008.
4.	B.P.Pundir, Internal combustion Engines Combustion and Emissions, Narosa Publishing House Private limited, New Delhi, 2010.
5.	WW Pulkrabek, Engineering Eundamentals of the Internal Combustion Engine, Prontice Hall 2006

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Department	MECHANICAL ENG	GINEEF	RING	i			R 2019	Semeste	r V
Course Code	Course Name	I	Hours / Week			t	Total	Maximu	m
19MEX09	REFRIGERATION AND	L	Т	Ρ	С		Hours	Marks	
	AIR-CONDITIONING s): The purpose of learning this course is	3	0	0	3		45	100	
 To study the To learn the To impart th To learn the Course Outcomes Illustrate th Explain the Demonstration 	he knowledge on air refrigeration system e working of single and multistage vapour operation of vapour absorption and other e knowledge about Psychometrics and it parameters involved in design of air con s: At the end of this course, learners will le e principle of operation of air refrigeration components and working of vapor comp te the working of vapour absorption and e psychometric problems in various appli	r compr er refrig s applic ditionin be able n system pression other re	eration ng sy to: ms. n refr efrige	on sy ns. stem	vstems. Is. ation sy	ster	ns.		
	the parameters involved in design of air o			syst	ems				
	DUCTION								09
First and Second co-efficient of per	Thermodynamics- Thermodynamics proc law of thermodynamics applied to refrige formance, Air refrigeration cycle. Reverse	rating r ed Carr	mach not c	nines ycle,	, Carno Bell-Co	t pr	inciples, ur	nit of refriger	ation,
	nermodynamic processes, priority criteria	a, and s	suitai	DILLY.					
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Manohar Prasad, Refrigeration and Air Conditioning, Wiley Eastern Limited, 2007.

6. J. B Hains, Automatic Control of Heating & Air conditioning, Tata McGraw Hill Publishing Company Private Limited, 2005

Department	MECHANICAL ENG	INEERING				INEERING			MECHANICAL ENGINEERING				R 2019	Semester	VI
Course Code	Course Name	Hours / C Week		U.realt		Total	Maximum								
		L	L	Т	Р	С	Hours	Marks							
19MEX10	FIBRE REINFORCED PLASTICS	3	0	0	3	60	100								

Course Objective (s): The purpose of learning this course is:

- To introduce the various materials for composite structure.
- To equip with the knowledge of sandwich structure technology.
- To provide knowledge in fracture mechanics of composites.
- To impart knowledge in fatigue and damping capacity of composite materials.
- To provide understanding of various manufacturing/fabricating techniques for composite structures

Course Outcomes: At the end of this course, learners will be able to:

- Select various materials for designing composite structures.
- Apply knowledge of fracture mechanics of composites during designing of composite
- Analyze critically the damping capacity of composite materials.
- Correlate various manufacturing/fabricating techniques for composite structures based on design

Unit I 09 INTRODUCTION Definition, Reason for composites, Classifications of composites, Thermosets - Epoxy; Unsaturated polyester resin; vinyl ester, polyimides etc.,- preparation, properties, and uses. 09 Unit II REINFORCEMENTS

Types, Properties, chemistry and applications of fillers such as silica, titanium oxide, talc, mica etc., Manufacturing process, Properties, structure and uses of Glass fiber-. Carbon, Aramid, Boron, jute, sisal, cotton.

FABRICATIONS OF THERMOSET COMPOSITES Unit III

Hand lay up method, compression and transfer moulding, pressure and vacuum bag process, filament winding, protrusion, reinforced RIM, RRIM, Injection moulding, of thermosets, SMC and DMC, Advantages and disadvantages of each method 09

Unit IV TESTING OF COMPOSITES

Destructive and non-destructive tests; Destructive- tensile, compression, flexural, impact strength, Hardness -Fatigue- toughness HDT ,basic concepts of fracture mechanisms.

Unit V **APPLICATIONS OF COMPOSITES**

Aerospace, land transport, marine, structural, chemical plants and corrosion resistant products, mechanica engineering and energy applications sports, electrical, electronic and communication applications, biomedical applications, repairs and maintenance etc.,

REFERENCE(S):

1.	Hand book of composite by G. Lubin, Van Nostrand Co., New York 1969
2.	Polymers and Polymer Composites in Construction by L.C. Holleway, 1990
3.	Engineering Plastics and Composites by John C. Bittence, 1990
4.	Handbook of Plastics, Elastomers and Composites by Chrles A Harper, 1975
5.	Designing with Reinforced composites- Technology-Performance, Economics-Rosato, 2st Ed.1997.

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Department	MECHANICAL ENGI	NEER	ING	12		R 2019	Semester	VI
Course Code	Course Name	Hours / Week			Credit	Total	Maximum	
	PROCESS PLANNING AND COST	L	T	P	C	Hours	Marks	
	ESTIMATION	3	0	0	3	45	100	
 To introdu To impart To study the To learn the teacher that the teacher teacher the teacher teacher	(s): The purpose of learning this course is: ce the process planning concepts. the importance of cost estimation process a ne procedure to calculate direct, indirect an ne procedure to estimate the various machin procedure to estimate the machining time for	d ove ne cos	rhea sts.	d ex	penses.	haping, mill	ing and grindi	na
operations.		Latin	0, ui	innig	, boring, o	naping, min	ing and grindi	19
 Explain the Assess the Compute of Determine 	s: At the end of this course, learners will be e concepts of process planning and cost es e importance of cost estimation process and direct, indirect and over head expenses. e the production cost of forging, welding, an achining time for Lathe, drilling, boring, sha	stimat l its p d four	ion. roce ndry			goperations	5	
Unit I PROCE	SS PLANNING		-					09
	ctive - Scope - Process planning activitie	s - A	nnr	hach	es - Mani	ial Compu	ter Aided Pr	-10 - The Co
Objectives and fur and Estimation - N Estimates - Estima	DUCTION TO COST ESTIMATION Inctions of Estimating - Costing - Importance Methods of Costing - Types of estimates - M ating procedure. NTS OF COST							
	erial Cost - Direct and Indirect - Labour cost	Dir	oot	Indire	oct and Da	tormination	of Direct Lab	09
Cost - Expenses -	Direct and Indirect - Analysis of overhead esses - Allocation of overhead expenses- Dep	expen	ses	- Adı	ministrative	e expenses	- Selling and	our
	CTION COST ESTIMATION		4	-	12 10 20			09
and welding shop	ng shop - Losses in forging and forging cos - Material cost, Labour cost and Finish on c and casting cost - Problems							ern
	TION OF MACHINING TIME	0.474				Sa A Pro-	1000	09
Importance of mac and grinding opera	chine time calculations - Estimation of mach ations - Problems	ining	time	e for l	Lathe, drill	ing, boring,	shaping, milli	ng
EFERENCE(S):		-						
Publications, 2	.Elanchezhian, B.Vijaya Ramnath, Process 008	planr	ning	and	cost estim	ation, New	Age Internatio	onal
	cess Planning and Cost Estimation, New A	-	_			The second se		i.
	Process planning, Design/Manufacture Inter	face,	Else	evier	science te	chnology B	ooks, Dec-20	02.
	echanical Estimating and Costing, Tata Mc	Graw	Hill	Publi	ishing Con	npany Priva	te. Limited.,2	001.
S. K. Mukhopa 2007.	dhyay, Production Planning and Control-Te	ext an	d ca	ses,	Prentice H	all of India	Private Limite	ed,
Chitale A V G								

6. Chitale.A.V., Gupta.R.C., Product Design and Manufacturing, Prentice Hall of India Private Limited, 2000.

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Department	MECHANICAL ENGIN	EERI	NG			R 2019	Semester	V
Course Code	Course Name	e Hours / Week Cree		Credit	Total	Maximum		
19MEX12	STATISTICAL QUALITY CONTROL AND RELIABILITY ENGINEERING	L	Т	P	C 2	Hours 45	Marks 100	
Course Objective (To familiar To study th To introdue To describ To impart Course Outcomes Identify U Explain th Implement	(s): The purpose of learning this course is: rize with various statistical process control more methods and characteristics of sampling. ce Taguchi method of experimental design. the the concept of reliability and its models. knowledge on design of reliability process. s: At the end of this course, learners will be a se the different statistical process control char the importance of sampling methods and its co the the Taguchi method for experimental design the reliability concept with their models.	able t arts. harac	:0:	0 stics		45	100	
Unit I QUALIT Quality-Definition,	e and analyze the reliability process. TY AND STATISTICAL PROCESS CONTRO Quality Assurance-Variation in process-Fac P, C and U-Chart tolerance design. Establish	tors,						09 s X,
Variables. Quality Unit II ACCEP Lot by lot samplin Characteristic cur		, dou	ble, ble	mult Qual	tiple samp	ling plans- (Operating ce Percent	09 ot
Tolerance Percer	nt Defective, Use of standard sampling plans IMENTAL DESIGN AND TAGUCHI METHO ctorial experiments, Random design, Latin so	D						09
Experiments, Sign	al/Noise ratio and performance measure, Or PT OF RELIABILITY					<u>n san ƙ</u>		09
bathtub curve-time models-serial, par standbysystems, Unit V DESIGN Reliability design p methods, parts a determination of c analysis of down-t	ty vs quality, reliability function-Mean Time B e dependent failure models-Distributions-Nor rallel and combined configuration -Markov co-variant models, static models, or NOF RELIABILITY process, system effectiveness, economic and and material selection, derating, stress str auses, assessments of effects, computation ime-Repair time distribution, stochastic point nance state dependent system with repair.	mal, e ana dynar alysis ength of cr	weil alysi mic an an ar itica	bull, is, mode d life nd a ality i	log norma load els. cycle cos nalysis, fa ndex, corr	I-Reliability sharing s t, reliability ailure analy rective actio	of system an systems, allocation, de rsis, identifica n, System sa	d 09 esign ation
Patrick D conn Charles E Ebli	Fundamentals of Quality Control and improve for, Practical Reliability Engineering, John-W ng, An Introduction to Reliability and Maintai Reliability, Maintainability and Risk: Practica	iley a nabili al Me	ty E	Sons Ingin ds fo	i Inc, 2002 eering, Ta r Engineer	2. ata McGraw rs, Butterwo		

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Course	nent	WILCHANICAL LING	CHANICAL ENGINEERING		MECHANICAL ENGINEERING			R 2019	Semester	V
	Code	Course Name	Hours / Week			Credit	Total	Maximum		
19MEX13	(13	NON - TRADITIONAL MACHINING		Т	Ρ	С	Hours	Marks		
19MEX13		PROCESSES	3	0	0	3	45	100		
• T • T Course O • E • S a • Fi • C • S	o provide o impart k o impart k utcomes: xplain the elect the s pplications ind the su hoose app elect the s	e mechanical energy based non-tradition knowledge on electrical energy based no mowledge on chemical and electro-chem anowledge on thermal energy based mac At the end of this course, learners will be basics of non-traditional machining processitable mechanical energy based non-tradi- sitable machining processes for machining propriate chemical and electro-chemical suitable thermal energy based process for KENTIONAL MACHINING PROCESS d - Classification - Energies employe	on-trac ical er hining e able esses. adition g elect energy r cuttir	to: bal m trical bas ng al	al ma y bas cesse achir ly col sed p nd ma	achining p ed proces es. ning proce nductive m rocesses f achining o	ses. sses for the naterials. for precisior f the hard m	n machining naterials.	09	
Electro-ch machining Init II Abrasive	nemical m g(PAM). MECHAN Jet Machir	Vater jet machining(WJM), Ultrasonic achining(ECM), Electron beam machinin IICAL ENERGY BASED PROCESSES ning, Water Jet Machining and Ultrasonic	g(EBN	1), Ē	aser	beam mac	chining(LBN	1), Plasma aro		
	(L	s, Material removal rate, Applications.			_				00	
ABBREA/MAR		Machining - Working Principles, Equipme	nt Pro	nae	e Par	ameters I	Material ren	noval rate	09	
		wer Circuits, Tool Wear, Dielectric, Flush						loval rate,		
and the second sec	and the product of the second	AL AND ELECTRO-CHEMICAL ENERG							09	
orinciple, I Electro-ch	Equipmen emical ho	g - Etchants, Maskants - techniques. Elec t, Process Parameters, Material removal ning - Applications. L ENERGY BASED PROCESSES	rate, I	Elect	trical	circuit. Ele	ectro-chemi	cal grinding -	09	
Laser Bea	m machir	hing, Plasma Arc Machining - Principles, I Beam control techniques, Material remov	Equipr	nent	. Ele	ctron Bear				
FERENC	CE(S):									
						lew Delhi	0007	CONTRACTOR OFFICE		
P. K. M	and the second se	on Conventional Machining, Narosa Publi	shing	HOU	se, n	EW Denn,	2007.			
P. C. F	Pandey ar Delhi, 2008	on Conventional Machining, Narosa Publi nd H.S.Shan, Modern Machining Process 3.			1.			npany Pvt Lto	i.,	

5. Vijaya Kumar Jain, Advanced Machining Processes, Allied Publishers Pvt. Ltd., New Delhi, 2005.

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Department	MECHANICAL ENG	NEER	ING		1 I	R 2019	Semester	VI
Course Code	Course Name	ŀ	lour We	10-10 Million	Credit	Total	Maximum	
	FLEXIBLE MANUFACTURING	L	T	Ρ	C	Hours	Marks	
19MEX14	SYSTEMS	3	0	0	3	45	100	
 To impart To unders To know th To study th Course Outcomes Compare to Apply the construct 	ce the basics of Flexible Manufacturing S the knowledge on importance of Group Te tand the material handling layout configur he concept of FMS using simulation softw. he work volume of Robot and its application at the end of this course, learners will be the benefits of FMS over conventional ma group technology concepts in machine ce the material handling layout with compute	echnol ation v are an ons. e able nufact Il desig r cont	ogy with o d da to: to: curing gn.	(GT). comp ita ba g sys d sys	outer contr ase system tem.	1.	n.	
	table simulation software for applying the I							
 Identify the 	e suitable robot configuration for automation	on in F	MS.	41			and the second second	
	1 () () () () () () () () () (-	17.	4	1. H. 1998		
	UCTION TO FLEXIBLE MANUFACTURI							09
	IS - Types of production, characteristics	, flexi	bility	in m	hachining	systems ar	nd its types,	need
	n, benefits and application.			_	2.1	the second of the		
	TECHNOLOGY							09
low analysis, cellu	(GT) - Part families, parts classification a lar manufacturing, composite part concep ept, grouping parts and machines by rank	t, mac	hine	cell	design, ty	pes of mach	nine cell desig	
	NENTS AND COMPUTER CONTROL SY					1000 - 20	1.11.70.00	09
handling system, i implementation iss		config	uratio	on, c	omputer o			and
	TER SOFTWARE, SIMULATION AND DA	- 10 - C - C		1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1				09
simulation. Manufa	ftware- System issues, types of simulatior acturing data systems - Data flow, FMS da						nd applicatior	n of
Unit V ROBOTI	C TECHNOLOGY AND APPLICATIONS							09
	ootic elements - Joints, links, robot configu ors in robotics. Applications - Material han							44(3) N 80
EFERENCE(S): Mikell P. Groo		-					<u> </u>	
Wikel P. Gro	over, Automation Production Systems and	Com	pute	r Inte	grated Ma	nutacturing	System.	
	of India, PTR Upper Saddle River, NJ, US				5	Ų		

	Prentice Hall of India, PTR Upper Saddle River, NJ, USA, 2007.
2.	S. R. Prasad, R. Prabhakar and S. Dhandapani, Intelligent Flexible Autonomous Manufacturing Systems, Tata McGraw Hill Publishing Private Limited., New Delhi, 2000.
3.	N. K. Jha, Handbook of Flexible Manufacturing Systems, Academic Press Incorporation, SanDiego, 1991.
4.	Satya Ranjan Deb, Robotics Technology and Flexible Automation, Tata McGraw Hill Publishing Company Private Limited., New Delhi, 2009.
5. _{pl}	Joseph Talvage and Roger G. Hannam, Flexible manufacturing systems in practice, Marcel Dekker Incorporation, NewYork, 1987.
6.	Nanua Singh, Systems Approach to Computer Integrated Design and Manufacturing, John Wiley Sons, Incorporation New York, NY, USA, 2011.

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Department	MECHANICAL ENGINEERING			ENGINEERING			Semester	VI	
Course Code	Course Name	1	Hours / Week		Great		Total	Maximum	
	COMPUTER INTEGRATED	L	Τ	P	C	Hours	Marks		
19MEX15	MANUFACTURING	3	0	0	3	45	100		

To introduce the basic concepts of Computer Integrated Manufacturing (CIM).

- To provide knowledge on Group Technology and Computer Aided Process Planning.
- To impart knowledge on Shop Floor Control and Flexible Manufacturing Systems.

To learn the various CIM implementation and data communication techniques.

 To provide knowledge on the concept of Manufacturing automation protocol, Technical office protocol and database terminology.

Course Outcomes: At the end of this course, learners will be able to:

- Assess CAD/CAM integration for changing manufacturing and management scene.
- Construct a machine cell using the concepts of Group Technology and Computer Aided Process Planning.
- Select the suitable material handling and storage system for Flexible Manufacturing Systems.
- Choose the suitable CIM implementation and data communication techniques.
- Use various protocols and database terminology in CIM.

Unit I INTRODUCTION

The changing manufacturing and management scene, External communication, Islands of automation and software, dedicated and open systems, manufacturing automation protocol, introduction to CAD/CAM integration.

Unit II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING

Classification and coding - DCLASS, MICLASS and OPITZ coding systems. Facility design using G.T. - Benefits of G.T - cellular manufacturing. Process planning, role of process planning in CAD/CAM integrationapproaches to computer aided process planning- variant approach and generative approaches.

Unit III SHOP FLOOR CONTROL AND FMS

Shop floor control phases -factory data collection system -automatic identification methods- Bar code technology automated data collection system. FMS- components of FMS- types -FMS workstation- material handling and storage systems- FMS layout-computer control systems-application and benefits

Unit IV CIM IMPLEMENTATION AND DATA COMMUNICATION

System modeling tools- ICAM definition (IDEF) models, activity cycle diagram, CIM open system architecture (CIMOSA) - manufacturing enterprise wheel- CIM architecture- Product data management, implementationsoftware. Communication fundamentals- local area networks (LAN) - topology -LAN implementations - network management and installations.

Unit V OPEN SYSTEM AND DATABASE FOR CIM

Open systems-open system inter-connection - manufacturing automation protocol and technical office protocol-(MAP/TOP).Development of databases -database terminology- architecture of database systems- data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

RE	FERENCE(S):
1.	Mikell P Groover, Automation of production systems and computer integrated manufacturing, Pearson Education, United States of America, 2008.
2.	Lee Kunwoo, CAD,CAM,CAE systems, Addison Wesley, United States of America, 1999
3.	Kant Vajpayee S, Principles of Computer Integrated Manufacturing, Prentice Hall, New Delhi, 2003
4.	Radhakrishnan P, Subramanyan S and Raju V, CAD,CAM,CIM, Second Edition New Age International Pvt. Ltd, New Delhi, 2000

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Department	MECHANICAL ENGIN	IEEF	RING			R 2019	Semester	VIII
Course Code	Course Name	ł	loui We		Credit	Total	Maximur	n
	INDUSTRIAL SAFETY ENGINEERING	L	Т	Ρ	С	Hours	Marks	
19MEX16		3	0	0	3	45	100	
 To study To introde To provide To learn solution To study 	(s): The purpose of learning this course is: the principles of safety management system. uce the provisions contained in the industrial le knowledge on safety requirements for engi safety requirement for chemical industry. the various safety measures adopted in cons es: At the end of this course, learners will be	laws ineer	ing i ion i					
ImplementImplementEvaluate	afety management system of an industry. In the provisions of acts and rules in industrie int and review the safety performance follower safety appraisal in chemical industries. In safety reports on construction industries.		vario	us ine	dustries			
Unit I SAFE	TY MANAGEMENT	1		1.1	No. of the local sector of	in the second	1.1.1.1	09
Analysis (JSA), Concept of an a - Safety indices.	lution, International Labour Organization (IL Safety survey, Safety inspection, Safety ccident, Accident causation models, cost of a	Sa	mpli	ng,	Accident	Investigatio	on and Repo	orting
Unit II SAFE	TY AND LAW						1.3*1	09
Environment and Act 1983, Boiler	N 1007000 N							-
	TY IN ENGINEERING INDUSTRIES							09
machine guardir handling industri Power press, for leak test, radiogr	working machinery and wood working maching - zero mechanical state (ZMS),types of al gases, storage and handling of gas cylindiging, safety in furnaces, Safety in finishing, in aphy.	gua ers- \$	rds, Safe	Pers ty in	onal prot cold formi	ective equip	oments- Safe working of m	ety in etals-
commissioning a and emergency	ess design, unit operations, pressure ves and inspection, pressure vessel, non-destru planning, management of maintenance HAZ TY IN CONSTRUCTION INDUSTRY	ctive	test			corrosion F		Plant nance 09
Causes of fatal construction- Ed dismantling, Occupational Sa on fragile roo chain pulley bloc	accidents, Construction regulations, contra ducation and training Hazards of constr road works, construction of fety and Health Administration (OSHA) requ	iremo iremo n n	n a hig ent f nach	and gh or hinery lling,	prevention rise bu working , inspect Safety in	n- excavation uildings - W at hei ion and te demolition v	on, scaffo orking at he ghts- Wo sting of cr vork, keys to	ice in Iding, ights, orking anes,
REFERENCE(S):			and a		Toularday	and the former of	111 80 5 da m	AL DECKER (
	ndustrial Safety, Prentice Hall, Incorporated,	New	Jers	sey, 1	973.			
2. National Safe	ety Council, Accident Prevention Manual for I	ndus	trial	Oper	ations, Ch	nicago, 1988	4	

3. Subramanian V., The Factories Act, 1948, with Tamil Nadu Factories Rules , 1950, Madras.

and a

4. Environmental Pollution Control Act, 1986

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5. BOCW Act, 1996, Madras Book agency, Chennai-1

6. Explosive Act, 1884, Eastern Book Company, Lucknow -266 001 1-0-3

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	epartment	MECHANICAL EN	GINEEF	RING	3	1.1.1	R 2019	Semester	VI
Co	ourse Code	Course Name	1	Hou We		Credit	Total	Maximum	
	19MEX17	INDUSTRIAL ROBOTICS	L	T	P	C	Hours	Marks	
Cou	To learn the To provide To impart k To study th To provide Inse Outcomes: Identify the Select a su Choose ser Formulate f Discuss the	The purpose of learning this course is e construction and fundamentals of rob knowledge on types of drives and end knowledge on sensors and machine visite kinematics of robots and its program knowledge on the applications of robots. At the end of this course, learners will components and construction of robot itable drive and an end effector for indunsors and machine vision system for in forward & inverse kinematics and constructions of robots in industry.	ots. effector on syst ming mo s in ind be able manipu ustrial ro dustrial ruct pro	ethor ustrice to: lator bots robo	d. es.		45	100	
Uni		MENTAL OF ROBOTICS PROCESS Robotics and Automation - Law of robot	ion Do	hot	Anoto		dinata Suat	ama Mark	0
		ation - Specifications - Pitch, Yaw, Roll,							
Uni		DRIVE SYSTEM AND END EFFECTO Hydraulic Drive, Mechanical Drives and	5 A (5 A T)						0
ser	nsors, touch and	tactile sensors, proximity and range slip sensors, force and torque sensor							locit
Uni For Ma Din pro	t IV ROBOT I ward Kinematic nipulators with nensional) - De	ure coding, object recognition and cate KINEMATICS AND ROBOT PROGRA cs, Inverse Kinematics and Difference Two, Three Degrees of Freedom (eviations and Problems. Teach Pender uages - VAL Programming - Motion Co	gorizati MMING es; Fo In 2 D ant Pro	on, v rwar imer ograr	visual d Kir nsiona nming	inspection nematics al), Four g, Lead th	n. and Revers Degrees o hrough prog	se Kinematic f Freedom (gramming, R	09 Cs c (In c) Robc
Uni For Ma Din pro and Uni	t IV ROBOT I rward Kinematic nipulators with nensional) - De gramming Langu Simple program t V IMPLEM	ture coding, object recognition and cate KINEMATICS AND ROBOT PROGRA cs, Inverse Kinematics and Difference Two, Three Degrees of Freedom (eviations and Problems. Teach Penda uages - VAL Programming - Motion Co ns. ENTATION AND APPLICATION	gorizati MMING es; Fo In 2 D ant Pro mmand	on, V rwar imer ograr s, Se	visual d Kin nsiona nming ensor	inspection nematics al), Four g, Lead th Comman	n. Degrees o hrough prou ds, End effe	se Kinematic f Freedom (gramming, R ecter comman	0 cs o (In Robo nds,
Uni For Ma Din pro anc anc Uni Cau cor disu Occ on cha safe	t IV ROBOT I ward Kinematic nipulators with nensional) - De gramming Langu Simple program t V IMPLEMI uses of fatal ac nstruction- Educ mantling, ro cupational Safety fragile roofs ain pulley blocks, e demolition, hea	ture coding, object recognition and cate KINEMATICS AND ROBOT PROGRA cs, Inverse Kinematics and Difference Two, Three Degrees of Freedom (eviations and Problems. Teach Penda uages - VAL Programming - Motion Co- ns. ENTATION AND APPLICATION recidents, Construction regulations, con- cation and training Hazards of con- bad works, construction y and Health Administration (OSHA) re- s, work permit systems- Constru- , earth moving equipment, conveyors- M- alth hazards from demolition, fire and en-	gorizati MMING es; Fo In 2 D ant Pro mmand tractual structic of equirem uction Manual kplosior	on, N rwar imer ograr s, Se l cla bon a hig ent f macl hanc n haz	visual d Kin nsiona nming ensor uses, and p h for hiner; dling, zard-	inspection nematics al), Four g, Lead th Comman permit to prevention rise bui working y, inspect Safety in o	and Revers Degrees o hrough proy ds, End effe work, Qua - excavatio ldings - W at hei ion and te demolition w confined spa	se Kinematic f Freedom (gramming, R ecter comman ality assurand on, scaffol orking at hei ghts- Wo esting of cra vork, keys to aces	09 cs c (In Robo nds, 09 ce i ding ghts rkin
Uni For Ma Din pro anc Uni Car cor disr Occ on cha safe REF 1.	t IV ROBOT I marked Kinematic mipulators with mensional) - De ogramming Langu Simple program t V IMPLEMI uses of fatal ac mantling, ro cupational Safety fragile roofs ain pulley blocks, e demolition, hea ERENCE(S): M. P. Groover, I Publishing Com D. Richard, Klaf	Aure coding, object recognition and cate KINEMATICS AND ROBOT PROGRA as, Inverse Kinematics and Difference Two, Three Degrees of Freedom (eviations and Problems. Teach Penda uages - VAL Programming - Motion Coms. ENTATION AND APPLICATION reidents, Construction regulations, con- cation and training Hazards of com- bad works, construction y and Health Administration (OSHA) re- s, work permit systems- Constru- , earth moving equipment, conveyors- Malth hazards from demolition, fire and e and training Hazards of com- pany Pvt. Ltd., New Delhi, 2001. Ter, A. Thomas, Chmielewski and Mich	gorizati MMING es; Fo In 2 D ant Pro mmand tractual structic of equirem uction in Aqual kplosior mming a	on, v rwar imer ograr s, Se l cla bn a hig ent f mac hanc hanc hanc hanc hanc	visual d Kin nsiona nming ensor uses, and p hiner dling, zard-	inspection nematics al), Four g, Lead th Commany permit to prevention rise bui working y, inspect Safety in o Safety in o cations, Ta	and Revers Degrees o hrough prouds, End effe work, Qua - excavation Idings - W at height ion and te demolition we confined spa	se Kinematio f Freedom (gramming, R ecter comman ality assurance on, scaffol- orking at hei ghts- Wo esting of cra vork, keys to aces	0 cs ((In Robo nds, 0 0 ce i ding ghts rkin
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Chairman - BoS Dept. of Mech Engg. - ESE

5. James G. Keramas, Robot Technology Fundamentals, Cengage Learning, 2011.

6. Subir Kumar Saha, Introduction to Robotics, Tata McGraw Hill Publishing Company Pvt. Ltd., New Delhi, 2008.

Department	MECHANICAL ENGI		111			R 2019	Semester	VI
Course Code	Course Name		Hour We	ek	Credit	Total	Maximum	
19MEX18	TOTAL QUALITY MANAGEMENT	L	T	P	C	Hours	Marks	_
		3	0	0	3	45	100	
	s): The purpose of learning this course is:		TON					
	oncepts, dimension quality and philosophic he TQM principles and its strategies.	es or	I QIV	4.				
	the seven statistical quality and managen	nont t						
	knowledge on TQM tools for continuous in							
	ce QMS and EMS.		onio					
Course Outcomes	: At the end of this course, learners will be	able	to:	2.11	101	Ren to C		
	oncepts, dimension of quality and philosop			QM.				
 Apply the 	principles of TQM and its strategies in indu	ustries	s.				1.8.1.	
	statistical quality tools and seven manager			5.				
	e suitable TQM tools for continuous impro-	veme	ent.					
Use the co	oncept of QMS and EMS in industries.			1.00				
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	DUCTION					1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	1. 199 (1990)	09
	ty - Dimensions of Quality - Quality Planni							
	asic concepts of Total Quality Management							IC
	Philosophy - Crosby philosophy - Continu	ious F	roce	ess ir	nproveme	nt - Juran T	rilogy, PDSA	
	- Obstacles to TQM Implementation.							
					0	un all Quala		09
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Principles of TQM Customer Percept	, Leadership - Concepts - Role of Senior M ion of Quality, Customer Complaints, Serv	vice Q	ualit	y, Cu	istomer R	etention, Err	nployee	on -
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N. him Chairman - BoS Dept. of Mech Engg. - ESEC

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0	MECHANICAL ENG	INEERI	NG			R 2019	Semester	O
Course	Course Name		ours Nee		Credit	Total Hours	Maximu	
Code		L	Т	Ρ	С	Hours	Marks	
19MEY01	ADDITIVE MANUFACTURING 3		0	0	3	45	100	
To prov To learn To impa To intro To expo To expo Course Outcom Explain Select ti Identify Design Implem Unit I INTR Needs - Impact o CNC Machining- of STL file - File V Benefits - Classifi Unit II LIQU Stereolithography Curing (SGC), F Principle, Constru	ve (s): The purpose of learning this cours ide knowledge on generic steps of Additive in the concept and applications of liquid and art knowledge on powder based AM process duce the concept of open source 3D printe base the emerging trends and applications of nes: At the end of this course, learners will the generic steps and classification of Add ne suitable material and AM process bases the suitable AM process to fabricate meta their own open source 3D printer based or ent the reverse engineering techniques for ODUCTION f AM and Rapid Tooling on Product Develo The Generalized AM Process chain - CAD (verification and Repair - Build File Creation cation of RP systems. JID POLYMER AND SOLID BASED SYS Apparatus (SLA), Digital Light Projection used Deposition Modeling (FDM) and ction, Materials and Applications. DER BASED SYSTEMS	e Manufa d solid ba sses. ers and r of Additiv I be able ditive Ma d on app allic comp n applica r develop Dopment - 0 Model - n - Part C TEMS n (DLP)	asec apid e to: nufa licat bone tion. Dis Inpo Cons	d AM tooli anufa acturi ions. ents. prote tincti ut file truct	processe ng. acturing te ng proces otype on betwee on betwee formats ion - Part	s. echnology. ses. en AM and - Generatio Cleaning a ation proce	nd finishing - ess, Solid Gr	RP 07
Particle Manufact	Sintering (SLS), Three dimensional Prir uring (BPM), Electron Beam Melting (EBM ction, Process Variables, Materials and A	1) and La	aser	Dire Eng	ect Metal ineered N	Deposition et Shaping	(DMD), Ba (LENS)- Wo	llistio rking
and the second	N SOURCE PRINTER AND RAPID TOO		10.					
UNIT OFE	N SOURCE FRINTER AND RAFID TOO	LING			4			11
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Department	MECHANICAL ENGINE	EER	ING			R 2019	Semester	OE
Course	Course Name		lour Wee		Credit	Total Hours	Maximum Marks	
Code		L	Т	P	C	1.2		
19MEY02	NON - DESTRUCTIVE EVALUATION FOR ENGINEERS	3	0	0	3	45	100	
	tive (s): The purpose of learning this course is	:						
	different surface inspection techniques.							
	de knowledge on magnetic particle testing.							
	rt knowledge on ultrasonic testing method.							
	de knowledge on radiography testing method.							
	y various special non destructive testing metho							_
Course Outco	mes: At the end of this course, learners will be	abl	le to:	o Verence o				
	ppropriate surface inspection techniques for th				s to be ins	spected		
	the magnetic particle testing method for ferrou							
	nd explain the suitable testing method for testi							
	diography testing methods for different suitable							
Choose	the suitable special non-destructive technique for	or va	rious	appli	cations.			1.00
	RFACE TECHNIQUES on-Destructive testing (NDT) - Discontinuities		131					09
Unit II MA Magnetic Particl echnique and V eakage Testing nstrumentation	enetrants to parts - Fluorescent penetrant test. GNETIC PARTICLE TESTING e Testing (MPT) Principles, applications - Mag Net fluorescent particle technique, demagnet g Principle, Instrumentation and applications and applications of Eddy Current Testing (ECT RASONIC TESTING	izati - E	on, /	Adva	ntages ar	nd limitation	ns - Magnetic	
Jltrasonic Testir	ng (UT) Principle, Types and characteristics of	f Ul	trasc	nic v	waves, A	ttenuation,	Couplants, Pro	bes
diaplava Anala	beam inspection of welds, Calibration of AST s, Applications.	гм -	Test	block	s Interna	ational Insti	itute of Welding	אוו ב
				-		12		09
Radiographic te scattering-Filters formation, Expo	esting (RT) Principle, Sources of X-rays and s and screens, imaging modalities - Film radio osure factors, film handling and storage Inve netrometers, Safety in radiography, Application	grap	phy a	ind D	igital Rad	iography -	Problems in sr	raphi
NEED TOTAL STRUCT	ECIAL TECHNIQUES							09
Red Thermogra	on Testing (AET) Principle - Advantages and aphy (IRT), Contact and non-contact inspect applications, LASER Shearography - Typ	tion	met	hods	, Pressur	e and Lea	ak lesting - I	estin
TEVT DOOLU		-						
TEXT BOOK(S);	No		otrue	tive Test	ing Naros	a Publishing 1	997
1. Baldev Ra	aj, Jayakumar T, Thavasimuthu M, Practical	INC	n-De	struc	Suve Test	ing, ivalus	ה רעטווסווווש, ו	551.
REFERENCE	S):			-		1000	-	

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Chairman - BoS Dept. of Mech Engg. - ESEC

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2. 3.		I and Vernon John, Non Destructive Testing, -Destructive Evaluation and Quality Control, A				ale Metale		
		b, USA, 2001	America	1 3001	ery of mer	als, Metals		
							N.	for
Dep	partment	MECHANICAL ENGIN	EERING	;		R 2019	Semester	OE
	ourse Code	Course Name	Hou We		Credit	Total Hours	Maximun Marks	ו
	Joue		LT	P	C			
19	MEY03	INDUSTRIAL SAFETY ENGINEERING	3 0	0	3	45	100	
•	To provid To provid To expos	ive (s): The purpose of learning this course is de in depth knowledge in Principles of Enviror de the knowledge of air and water pollution ar se the students to the basics in hazardous wa mes: At the end of this course, learners will be	nmental nd their o ste mar	control		oplications i	in various field	IS.
	certificati Illustrate I SAF eral safety	and the standards of professional conduct that ion bodies. the importance of safety of employees while ETY IN METAL WORKING AND WOOD WO rules, principles, maintenance, Inspections of	working RKING If turning	with n MACI	nachinerie HINES hines, bor	s. ing machin	es, milling ma	09 achine
		ne and grinding machines, CNC machines	Mood	work	ing mach	·	s. safety prin	ciples
ma	aterial hand	s, work area, material handling, inspection, s Iling equipments.						ection
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Departmer	Artment MECHANICAL ENGINEERING			R 2019	Semester	OE		
Course	Course Name		lour Wee		Credit	Total	Maximum Marks	1 1
Code		L	Т	Ρ	С	Hours	Warks	4
19MEY04	MAINTENANCE ENGINEERING	3	0	0	3	45	100	
 To un manage To e 	ective (s): The purpose of learning this course is iderstand the principles, functions and practices a gement of maintenance activities. educate different maintenance categories oring and repair of machine elements.	adap				ne success maintenan		n
Course Outo Explai mainte Demo Explai Explai	comes: At the end of this course, learners will be in principles, functions and practices adapted in i enance activities. Instrate the various policies preventive maintenar in Preventive maintenance concepts. in condition monitoring concepts. but various repair methods of machine elements.	indus nce.		or the	success	ful manage	ement of	
	PRINCIPLES MAINTENANCE PLANNING		-					09
Importance	ples of maintenance planning - Objectives and p and benefits of sound maintenance systems - Re PRACTICES OF MAINTENANCE PLANNING						activity -	09
Maintenance	Between Failures, Mean Time To Repair and Me e organization - Maintenance economics.	ean V	Vaitir	ng Tir	ne - Facto	ors of avail	lability -	
Unit III I	MAINTENANCE POLICIES - PREVENTIVE MAI	INTE	NAN	ICE				09
Maintenance maintenance Maintenance	e schedules, repair cycle - Principles and	each me		categ ls c		Preventivation -		
Unit IV (CONDITION MONITORING			K				09
Condition ba offload testin	ased maintenance - Cost comparison with and wi	ithou	t Cor	nditio	n Monitor	ing - On-lo	ad testing and	ł
Unit V F	REPAIR METHODS							09
Failure analy	ysis - Failures and their development - Repair me	ethoc	ls for	Mair	tenance.			
REFERENCE	E(S):	1.00		et ange	Carlor Carlor (Carlor)	44 ()	Profession of	
	ava S.K., Industrial Maintenance Management, S.	. Cha	and a	and C	ompany.	2002.	1. 1. 1.	
2. Venkata	araman.K, Maintenance Engineering and Manage g, Pvt. Ltd., 2007.			-				
3. Andrew	K.S.Jardine and Albert H.C.Tsang, Maintenance	, Re	place	emen	t and Reli	ability, Ta	ylorand	- 11-2
Francis, 4. Mishra F 2012.	2006. R.C. and Pathak.K, Maintenance engineering ar	nd M	anag	jeme	nt, PHI Le	earning, P	vt.Ltd.,	
5. Higgins	R.L, R.Keith Mobley and Darrin Wikoff, Maintena nies Inc. 2008.	ance	Engi	neeri	ng Handb	book, McG	raw-Hill	

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	MECHANICAL ENGIN	EER	ING			R 2019	Semester	OE
Course	Course Name	1 1153	lour: Wee		Credit	Total	Maximu Marks	n
Code		L	Т	Ρ	С	Hours	Warks	
19MEY05	RENEWABLE ENERGY SOURCES	3	0	0	3	45	100	
 To lear To prov To stud 	ve (s): The purpose of learning this course is n about solar radiation and solar thermal sys ride knowledge on fundamentals of Photovol ly about the working of ocean and geotherm art the knowledge on wind energy system.	tems Itaic s	system		es.			
Course Outcon Explain Summa Illustrat Compu Select t	n about bio mass energy sources and its utili nes: At the end of this course, learners will b solar radiation and its conversion into heat the arize the characteristics of solar photovoltaic the working of ocean and geothermal energy the wind energy potential and design of wind he bio mass energy sources and its converse	e abl using syste gy so energ ion te	e to: sola em. ource gy sy echno	es. stem	S.		*	00
001	AR RADIATION AND SOLAR THERMAL		91 372,32				line for a for	09
	at the Earth's surface, solar radiation meas Introduction to conversion of solar radia es.							
Jnit II SOL	AR PHOTOVOLTAIC SYSTEMS							09
	hotovoltaic system, Voltage current character olar cell, configuration of solar photovoltaic p							
Unit III OCE	AN ENERGY AND GEOTHERMAL ENERG	Y					19 a	09
conversion sys classification of	Energy from waves, energy potential. Co tems. Ocean thermal energy conversion geothermal resources, schematic of geother	-Me	thodo	ology	, Applica	tions. Ge	othermal en	
proplems	5 (mai p	owe	r piar	its, opera	itional and	environment	
problems Unit IV WIN		mai p	oowe		its, opera	itional and	environment	
Unit IV WIN Basic principles system for rote	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind	n of v data	wind	turbi	nes, wir	nd turbine	e rotor, reg	al 09
Unit IV WIN Basic principles system for rote considerations -	D ENERGY of wind energy conversion - classificatior	n of v data	wind	turbi	nes, wir	nd turbine	e rotor, reg	al 09 ulatin
Unit IV WIN Basic principles system for rote system for rote considerations - Unit V BIO Biomass resour Biogas - recovery from unitial State	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems ENERGY rces - Conversion technologies - Biochem Production, factors affecting ban waste, power generation from liquid wa	n of v data s nical bi	wind and conv ogas	turbi d e versic	nes, wir nergy o n, Biom oduction,	nd turbing estimation nass gas biogas	e rotor, reg Site se ification, Pyr plants. E	al 09 ulatin ectio
Unit IV WIN Basic principles system for rote considerations - Unit V Biomass resour Biogas	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems ENERGY rces - Conversion technologies - Biochem Production, factors affecting ban waste, power generation from liquid wa	n of v data s nical bi	wind and conv ogas	turbi d e versic	nes, wir nergy o n, Biom oduction,	nd turbing estimation nass gas biogas	e rotor, reg Site se ification, Pyr plants. E	al 09 ulatin ectio 09 olysis
Jnit IV WIN Basic principles system for roto considerations - Jnit V BIO Biomass resour Biogas recovery from un REFERENCE(S) 1. D. P. Kotha Technologie	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems ENERGY rces - Conversion technologies - Biochem Production, factors affecting ban waste, power generation from liquid wa t ri, K. C. Singal and Rakesh Ranjan, Renewa es, Prentice Hall of India , New Delhi, 2009	n of v data s nical bi ste, t	wind and conv ogas bioma	turbi d e versic pro ass co	nes, wir nergy o n, Biom oduction, ogenerati urces and	nd turbine estimation nass gas biogas on, bio-fue d Emerging	e rotor, reg Site se ification, Pyr plants. E	al 09 ulatin ectio 09 olysis
Jnit IV WIN Basic principles system for rote considerations - Jnit V BIO Biomass resourd Biogas recovery from und REFERENCE(S) 1. D. P. Kotha Technologie 2. Godfrey Bo	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems -ENERGY rces - Conversion technologies - Biochem Production, factors affecting rban waste, power generation from liquid wa : ri, K. C. Singal and Rakesh Ranjan, Renewa	n of v data s nical bi ste, t	wind and conv ogas bioma	turbi d e versic pro ass co	nes, wir nergy o n, Biom oduction, ogenerati urces and	nd turbine estimation nass gas biogas on, bio-fue d Emerging	e rotor, reg Site se ification, Pyr plants. E	al 09 ulatin ectio 09 olysis
Jnit IV WIN Basic principles system for rote system for rote considerations - Jnit V BIO Biomass resour Biogas - recovery from un REFERENCE(S) 1. D. P. Kotha Technologie 2. Godfrey Bo with the Op 3. S. A. Abbas	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems ENERGY rccs - Conversion technologies - Biochem Production, factors affecting ban waste, power generation from liquid wa : ri, K. C. Singal and Rakesh Ranjan, Renewa es, Prentice Hall of India , New Delhi, 2009 yle, Renewable energy power for sustainable	n of v data s nical bi ste, k able E e futu	wind and conv ogas ioma Energ re, C	turbi d e ersic pro ass c yy So	nes, wir nergy o n, Biom oduction, ogenerati urces and Universi	nd turbine estimation nass gas biogas on, bio-fue d Emerging ity Press ir	e rotor, reg Site se ification, Pyr plants. E el	al 09 ulatin ectio 09 olysis
Jnit IV WIN Basic principles system for roto considerations - Jnit V BIO Biomass resour Biogas recovery from un REFERENCE(S) 1. D. P. Kotha Technologia 2. Godfrey Bo with the Op 3. S. A. Abbas	D ENERGY of wind energy conversion - classification or, wind power generation curves, wind Merits and demerits of wind energy systems -ENERGY rces - Conversion technologies - Biochem Production, factors affecting ban waste, power generation from liquid wa : ri, K. C. Singal and Rakesh Ranjan, Renewa es, Prentice Hall of India , New Delhi, 2009 yle, Renewable energy power for sustainable en University, New Delhi,2004 ii and Naseema Abbasi, Renewable energy s Il of India, New Delhi, 2001 ridell and Anthony D. Weir, Renewable energy	n of v data s nical bi ste, b able E able E	wind and conv ogas ioma re, C re, C	turbi d e prersic pro ass c Dxforo nd th	nes, wir nergy o n, Biom oduction, ogenerati urces and Universi eir enviro	nd turbine estimation. nass gas biogas on, bio-fue d Emerging ty Press ir nmental in	e rotor, reg Site se ification, Pyr plants. E el	al 09 ulatin ectio 09 olysis

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Department	MECHANICAL ENG	INEER	ING			R 2019	Semester	OE
Course	Course Name		Hours / Week		Credit	Total Hours	Maximur Marks	n
Code		L	Т	Ρ	С	Hours	Inal NS	
19MEY06	POWER PLANT ENGINEERING	3	0	0	3	45	100	207
 To impaie To learn To study 	tive (s): The purpose of learning this course rt the knowledge on boilers and steam power about the various components associated the working of nuclear and hydel power plat about the working of diesel and gas turbing	er plan with ste ant.	eam		er plant.			
	de the knowledge on power plants using re				and eco	nomics of	power plants	
 Explain t Assess t Select th Expose t 	mes: At the end of this course, learners will the working principle of steam power plant a the function of various systems in steam power be suitable components for nuclear power pl the working of diesel and gas turbine power the different sources of renewable energy a	and bo wer pla lants a plant.	ilers. ant. nd hy	ydel p			nlants	
	RODUCTION TO POWER PLANTS AND			suic	economic		planta	09
Layout of Stear	m power plant - Components, Selection. Ste ilers, Fluidized Bed Boilers. Combined Pow	eam Bo	oilers					1
	EAM POWER PLANT							09
Electrostatic Pr Cooling Towers	andling - Combustion Equipment for burnin recipitator, and Mechanical Collectors. Drau s. Pollution controls.							
Unit III NU	CLEAR AND HYDEL POWER PLANTS			1	1.21	a harda a da		09
Water Reactor,	 y - Fission, Fusion Reaction. Layout - Ty Waste Disposal and safety. Hydel Power rbines, Governing of Turbines. 							
	SEL AND GAS TURBINE POWER PLANT	S	-	11	All Sections			09
	el power Plant - Components, Selection of Fuels, Gas Turbine Material. Open and Clo							ır
Unit V OT	HER POWER PLANTS AND ECONOMICS	OF P	OWE	R PL	ANTS	100	24 1 29 6	09
plant. Wind ene	ower plant. Ocean thermal energy conver ergy. Wind turbines. Magneto hydrodynamio s, Economics of load sharing.	sion ((c gene	DTEC	C). T (MH	idal powe D). Cost (er plant. So of Electric	olar thermal Energy - Fixe	powe d and
REFERENCE(S	j):							
	a, S. Domkundwar, A course in Power Plant	Engin	eerin	g, Dł	nanpatrai	& Sons, N	ew Delhi, 200)8.
2. K.K.Ramal	ingam, Power Plant Engineering, Scitech P	ublicat	ions	(India	a) Private	Limited, 2	002.	
	Power plant Engineering, Tata McGraw Hill					, New Del	hi, 2014.	
	bal, Power Plant Engineering, Khanna Publi	11						
the second se	Introduction to Power Plant Technology, Kh		1.20101.01			lhi, 2013.	A DEPENDENCE OF THE OWNER	-
6. R. K. Rajpu	ut, Power Plant Engineering, Laxmi Publicat	lions, M	iew I	Delhi,	,2007.		and managements	

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Departmen	MECHANICAL ENGIN	IEERI	NG		17 6	R 2019	Semester	OE
Course	Course Name		lour: Wee	T0000	Credit	Total Hours	Maximu Marks	
Code		L	Т	P	С	liouio	Warks	
19MEY07	RAPID PROTOTYPING	3	0	0	3	45	100	
To u differ	ctive (s): The purpose of learning this course inderstand the process of generating 3D Co ent method plain the constructional features and to develo	mpute				.2 	VILLANDIAN	
 To Proto To Tech To en 	fries. provide an exhaustive knowledge on v typing Techniques (RPT). familiarize about materials and process niques. lucate powder based methodology and emergi facturing (AM) technology.	s par	rame	eters	of liqu	id and	enefits of solid base ations of Add	
Course Outo Designed Development Generic Select Select	omes: At the end of this course, learners will b n a 3D model from the 2D data. op a CNC program for simple components. rate stl file to feed into RP machine. t appropriate liquid or solid materials based RI t appropriate process for aerospace, automotiv	⊃ proc	ess					
applic Unit I (AD MODELING		-					09
Unit II / A Introduction features, ad bearings, driv	CAD/CAM data exchange - IGES, STEP. Prod UTOMATION AND CNC MACHINES to Automation - Definition, types, reasons fr antages, applications and CNC Machine str e system, and control system. CNC Lathe and	or aut	toma	ating. .inea	CNC Ma	achines - bearings,	Recirculating	
	threading and drilling programs. DDITIVE MANUFACTURING							07
Introduction between AM Generation a Part Cleaning	 Impact of Additive Manufacturing (AM) a and CNC Machining- The Generalized AM nd Conversion of STL file - File Verification an and finishing - AM Benefits - Classification of 	Proce nd Rep AM pr	ess o pair	chain - Bui	- CAD	Model - In	put file form	nction hats - ion -
	QUID AND SOLID MATERIAL BASED SYST	CARDEN AND THE						08
	aphy Apparatus (SLA), Solid Ground Curing (S oject Manufacturing (LOM) - Working Principle,							ons
	OWDER BASED PROCESSES AND ANUFACTURING	APF	PLIC	ATIC	ONS OF	ADDIT	IVE	11
Engineered Applications.	er Sintering (SLS), Three dimensional Printin Net Shaping (LENS) - Working Principle, Application of Additive Manufacturing in Medic d Electronics and Retail industries.	Cons	struc	tion,	Process	Variable	s, Materials	
	S)-	5					the second second	
TEXT BOOK	0).							
	eid, R.Sivasubramania, CAD/CAM Theory and	Practi	ice, ⁻	Tata	McGraw I			

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2.	D. T.Pham, S. S.Dimov, Rapid manufacturing, Springer-Verlag, London, 2001.
3.	I. Gibson, D. W. Rosen, and B. Stucker, Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing, Springer, 2010
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Department	MECHANICAL ENGIN	EER	ING			R 2019	Semester	OE
Course	Course Name		lour Wee	<u>– – – – – – – – – – – – – – – – – – – </u>	Credit	Total Hours	Maxim Mark	
Code		, L	Т	Р	С	nouro	Mark	3
19MEY08	NANOMATERIALS SCIENCE	3	0	0	3	45	100	
 To ur To co To ac 	ctive (s): The purpose of learning this course is inderstand the fundamentals of physics of nanon prrelate on multidisciplinary branch equire the knowledge in nanomaterials synthesis usions at nano level	nater	A.:	e and	analyze o	data and dr	aw	
 Class Expla Analy Illustr applica 	omes: At the end of this course, learners will be sify the size dependant properties of different na in different experimental methods used for the rese the data using different characterization tech rate the different techniques to synthesize semic tion ify the impact of nanomaterials and their applica	nom prepa nniqu condi	ateria aratic es uctor	nanc	ostructure	s and utiliz	e them for	
	IANO SCALE MATERIALS	uona		ano	devices			09
properties -m physical prop Unit II N Top down pro chemical vap	IANOMATERIALS SYNTHESIS METHODS occesses - mechanical milling, nanolithography a pour deposition, plasma enhanced CVD, o nomaterials - ordering of nanosystems, self-ass	erend and t	ces b types idal	betwe	en bulk a ed on rad sol-gel - organiza	nd nanoma iations - Bo methods ation - DC s	aterials and ottom up pro	their 09 bcess base
	HARACTERIZATION TECHNIQUES			_				09
techniques -	sification of characterization methods - and electron microscopy, scanning electron micro opy - diffraction techniques - X-ray spectroscopy	osco	py, t	ransr	mission e	lectron mi	croscopy, a	tomic
Unit IV S	EMICONDUCTOR NANOSTRUCTURES							09
super lattices synthesis ar nanomaterials	nfinement in semiconductor nanostructures - -epitaxial growth of nanostructures-MBE, metal nd electrical properties -applications- fuel s.	l orga cell	anic ' s -	VPE, qua	LPE - ca ntum eff	rbon nano iciency of	tubes- struc	cture,
Unit V N	ANOMACHINES AND NANODEVICES					the second		09
organic FET- injection, exci	nechanical systems (MEMS) and Nanoelectron principle, description, requirements, integrated tons, optimization - organic photovoltaic cells- n of nano materials in biological field.	d circ	cuits-	orga	anic LEDs	s - basic p	rocesses, c	arrier
TEXT BOOK	S).	1		-				-
	0].	Para	1			- S.P. market	and the second	1

1. Willam A. Goddard, Donald W. Brenner, Handbook of Nanoscience, Engineering, and Technology, GRC Press, 2012.

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REFERENCE(S		10.00			ogy, Wiley			
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College Pr	Cao, Y. Wang, Nanostructures and Nanoma ess, 2011.	aterials	-Syn	the	sis, Prope	erties &Appli	ications, Imp	erials
	ep, NANO: The Essentials Understanding (India) Ltd, 2012.	Nano	scien	ce	and Nano	technology,	, for	-
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Department	MECHANICAL ENGIN	NEERI	NG	6		R 2019	Semester	OE
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 Discuss Micropr Discuss Explain challen 	atrol of Mechanical, Electronic Systems and s the architecture of Microprocessor and ocessor and Microcontroller. Programmable Peripheral Interface, Archite the architecture, programming and applica- ges in the areas of Mechatronics engineering various Actuators and Mechatronics system	Micro ecture tion of g.	contr of 82: prog	olle 55 I ran	er, Pin D PPI, and v nmable lo	various devi gic controlle	ice interfacing ers to proble) ms an
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4.	Krishna Kant, "Microprocessors & Microcontrollers", Prentice Hall of India, 2007
5.	Michael B.Histand and Davis G.Alciatore, "Introduction to Mechatronics and Measurement systems", McGraw Hill International edition, 2007
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De	partment	MECHANICAL ENGIN	EEF	RING		(R 2019	Semester	OE
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box,	fluid flywhee and Torque	l construction, gear boxes- manual and a el, torque converter, propeller shaft, slip join e Tube Drive. ING, BRAKES AND SUSPENSION SYSTE	ts, u	nive					otchkiss
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1.		/. "Internal Combustion Engines", Third Edit	ion.	Tata	McC	Fraw-Hill	2012.	Bar Jack Serger	
2.		ler, "Advanced Engine Technology," SAE Ir						3.	135
3.		itner, "Automotive Mechanics," Second Edit							
4.	Martin W,	Stockel and Martin T Stockle , "Automotive nc, USA ,1978.	10.55.92			energy discounts and the		ood heart - V	Vill Cox
5.		eeds and Garet, "Motor Vehicles", Butterwo	orth F	Publi	sher	s,1989.			

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	se Code	Course Name	. 1	Hour We		Credit	Total	Maximum	
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	nent	MECHANICAL ENGIN	EER	RING	1	NG T	R 2019	Semester	OE
Course C	Code	Course Name	ŀ	lour		Credit	Total	Maximum	pana 2
			L	T	Ρ	C	Hours	Marks	
19MEY	13	ENTREPRENEURSHIP DEVELOPMENT	3	0	0	3	60	100	
	To d	(s): The purpose of learning this course is: evelop and strengthen entrepreneurial qua eurial skills and understanding to run a busin						and to impart	t basi
Course Ou	utcome	s: At the end of this course, learners will be vledge and skills needed to run a business si	able	to:		y and enec	divery.		
Unit I		EPRENEURSHIP	4000						09
	eur – 7	Types of Entrepreneurs – Difference between, Factors Affecting Entrepreneurial Growth.	en E	intre	prene	eur and In	trapreneur	Entrepreneur	ship i
Unit II	MOTIN	ATION	1.0			11.5	1.1.2		09
Thematic Objectives	Appere	fluencing an Entrepreneur – Achievement M ception Test – Stress Management, Enti							
Unit III	BUSIN	IESS							09
		a - Definition, Classification - Characteristics							Step
involved in Techno E Sources of	setting conomi f Inform	 Definition, Classification – Characteristics up a Business – identifying, selecting a Good c Feasibility Assessment – Preparation of hation – Classification of Needs and Agencies ICING AND ACCOUNTING 	d B	usin	ess c	opportunity	, Market Su	urvey and Res	Step earch aisal
involved in Techno E Sources of Unit IV Need – So	f Inform	g up a Business – identifying, selecting a Goo c Feasibility Assessment – Preparation of nation – Classification of Needs and Agencies	od B f Pros. Fina	usin elim ancia	ess c inary al Ins	pportunity Project F	, Market Su Reports –	urvey and Res Project Appra	Step search aisal 09
involved in Techno E Sources of Unit IV Need – So Costing, B	f Inform FINAN Durces reak Ev	up a Business – identifying, selecting a Goo c Feasibility Assessment – Preparation of hation – Classification of Needs and Agencies ICING AND ACCOUNTING of Finance, Term Loans, Capital Structure,	od B f Pros. Fina	usin elim ancia	ess c inary al Ins	pportunity Project F	, Market Su Reports –	urvey and Res Project Appra	Step search aisal 09 Capita
involved in Techno E Sources of Unit IV Need – So Costing, B Unit V Sickness i Incubators Diversifica	setting conomi f Inform FINAN Durces reak Ev SUPP n smal – Gov tion, Jo	g up a Business – identifying, selecting a Goo c Feasibility Assessment – Preparation of hation – Classification of Needs and Agencies ICING AND ACCOUNTING of Finance, Term Loans, Capital Structure, ven Analysis, Taxation – Income Tax, Excise	Fina Dut	usin elim ancia y – \$ Cor	ess c inary al Ins Sales	ppportunity Project F titution, M Tax.	, Market Su Reports – anagement	urvey and Res Project Appra t of working C leasures - Bu	Step search aisal 09 Capita 09 sines
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involved in Techno E Sources of Unit IV Need – So Costing, B Unit V Sickness i Incubators Diversifica EXTBOOK 1. Do 20 2. Kh	setting conomi f Inform FINAN Durces reak Ev SUPP n smal – Gov tion, Jo S: nald F 14. anka. S ES:	g up a Business – identifying, selecting a Goo in Feasibility Assessment – Preparation of mation – Classification of Needs and Agencies ICING AND ACCOUNTING of Finance, Term Loans, Capital Structure, ven Analysis, Taxation – Income Tax, Excise ORT TO ENTREPRENEURS I Business – Concept, Magnitude, Causes vernment Policy for Small Scale Enterprises int Venture, Merger and Sub Contracting. Kuratko, "Entrepreneurship – Theory, Proces S.S., "Entrepreneurial Development" S.Chand	Fina Duty and s - (usin elim ancia y – S Cor Grov	ess c inary al Ins Sales nsequ wth S ractic td., F	pportunity Project F titution, M Tax. Jences, C Strategies	r, New Delk	urvey and Res Project Appra t of working C leasures - Bu dustry – Expa gage Learning ni, 2013.	Step search aisal 09 Capita 09 siness ansion
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Department	MECHANICAL ENGI	NEEF	RING			R 2019	Semester	OE
Course Code	Course Name	ŀ	Hour We		Credit	Total	Maximum	
		L	T	P	С	Hours	Marks	
19MEY14	PRODUCTION TECHNOLOGY OF AGRICULTURAL MACHINERY	3			3	60	100	
Course Objectiv	e (s): The purpose of learning this course is:							
lathe, sha broaching		d allie	d ma	g, wo achin	orking of st es, grindin	andard mac g and allied	chine tools, su machines an	ch a: d
	nes: At the end of this course, learners will be e different manufacturing process and use th			stry fo	or compon	ent product	on.	
Unit-I ENG	INEERING MATERIALS		-			-		10
	aterials - their classification - Mechanical	pron	pertie	es of	material	s. strength	elasticity pla	
stiffness, malle Steels and cast	ability, ductility, brittleness, toughness, har irons: Carbon steels, their classification base eir properties & applications. Wrought iron, ca	dness ed on	s, re perc	silier	nce, machir ae of carb	nability, forr on as low, r	mability, weld mild. medium	abilit
Unit-II MAC	HINING			ine j e				8
Basic principles	of lathe - machine and operations perfe	orme	d or	n it	Basic des	cription of		ad
an analiana a COL							machines a	10
operations of Sr	haper-Planner, Drilling, Milling & Grinding.						machines a	a
	haper-Planner, Drilling, Milling & Grinding.						machines a	
Unit-III WEL	DING ssification of welding processes. Gas weldi	ng, ty	/pes	of fl	ames and			7
Unit-III WEL Introduction, cla welding. Resista	DING	ng, ty	/pes	of fl	ames and			7 ric Ar
Unit-IIIWELIntroduction, clawelding. ResistaUnit-IVADV.	DING ssification of welding processes. Gas weldi ince welding, Soldering & Brazing processes ANCED MANUFACTURING PROCESS	ng, ty and t	/pes their	of fla	ames and	their applic	cations. Electr	7 ric Ar 10
Unit-IIIWELIntroduction, clawelding. ResistaUnit-IVADVAbrasive flow mcut EDM - Elect	DING ssification of welding processes. Gas weldi ince welding, Soldering & Brazing processes	ng, ty and t	/pes their	of fla uses	ames and	their applic	cations. Electr	7 ric Ar 10 - Wir
Unit-IIIWELIntroduction, clawelding. ResistaUnit-IVADVAbrasive flow mcut EDM - ElecMachining (EBM)	DING ssification of welding processes. Gas weldi ince welding, Soldering & Brazing processes ANCED MANUFACTURING PROCESS achining - abrasive jet machining - water jet tro Chemical Machining (ECM) - Ultrasoni	ng, ty and t	/pes their	of fla uses	ames and	their applic	cations. Electr	7 ric Ar 10 - Wir
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Department	MECHANICAL ENGI	NEER	ING			R 2019	Semester
Course Code	Course Name		lour Wee	100 M 100	Credit	Total	Maximum
	GEOMETRIC DIMENSIONING AND	L	т	Р	С	Hours	Marks
19MEZ01	TOLERANCING	1	0	0	1	15	100

To understand the basics of GD&T and its practical applications

• To understand the proper way to specify dimensions and tolerances, symbols, datum, position, location, run out and profile

Course Outcomes: At the end of this course, learners will be able to:

- Classify the standards and fundamentals of limits, fits and tolerance.
- Explain the rules and symbols of dimension and tolerance in various products.

Unit I GEOMETRIC DIMENSIONING AND TOLERANCING

Introduction to Geometric Dimensioning and Tolerancing - Dimensioning and Tolerancing Fundamentals -Symbols, Terms, and Rules-Datum Application, Datum feature identification-Inclined, cylindrical datum feature. Form flatness, straightness, circularity, cylindricity - Position Maximum Material Condition, Least material Condition - Location - Position, Coaxiality - Concentricity Symmetry Exercises - Run out - Definition, circular run out, total run out Profile Definition, Specifying profile, radius refinement with profile of conical feature.

REFERENCE(S):

1.	Gene R	Cogorno,	Geometric	Dimensioning	and	Tolerancing	for	Mechanica
2.		Graw Hill, 2006 wski, Fundamer	ntals of Geometri	c Dimensioning		and Tolerancing	, Delmar	Cengage
3.	Learning, 19 Gary K	997 Griffith,	Geometric	Dimensioning	and	Tolerancing:	Applica	ation and
	Inspection, I	Prentice Hall, 20	001.	J				

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	epartment	MECHANICAL ENG	INEERI	NG			R 2019	Semester	
Co	ourse Code	Course Name	10.00	ours Veek	-	Credit	Total	Maximum	
	19MEZ03 PIPING ENGINEERING L T P C 1 0 0 1			С	Hours	Marks			
29	19MEZ03	PIPING ENGINEERING	1	0	0	1	15	100	
	To impart kn To create ex irse Outcomes:	s): The purpose of learning this course i owledge on piping processes. pertise in Preparation of Plot Plan-Preparation At the end of this course, learners will b process diagram for piping network	aration o		uipn	nent Layo	outs		
		and the second death of the state of the second state of the secon	votomo						
	I PIPINO	ess layouts and design efficient piping s B ENGINEERING			0 102				15
Intro Pipi Que of F Mat Cale forc	Deduction to Piping ng Special Items Pries and Technic Piping General A erial Take off-Pr culations-Branch es and momen), Line Li n power ot Plan- I Cross S tion-, Va n to Stre	and Prep Sectional alve ess A	pro parat ona Mat Anal	cess indu tion of Eo I Drawing terial Spe ysis-Type	ustries Ove quipment La gs-Piping Is ecification-P es of stress	erview of Tec youts- Prepa ometric Drav ipe Wall thic es- Significar	s and hnica ration vings kness kness
Pipi Que of I Mat Cale forc Sele	Deduction to Piping ng Special Items Pries and Technic Piping General A erial Take off-Pr culations-Branch es and momen	G ENGINEERING g, Process Diagrams (PFD, UFD, P&ID s -Various codes and standards used in cal Bid Evaluations - Preparation of Plo Arrangement Drawings-Preparation of reparation of Piping Material Specifica reinforcement calculations-Introduction ts in piping system-Expansion Loop), Line Li n power ot Plan- I Cross S tion-, Va n to Stre	and Prep Sectional alve ess A	pro parat ona Mat Anal	cess indu tion of Eo I Drawing terial Spe ysis-Type	ustries Ove quipment La gs-Piping Is ecification-P es of stress	erview of Tec youts- Prepa ometric Drav ipe Wall thic es- Significar	s and hnica ration vings kness kness
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Intro Pipi Que of F Mat Cale forc Sele	PIPING oduction to Piping ng Special Items eries and Technic Piping General A erial Take off-Pro- culations-Branch es and momen ection-Support Lo RENCE(S): Sam Kannappa	B ENGINEERING g, Process Diagrams (PFD, UFD, P&ID s -Various codes and standards used in cal Bid Evaluations - Preparation of Plo Arrangement Drawings-Preparation of reparation of Piping Material Specifica reinforcement calculations-Introduction the in piping system-Expansion Loop ocation-Support Span Calculation.), Line Li n power ot Plan- I Cross S tion-, Va n to Stre o and B	and Prep Section alve ess A Bellow Viley	proparational onal Mat Anal ws-F	cess indu tion of Ed I Drawing terial Spe ysis-Type Pipe Sup pons, 2006	ustries Ove quipment La gs-Piping Is ecification-P es of stress oports-Supp	erview of Tec youts- Prepa ometric Drav ipe Wall thic es- Significar	s and hnica ration vings kness kness

D	Department		MECHANICAL ENGINEERING					R 2019	Semester	1
Course Code 19MEZ04		ode	Course Name PROBLEM SOLVING TECHNIQUES	Hours / Week			Credit	Total	Maximum	
		2.4		L	т	P	C 1	Hours	Marks 100	
		4		1	0	0				
• Unit	Carr	y out qu	quality control method of problem solving t ality control measures using the quality co _EM SOLVING TECHNIQUES				echniques	5		15
	alysis - s	trol Tool	s and story -seven steps of story -seven q identification - actions and execution - che							
	RENCE	(S):							- 1 9	
1.	L.Suga	anthi and	Anand A Samuel, Total Quality Manager	nent,	PHI	Lea	rning, 200	09.		

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Department	MECHANICAL ENGINEERING						Semester	
Course Code	Course Name		Hours / Week			Total	Maximum	
	LEAN MANUFACTURING	L	Т	Р	С	Hours	Marks	
19MEZ02	LEAN MANUFACTURING	1	0	0	1	15	100	

 To acquire the general knowledge to deliver consistently high quality and value added products and services to the customer in a lean environment

• To understand the terminology relating to lean operations in both service and manufacturing organizations **Course Outcomes:** At the end of this course, learners will be able to:

- Summarize the quality requirements to provide products and services in lean environment
- Implement technologies related lean operations and its significance in manufacturing processes

Unit I LEAN MANUFACTURING

History Evolution - Toyota production system - Lean manufacturing overview - Work place organization - Visual controls - Pull production and cellular manufacturing - Value flow pull - Value and perfection lean Mapping the present Mapping the future - Product and process development Value stream analysis - Over production - Waiting - Work In Progress - Transportation - Inappropriate processing - Excess motion or ergonomic problems - Defected products - Under- utilization of employees - Just In Time - Kanban tooling - Total Productive Maintenance 5S - Single Minute Die Exchange - Lean six sigma - Flow charting - Identifying and eliminating unnecessary steps - Setup time - reduction approaches - Steps in implementing lean strategy Lean accounting system.

REFERENCE(S):

1.	Dennis P Hobbs, Lean Manufacturing Implementation, J. Ross Publications, 2004				
2.	Jeffrey K Liker, The Toyota Way-14 Management Principles, McGraw Hill, New York, 2004				
3.	Pascal Dennis, Lean Production Simplified, Productivity Press, USA, 2002				
4.	James P Womack, Daniel T. Jones, Lean Thinking: Banish waste and create wealth in your corporation, Simon & Schuster, UK Limited, Free Press, 2003				
5.	Jay Arthur, Lean Six-Sigma Demystified, Tata McGraw-Hill Company, New Delhi, 2007				
6.	Richard J Schonberger, World Class Manufacturing, Free Press, 2008				

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Department	MECHANICAL ENGINEERING					R 2019	Semester	
Course Code	Course Name AUTOMOTIVE EXHAUST SYSTEM	Hours / Week		Credit	Total	Maximum	ım	
		L	Т	Р	С	Hours 15	Marks	s
19MEZ05		1	0	0	1		100	
 To dissemin automotive To identify the Course Outcomestication Explain the second second	and the concepts and design of exhaust sys ate information about various types of exha industry ne various factors to be considered for selec s: At the end of this course, learners will be various factors influencing the performance ign and modeling of exhaust manifold syste	ction able of ex	yster of ex to:	ms a chaus	nd strateg st manifolo	jies relevant d system		
 Implement ti 	The CFD tool to improve the automotive exhapt CMOTIVE EXHAUST SYSTEM		yste	ms				15
Mufflers - Types - control - SCR - F Drafting - Basics v	Exhaust system Function -Parts - Types - 0 Principles - Design trade off - BS IV and a function -Pollution control - CATIAV5 app with Exhaust manifold modeling practical set low analysis - Pressure drop - CPSI optimiz	above lication ssion	e noi on fo - CF	rms - or Ex	- EGR - S haust sys	CR-EGR F stem - Mode	unction - Po eling - Asser	llution
	ngh, Automobile Engineering (Volume II), Si	tanda	ard n	ublis	hers distri	butors	The state	
. Ronald M. He	eck, Robert J. Farrauto and Suresh T. Gulat Wiley, 3rd Edition, Feb 2009.							

Department	MECHANICAL ENGINEERING					R 2019	Semester
Course Code	Course Name	Hours / Week Credit		Total	Maximum		
	CONTINUOUS IMPROVEMENT	L	т	Р	С	Hours	Marks
19MEZ06	CONTINUOUS IMPROVEMENT	1	0	0	1	15	100

Course Objective (s): The purpose of learning this course is : -----

• To acquire the general knowledge to deliver consistently high quality and value added products and services to the customer in a Manufacturing environment

• To understand the terminology relating to continuous improvement in manufacturing organizations

Course Outcomes: At the end of this course, learners will be able to:

- · Identify the continuous improvement metrics
- · Understand and appreciate various tools applied and methodology adopted to run a KAIZEN event

Unit I CONTINUOUS IMPROVEMENT

History -Evolution - Toyota production system - Lean Manufacturing - Fundamentals, Importance, Definitions, Phases, Lead time - Supplier - Manufacturer - Customer Chain, Work place organization - Visual controls - Pull production and cellular manufacturing -Waste identification - Over production - Waiting - Work In Progress -Transportation - Inappropriate processing - Excess motion or ergonomic problems - Defected products -Under utilization of employees - Organizations Vision, Mission, Strategy Deployment and Key performance Indicators. Importance of Measurement. Gap Analysis, Identification of KAIZEN projects. Methodology, team formation, Problem statement, Data collection, Brainstorming, Analysis, containment action, corrective action and preventive action. Overview of performance metrics visual control.

REFERENCE(S):

1 13

1.	Dennis P Llobbs, Lean Manufacturing Implementation, J. Ross Publications, 2004
-	Jeffrey K Liker, The Toyota Way-14 Management Principles, Mc-Graw Hill, New York, 2004

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3.	Pascal Dennis, Lean Production Simplified, Productivity Press, USA, 2002
4.	James P Womack, Daniel T. Jones, Lean Thinking: Banish waste and create wealth in your corporation, Simon & Schuster UK Limited, Free Press, 2003
5.	Jay Arthur, Lean Six-Sigma Demystified, Tata McGraw-Hill Company, New Delhi, 2007
6.	Richard J Schonberger, World Class Manufacturing, Free Press, 2008.

Department	MECHANICAL ENGINEERING					R 2019	Semester
Course Code	Course Name	10.00	lour Wee	572 ····	Credit	Total Hours 15	Maximum
		L	Т	P.	С		Marks
19MEZ07	INDIAN PATENT LAW	1	0	0	1		100

Course Objective (s): The purpose of learning this course is :

- To make students familiar about Indian patent law
- To make the students find the patentability of any invention
- To make the students aware of legal background of various process of Indian Patent

Course Outcomes: At the end of this course, learners will be able to:

- Summarize the various provisions of Indian Patent Law
 - Find patentability of any invention
 - Assess the legal provisions of Indian patent system

Unit I INDIAN PATENT LAW

Preliminary, Inventions Not Patentable, Applications for Patents, Publication and Examination of Applications, Opposition Proceedings to Grant of Patents, Anticipation, Provisions for Secrecy of Certain Inventions, Grant of Patents and Rights Conferred Thereby, Patents of Addition, Restoration of Lapsed Patents, Surrender and Revocation of Patents, Register of Patents, Patent Office and Its Establishment, Powers of Controller Generally, Working of Patents, Compulsory Licenses and evocation, Central Government, Suits Concerning Infringement of Patents, Appeals to the Appellate Board, Penalties, Patent Agents, International Arrangements.

REF	ERENCE(S):
1.	Indian Patent Act ,1970
2.	Indian Patent Rules,2003
3.	www.ipindia.nic.in

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Department	epartment MECHANICAL ENGINEERING					R 2019	Semester
Course Code	Course Name		Hours / Week		Credit	Total	Maximum
19MEZ08	RAILWAY TRACK TECHNOLOGY	L	т	Р	C 1	Hours 15	Marks
		1	0	0			100
To familiaTo under	e (s): The purpose of learning this course is ar about Indian Railway and types stand the Railway track and its types.						
 Summaria 	s: At the end of this course, learners will be ze Indian Railway system and types of rails ailway track system		to:				

Unit I RAILWAY TRACK TECHNOLOGY

Indian Railway overview, Evolution, Structure, Grades, Coning of Wheels and Caning of Rails, Types of Rails, Rail Material, Rail Joints, Sleepers, Rail and Sleeper Fastening, Railway Curves, Track Maintenance, Modern Track Construction, Track Inspection, High Speed Tracks and Special Tracks, Derailment Investigations.

REFERENCE(S):

1. Railway Track Engineering, Fourth Edition, by J.S.Mundrey, McGraw Hill Education (India) Private Limited, 2009

Department	MECHANICAL ENGINEERING				4	R 2019	Semester
Course Code	Course Name		lour Wee		Credit	Total Hours 15	Maximum Marks
10145700	GLASS ENGINEERING	L	Т	Р	С		
19MEZ09	GLASS ENGINEERING	1	0	0	1		100

Course Objective (s): The purpose of learning this course is :

- To understand the basics of Glass making and various types in real world practice
- To understand the applications of commercial and special purpose glasses for various engineering applications

Course Outcomes: At the end of this course, learners will be able to:

- Classify glasses and select suitable glass for suitable engineering application.
- Explain the glass making and treatment processes in a glass Industry

Unit I GLASS ENGINEERING

Introduction, History of Glass, Raw Materials & Manufacturing Process, Glass Properties, Care and Storage, Glass Processing, Types of glass based on application, Float Glass, Processed Glasses - (Laminated Safety Glass, Heat Treated Glass, Curved Toughened Glass, Insulated Glass), Reflective & Coated Glass, Special Purpose Glasses for fire resistance, bullet proof & sound proof requirements, Decorative Glass, Standards and Testing, Fields of application - applied engineering - facades - selection of glass for facades.

REFERENCE(S):

الله ال

1.	Glass Engineering Handbook, by Errol Bertram Shand (Author), W. H. Armistead (Foreword), Literary Licensing, LLC (May 19, 2012)
2	Introduction to Glass Science and Technology, Royal Society of Chemistry, James E Shelby, 12 Jan 2005.

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Department	MECHANICAL ENGINEERING	R 2019	Semester				
Course Code	Course Name	1.1.1.1	lour Wee		Credit	Total	Maximum
	PLASTICS - DESIGN, PROCESSING	L	Т	Ρ	С	Hours	Marks
19MEZ10	TOOLING, ASSEMBLY AND TESTING	1	0	0	1	15	100

Course Objective (s): The purpose of learning this course is :

- To know the various plastic materials used in Automotive, home appliance, Medical fields
- To understand the basic and advanced methods of plastic processing and the tooling & equipment used for it.
- To learn various post processing requirements such as painting, foiling, pad printing.

To learn the various plastic joining processes and plastic testing methods.

Course Outcomes: At the end of this course, learners will be able to:

- Classify the plastic material and its applications
- Explain the plastic processing methods & machine, tooling used for it
- Indicate the post processing requirements and its significance
- Assess the plastic joining processes characteristics

Unit I PLASTICS - DESIGN, PROCESSING, TOOLING, ASSEMBLY AND TESTING

Introduction on Plastics, Types of plastics - Thermo plastics, Thermo setting plastics, Applications in Automobiles, Home appliances etc., Basic concepts on plastic design, Mould flow analysis Plastic processing-Preheating, Molding, Molding types - Injection molding, compression molding, Roto molding, 2K molding., Tooling- Core, Cavity, Inserts, heating & cooling circuits, Tool materials, Molding machines - Types, Tonnage & other specifications. Molding defects -Warpage, Catching, Weld line, burning, Sink marks etc, Method of avoiding defects Post molding process- Annealing, Texturing, color foiling, Pad printing, Painting etc., Assembly of Plastics- Ultrasonic welding, Heat sinking, Vibration welding. Testing of Plastics-UV testing, scratch resistance, Flammability, Resistance against chemicals, impact test.

REFERENCE(S):

1. Hand book of Plastic Technologies - Charles A Harper

2 Plastic Engineering - R.J Crawford

3 Plastic Materials and Processes-A Concise Encyclopedia - Charles A. Harper& Edward M.Petrie

Department	MECHANICAL ENGINEERING	- ar the state				R 2019	Semester	
Course Code	Course Name		lour Wee		Credit	Total	Maximum	
1000	5S - INTRODUCTION AND	L	Т	Ρ	C	Hours	Marks	
19MEZ11	IMPLEMENTATION	1	0	0	1	15	100	

Course Objective (s): The purpose of learning this course is :

To impart the knowledge on 5S fundamental and implementation concepts

To provide the 5S training for implementation in engineering fields

Course Outcomes: At the end of this course, learners will be able to:

- Demonstrate various steps of 5S implementation principles
- Practice 5S in real time life and engineering fields

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Unit I 5S - INTRODUCTION AND IMPLEMENTATION

Need for implementing 5S and advantages-Explanation on 5S- methodology -zone formation, individual responsibility, hidden and common area and no man- land-Introduction to SEIRI-Tagging system, Disposal Policy, SEIRI Museum - 1S Practical - Introduction to SEITON -PEEP, Points for Storage, Safety, Quantity Identification - 2S Practical - Introduction to SEISO-Cleaning methods, Schedules, Accessories, Responsibilities - 3S Practical, Introduction to SEIKETSU - Evolving Standard Practices, Visual Controls - 4S Practical- Introduction to SHITSUKE-Self audit, Check lists. Evaluation - 5S Practical, Management audit, Jagruthi groups, Motivation, Awards, manuals. Practice: Form students group, assign areas and do 5S practice

REFERENCE(S):

1. L.Suganthi and Anand A Samuel, Total Quality Management, PHI Learning, 2009

Department	MECHANICAL ENGINEERING					R 2019	Semester
Course Code	Course Name	11.0	lour Wee		Credit	Total Hours 15	Maximum Marks
	ENERGY AUDITING AND	L	Т	Р	С		
19MEZ12	INSTRUMENTS	1	0	0	1		100

Course Objective (s): The purpose of learning this course is :

- To acquire knowledge about various thermal and electrical energy audit instruments used in the field as per Bureau of Energy Efficiency, Govt. of India
- To gain the skill in using the Energy Audit Instruments for field measurements

Course Outcomes: At the end of this course, learners will be able to:

- Apply the measurement skill of energy related parameters in industrial environment
- Interpret the measurements for its accuracy and genuineness
- · Express the analytical skill in quantification of energy flow in and out of an energy system

Unit I ENERGY AUDITING AND INSTRUMENTS

Introduction to Energy Conservation Act 2001, Basics of Energy Audit, Instruments : Clip on power meter, Infrared Thermometer, Vane Anemometer, Pitot tube with digital pressure meter, Stroboscope, Hygrometer, Combustion efficiency Monitor, Light Meter, Specifications, Limitations, applications and measurement calculations for Pressure, flow (Air and Water), power consumption, waste heat recovery calculations.

REFERENCE(S):

1.	Energ	y Audit Man	ual publishe	d by Energ	y Manage	ement Centre, Go	ovt o	f Kerala , K	erala – N	lanua	I-201	7.
2.	CO2	Emission	Mitigation	through	Energy	Conservation-	Α	Practical	Guide.	by	Dr.	M.
	Thirug	nanasamba	andam, Publi	shed by S	hanlax Pu	blishers- 2018						

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Department	MECHANICAL ENGINEER	RING	6			R 2019	Semester	-
Course Code	Course Name	1.00	lour Wee		Credit	Total	Maximum M	arks
Course Sour		L	Т	Р	С	Hours		
19MEV01	INTORDUCTION TO RISK ANALYSIS	-		-	-		14	60
To Testing, Deflag Friction Sensitiv Unit III	tive (s): The purpose of learning this course is understand the importance of risk analysis. understand the working principles instruments understand the risk assessment techniques. create awareness on various soft wares in ris understand the methods to carry out consequenes: At the end of this course, learners will be plain the importance of risk analysis. monstrate the working principles instruments. monstrate the working principles instruments. ply consequent analysis techniques. ply consequent analysis techniques. plain the methods to carry out consequence and CARD, RISK ISSUES AND HAZARD ASSESS (ISSUES AND HAZARD ASSESSMENT nazard monitoring-risk issue – Probabili afety audit, checklist analysis, what-if analysis TRUMENTATION Advanced Equipments and Instruments- The o Gravimetric Analyzer (TGA), Principles of ration Test, Detonation Test, Ignition Test, Serve Test (BAM). K ANALYSIS QUANTIFICATION AND SOFT ard analysis (PHA), hazard operability studies ic Symbols, fire explosion and toxicity	s. k an lence abl sme ty, s, sat f op nsitiv WAF	e ana le to: sis. NT relial fety re ocalo eratic ve Te RE ZOP	oility, eview rimet ons, est, In	Hazard ry, Differe Applicatio npact Sen ult Tree A	ential Scar ons, advar sitive Test nalysis & I	nning Calorim ntages. Explo (BAM) and Event Tree	eter sive
Mode and Effect Unit IV CON Introduction to Pool Fires, Fla Dispersion - So	t Analysis(FMEA)- Basic concepts of Software ISEQUENCES ANALYSIS modeling procedures, Basic concepts used i ares, Torch Fires, BLEVEs and Fireballs, burce Models, Aerosols, Pool, Vaporization, I IT Models, TNO Multi- Energy, Baker- Strehlo	e on in Co Rele Dens	Risk onsec ease se Ga	anal quen Mod	ysis. ALO ce Analys els- Liqu spersion,	HA iis, Fire R id, Vapor Momentui	adiation Mode , Aerosol, Va m Jet Dispers	ls - por ion,
releases.	E STUDIES							
chemical acci Hudson disas analysis of siz	analysis as information sources for Hazard dent, Mexico disaster, Flixborough, Bhopal, ster-convey report, hazard assessment of no e potentially Hazardous Industrial objects- Ra- ear Power Plant.	Sev	veso, clear	Pas insta	adena, F Ilation-	eyzin disa Richr	nond report,	Port
REFERENCE(S	S):		- 1					
	Less Butterworth-Hein, Loss Prevention in Pro	cess	s Indu	ustrie	s (Vol.I, II	and III), E	Butterworth-	+ 'D
2. F.I. Khan,	S.A. Abbasi, Advanced Risk Assessment In House, 2000.	Che	mica	l Pro	cess Ind	ustries, D	iscovery	
3. Center for	Chemical Process Safety (CCPS), Quantitative, Institute of Chemical Industries, Centre for Che							
	s for Hazard Evaluation Procedures, Centre fo							
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Course Cod	e Course Name		Hour Wee		Credit	Total	Maximum N	arks
		L	Т	Р	С	Hours		
19MEV02	MODELING USING CATIA V5	•		•	-	-	-	
To acq To acq To acq To hav To imp To imp To imp Course Outc Make s Model Constr Make s Ma	ctive (s): The purpose of learning this course is uire knowledge in sketching and constraining. uire knowledge in creating solid models using v e a clear idea in assembling the modeled parts art knowledge in drafting and sectioning. art knowledge in wireframe and surface modelir omes: At the end of this course, learners will be sketching and constraining using CATIA V5. any three dimensional objects by CATIA V5. act assembly after part modeling using CATIA V5. uct assembly after part modeling, using CATIA V ectioning and drafting using CATIA V5. vireframe and surface modeling, using CATIA V sectioning and surface modeling, using CATIA V sectioning and surface modeling, using CATIA V section Standard Element - Select Toolb c, Center Lines, Rectangles, and Parallelograms RAWING SKETCHES IN THE SKETCHER - Drawing Ellipses, Splines, Keyhole Profiles , He eting , Chamfering, Mirroring Translating, Rotating	arious using ng usi able /5. 5. the S ar .Dr s. Cre	CAT ng va to: Sketcl awin ating	ner To g Ske Point	5. erms – Sp etches Us s, Drawin and Modi	of CATIAN becification ing the Ske g Circles, fying Sketc	n Tree - Grid - etcher Tools. Arcs, Profiles. thes - Trimming	
Constraining S Creating Base & Exercise 1 E Unit IV F mportance of S ines ,Other	EFERENCE ELEMENTS AND SKETCH-BASE Sketching Planes - Reference Elements, Referent Sketch-Based Features ,Creating Drafted Fillete	ning (Rotati ED FE nce P ed Pa	Const ng, M ATU lanes d Fea	raints lodify RES	s, Exiting ing the Vi eating Poi	ew , Tutori ints , Crea	ial 1 , Tutorial ting Reference	2
Jnit V C	ted Filleted Pocket Features , Multi-Pocket , Gro REATING DRESS-UP AND HOLE FEATURES	5			م ما الم	- Droft to 1		
	eling Tools - Creating Hole Features - Fillets hell Feature. Editing Features of a Model	- 0	namr	ers	-Adding	a Draft to t	the Faces of	
	RANSFORMATION FEATURES AND ADVANC	Carl Carl Carl	1. 2. 2. 2. 2. 3	Sold Libertin				
Patterns, Circul Multi-Sections								
	SSEMBLY MODELING eling - Types of Assembly Design Approaches -(Croot	ng D	ottom		mblica C	rooting Top	
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Automatically G Modifying the H	orkbench -Starting a New File in the Drafting W ienerating Views - Individual Drawing Views - E latch Pattern of Section Views. Inserting the Fi ial (BOM) -Generating Balloons.	xploc	ed V	iew -	Editing a	nd Modifyi	ng Drawing V	ews
the second second second second second	VORKING WITH THE WIREFRAME AND SURI				0.010-000-000-000-000-000-000-000-000-00			
Extruded Surface	e Modeling - Creating Wireframe Elements ces - Revolved Surfaces - Spherical Surfaces - C Sections Surfaces - Operation on Shape Geome	Cylind	rical \$	Surfa	ces - Offs	et Surface		; -
	Contrained Charles Charles Cherner	July	June	100 0	Policitions		1 1 2	

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REF	ERENCE(S):
1.	CATIA: Introduction to Modeling, Version 5, Release 21, Ascent, Center for Technical Knowledge, 2012.
2.	Richard Cozzens, CATIA V5 Workbook Release V5-6R2013, SDC Publications, 2013.

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1. Dassault Systèmes SolidWorks 2015: Advanced Part Modeling, Dassault Systèmes SolidWorks Corporation, 2014.

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Department	MECHANICAL ENGIN	EERING	G			R 2019	Semester	
Course Code	Course Name	Ηοι	urs /\	Week	Credit	Total	Maximum M	arke
course coue	Course Marine	L	Т	Р	С	Hours	Maximum	aina
19MEV04	CORE JAVA PROGRAMMING		-	-	-	-		i.
To design, To create a To control To develop To develop To develop Course Outcome Design a c Apply contr Develop pr Create pac Develop sin Unit I JAVA E Overview- Environn	e (s): The purpose of learning this course write, debug and run Java programs us a programs using decision making state the abnormal termination of the program o User Defined packages and interfaces o Graphical User Interface applications u rs: At the end of this course, learners will lass for real world objects using Java pur rol structures to perform decision makin ograms using inheritance and exception kages to group the classes for application mapple GUI application for the real world p BASICS ment Setup Basic - Syntax - O	ing JDł ments n using s sing A l be abl rogram g and it n handl on dev roblem	and I exce pplet le to: terati ing n elop s.	ions forment.	handling or the sim) mechani nple probl Java		
Basic Operators -	OPERATORS Loop Control - Decision Making -Number	ers Meth	nods	-Chara	acters Me	ethods-Stri	ngs Methods-	7
Arrays-Date & Tim			1					
Methods- Type - Ov class – super	verloading - Exceptions – Try Catch – Multi	ple try c	atch	– Fina	illy – Inher	tiance – Ba	ase class —child	1
Polymorphism – M Packages		eating in	nterfa	aces -	- impleme	enting Inte	rfaces-	
Unit V INPUT	OUTPUT METHODS						The Lark of	
iles and I/O - By	te Streams – Character Streams - GUI P	rogram	is-Ja	va Ap	plets	THE REAL PROPERTY OF	Service Service Market	
REFERENCE(S):			-					
	dt, Java -Complete Reference, 8th editio	on Tata	McG	Graw H	lill, 2012.	38.5		
2. Kathy sierra a	and Bert Bates Head, First Java, second	edition	, Ore	eilly, 2	010.			
	eitel and Paul J. Deitel, Java How to Pro and Cay S.Horstmann, Core Java Vol.1	-	Prent					

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Department	MECHANICAL ENGINEE	RING	G		2.	R 2019	Semester	-
Course Code	Course Name		Hours / Week		Credit	Total	Maximum M	larks
coulor coulo		L	т	Р	С	It Total Hours Maximum Ma - - - cool design. - - applications. - -	- Carris	
19MEV05	TOOL DESIGN AND MANUFACTURING	-	-	1			pie webb i	
To unde To acqu To unde To acqu To unde To acqu To unde To acqu To unde Develop Develop Develop Apply mi Unit I Introduction to t of metal cuttin	ive (s): The purpose of learning this course is rstand mechanics of metal cutting, materials, ire knowledge of principles in work holding d rstand principles of designing jigs, fixtures and ire the concept of press tool operation and di rstand the complex shapes and machining in mes: At the end of this course, learners will be etal cutting methods and design the tools. work holding devices. jigs and fixtures for conventional and automa press tools and dies for forming of parts icro machining techniques to machine complet ool materials, heat treating, general motions of materials, heat treating, general motions of tool wear, cutting forces, control of the causes	hea evic did dies adies ab ated x sh f ma erat	es. ies fo aking and le to: man apes achine ure.	e tool	ustrial ap cedures. lds. turing. ls – metal ing tool o	plications.	nciples, mech	anic
degrees of free principles, types developing the Unit III Fundamentals of cutting tools, de selection of die principle of oper	principles, general considerations, Locating p dom, basic locating rules, locational tolerance s of clamps, standard components, other elem preliminary fixture design - computer application of cutting tool design - types and its properties sign of press working tools, power presses, of sets – simple and progressive die - bending ration –Wire cut EDM – Electrical Discharge M A) in die making applications	es, to ons es, to uttin die	fool p s. Var in fixt ool ge ig (sh – sir	eome ngle a	ng, basic types of f lesign and etry - desi ng) operat and doub	types of k ixtures, de d analysis. gn of sing tions, die a le action of	le and multi p nd punch des lie. Introductio	oing oint
REFERENCE(S	5):	112	Post in		and the second	State of the	S. C. Carolin	
	nd A. Battacharya, Principles of Metal Cutting	, Ne	w Ce	ntral	Book Age	ency, India	, 1969	-
	iksen, Jig and Fixture Design Manual, Industr				York, 19	73		1918
	on, G H Lecain and V C Goold, Tool Design,							-
4. J R Paquir	and R E Crowley, Die Design Fundamentals	Ne	w Yo	rk-Ind	dustrial Pr	ress Inc, 2	005	

5. P K Mishra, Nonconventional Machining, Narosa Publishing House, New Delhi, 2008

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Department	MECHANICAL ENGINEER	RING	G			R 2019	Semester	° .⊷
Course Code	Course Name	Hours / Week		Credit	Total		ark	
oourse ooue	Course Name	L	т	P.	Credit Total Hours Maximum Ma C - - - - - - - - in CNC machining. - - ulation. - - operation of the CNC machines. - - machining. CNC machining. - 1.S.S., carbide, ceramic and - Statistical Process Control (SPC (CNC), Familiarization of corprevention practices and procedu quality control. Set-up, align, and - - design of single and multi point register values to assure tool -up and inspection procedures. - ual Data Input (MDI) operation e upload/downloading and other -			
19MEV06	CNC PROGRAMMING AND OPERATIONS	-	-	-	-	-	-	
 To und To acq To acq 	tive (s): The purpose of learning this course is erstand GD & T, process planning and quality uire the knowledge of tooling and work holdin uaint with CNC machine features and control uire the knowledge of CNC programming and	rec g de s.	vices	s used	in CNC	machining	3.	
To und Course Outco Apply G	lerstand set up procedure of tooling and job in CN mes: At the end of this course, learners will be iD & T and plan the process, operations and qu	e abl ualit	e to: y in C	e and	operation machinin	g.	machines.	
OperatPrepare	method of tooling and work holding devices for the the CNC controller, load and edit the CNC per the CNC program and simulate tool path. the tooling, job in CNC machine and operate the n	prog	ram.	-	CNC ma	achining.		
Unit I					N		6	
echniques and Unit II ntroduction to banel, machine work-holding, to zero-out work h Unit III	geometric dimensioning and tolerancing (GD8 machining technology, Computerized Nume tool set-up operation and programming. Ap poling, machine set-up and operation, program holding devices, tooling adapters, and tool hold	&T). erica oply pro ers.	I Co accie of-ou	ontrol dent j it and	(CNC), preventio quality c	Familiari n practice ontrol. Set	zation of co s and proced -up, align, and	ontro ures
Perform dry/fir	of cutting tool design - types and its properties, rst/production runs and inspections, adjust ad part dimensionality. Communicate and apply	sting	va	rious	register	values	to assure too	
edit canned	am problems and perform basic editing opera cycle functions utilizing calculations / da worked Computer (DNC) functions on a shop f	ta, D	Demo	nstra	te upload			ns,
	reparation of turning, facing and taper turning o	cycle	es. Si	mulat	ion and n	nachine op	perations	
REFERENCE(S):							_
	krishnan, Computer Numerical Control Machine	es, N	lew (Centra	al Book A	gency, Ind	ia,2004	
0	hatronics, Tata McGraw Hill Publishing Compa				in an		A 19 20 31	
3. Hillwig, Le	nzi, Precision Machining Technology: Workboo 44550), 2015			and the second se	A DESCRIPTION OF A DESC	a second s	Learning (ISB	N
	Gizelbach, CNC Machining Fundamentals an						Company, Inc	
F		1		0.411.4.4	to the sol		and the second se	107 414

5. T.K. Kundra, P.N. Rao and N.K. Tiwari, CNC and Computer Aided Manufacturing, Tata

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Department	MECHANICAL ENGINEE	RINC	3		1863	R 2019	Semester	
Course Code	Course Name	Hours / Week			Credit	Total	Maximum Mark	
		L	т	Р	С	Hours		
19MEV07	WELDING INSPECTION & TESTING	-	-	-	1-1-1-1	ie wiet	-43-5	
 To provid metallic r To impart To demor 	knowledge on the welding design for varion Instrate the response of weld material to me	ss, S us m	etal	struc	tures.			or
	ring the necessary background for understa	nding	g Nor	ndest	ructive te	sting proc	ess	
	welding standards and codes nes: At the end of this course, learners will b	e abl	e to:					
	able welding process, power source, Electr			fferer	nt materia	IIS.		
	ne knowledge of weld design and weld geo							
	weld metal property against fracture in real-							
	he knowledge of different nondestructive tes	sting	inspe	ectior	n process	•		
	owledge of welding standards and codes ing and Allied Process			11.01	7			
	er source - Gas welding and cutting, Fusion	weld	ina –	Intro	duction o	f Shielded	Metal Arc	
	ingsten Arc welding - Gas Metal Arc welding		-					
	oy steel- Heat Treatment of weldments.			0				
Unit II Weld	Design, Codes & Standards		16.5	- 11				34
Surface and sub Welding Procedu	s-Welding design - Selection of joint - Electro osurface defects –Distortion and Residual S ure Specification- ASME codes for Consuma ructive Testing	Stres	s– Č	ause	s of weld	defect &	Remedial act	ion.
Contraction and the second	- Destructive Testing as per ASTM standard	ds- To	ensile	Tes	ts. Impact	Tests, Ha	rd ness Test	-
	d Microstructure study, Fractography-SEM 8							
Jnit IV NDT-	Surface & Subsurface Tecchniques				10.00	Contra de		
- Preparation of	-Destructive testing (NDT) - Visual or Optica test materials - Advantages and limitation Principles, applications - Dry particle to sting (ECT).	ns -	Fluo	resce	nt penetr	ant test. N	Magnetic Parl	ticle
Unit V NDT-	Ultrasonic Testing & Radiography Testin	g		÷.,			the second	
Phased Array te nstitute of Weldi	ng (UT) Principle, Couplants, Probes - Ir echniques, Angle beam inspection of weld ing IIW) reference blocks. Radiographic testi d their characteristics, Safety in radiography,	ls, C ng (F	alibra RT) P	ation rincip	of ASTM	Test bloc	cks (Internatio	
REFERENCE(S)):	10000		-			He	
	Cary, Modern Welding Technology Fifth Edit	son I	Prent	ice H	all. Ohio-	2005	2.14	-
	er, Welding Processes & Technology, Khanr					Second States	1. 1. 7 Je	
14. O. I anna	Testing & Evaluation, Volume 8, American S					, 2000.		1000
	Jayakumar T, Thavasimuthu M, Practical N					Narosa Pu	blishing, 1997	
5. ASNT Hand	d Book. Non Destructive Testing 4Th Edison	vol	10 2	006				-

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Department	MECHANICAL ENGINEE	RINC	6		- C.P.	R 2019	Semester	-	
Course Code	Course Name	Hours / Week			Credit	Total	Maximum N	larks	
9			T,	Р	с	Hours	Maximum Ma Maximum Ma - onding e cl ient on and test ing he client criterion – ests requirement sification – Cas fication – Cas fication – unit integrity – esting procedure esting procedure sific chemical		
19MEV08	PUMP INSPECTION AND TESTING	-	-		le se	3.42 (3.4	i suura		
To gain To under To provide accepta To obtain To provide requirem Course Outcom Underst Demonse Identify Underst Oemonse Identify Underst Analyze requirem Jnit I INTRO Need for pump in Responsibility cla Inspection and Jnit II INSPI Material identific: Defect checks – Procedure for ma Jnit II SHOF Hydrostatic test - //bration level – Jnit IV PERF Festing configura Recorded test da Jnit V NPSH	ies: At the end of this course, learners will be and the basic requirements in the pump insistrate practical limitations and acceptance of shop test requirements based on the character and the procedure to be followed for various the performance graphs to identify the pumpent. ODUCTION nspection and testing – Stages – Reference assification – Requirement categorization – testing checklist – Shop test procedure. ECTION REQUIREMENTS ation as per standards – Heat test for material for repairs. P TEST REQUIREMENTS - Pressure parts – Cooling passage – Chlorialignment – Pump performance – NPSH ORMANCE TESTING ation – shop test stand limitations – Test equata list – Performance curve – Acceptance curve – Acceptance curve – for presentation – flow point graphical representation – flow	of pump bump es, the curve e abl pecti criteris s pum np pe docu Inspe als – ling re ide co	insp eir lin cedur es of e to: on ar on fo tic to rforn ment ction Mate eview	ectio nitation res. pum nd te r cas b be t st co nanco requ requ requ requ requ requ requ requ	n. ons and it p with res sting. e specific rested. onditions. e in order d their acc irements of Constru asting rep lechanica	s correspondent pect to the inspection to meet the ceptance of - Shop tes oution class pair classifier I seals - U tion - Test	e cl ient n and test ing e client sification – sification – Ca cation –	nts	
1. American P		100000	60	0000	ol rofinan	oonvises			
-	etroleum Institute (API) 610 – Centrifugal pu				22	111 5200-	v services		
Antericant	etroleum Institute (API) 674 – Positive displ E Standard B73.1M – Specification for horizo							i i i i i i i i i i i i i i i i i i i i	
	E Standard B73.2M – Specification for vertic	al ce	ntrifu	gal p	umps for	chemical p	process.		
	6 – Reciprocating pump tests	- 54		0.76			5 1 1 4 1 2 1		
6. ANSI/HI 5.1 test.	I-5.6 – Sealless rotodynamic pumps for nom	nencla	ature,	def	initions, a	pplication,	operation and	ł	

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Department	MECHANICAL ENGINEE	RING	G			R 2019	Semester	-
Course Code	Course Name		Hour Wee		Credit	Total	Maximum N	larks
oouloo oouo		LTP		С	Hours			
19MEV09	SHEET METAL TOOLS - DESIGN AND MANUFACTURING PROCESS	-	-	-	-	-	-	
 To unde To acquite To unde To acquite To unde To acquite To unde To unde To unde Course Outcor Apply m Design Develop Develop Apply m Unit I SHE Introduction to of metal cutting formation, tool 	ive (s): The purpose of learning this course is erstand mechanics of metal cutting, materials uire knowledge of principles in work holding de erstand principles of designing jigs, fixtures ar uire the concept of press tool operation and di erstand the complex shapes and machining in mes: At the end of this course, learners will be netal cutting methods and design the tools. work holding devices. b jigs and fixtures for conventional and automa o press tools and dies for forming of parts nicro machining techniques to machine complex shapes tool materials, heat treating, general motions of chip formation friction and temperature. Cutti wear, cutting forces, control of the causes of ET METAL TOOL DESIGN AND MANUFAC	, hea evice and di ie ma ie ma ie ma ie ma ie ab ated hape TUR of m ing to	es. es fo aking s and le to: man s ING achir bol de wear	r indu proce mou ufact PRO ne too esign and f	ustrial app edures. Ids. uring. CESS ols metal o . Cutting t failure.	lications.		anics
degrees of free principles, types developing the Unit III Fundamentals cutting tools, de selection of die	orinciples, general considerations, locating dom, basic locating rules, locational toleran s of clamps, standard components, other elem preliminary fixture design - computer applicati of cutting tool design - types and its propert esign of press working tools, power presses, e sets simple and progressive die - bendin tration -Wire cut EDM Electrical Discharge Ma blications	ces, nents ons ties, cutti g di	fool s. Vai in fixi tool g ing (s e sin	proof rious ture d geom shear gle a	fing, basis types of f lesign and netry - des ing) opera and doubl	c types of ixtures, de d analysis. sign of sin ations, die e action	locators, clar signing fixture gle and multi and punch de die. Introdu	poin poin
REFERENCE(S	3):				- 1	2000 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 - 1910 -		
	nd A. Battacharya, Principles of Metal Cutting	, Ne	w Ce	entral	Book Age	ency, India	,1969	
2. E. K. Henr	iksen, Jig and Fixture Design Manual, Industr	ial P	ress,	New	York, 19	73		
	on, G H Lecain and V C Goold, Tool Design,		1.5. 1.0.2017.4	100.00				
J R Paquir	and R E Crowley. Die Design Fundamentals	. Ne	w Yo	rk-Ind	dustrial Pr	ess Inc. 2	005	

5. P K Mishra, Nonconventional Machining, Narosa Publishing House, New Delhi, 2008

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