T.Y.B.Tech Mechanical SEM-I & II Syllabus AY 2023-24

		Walc	hand College	of Engineering, San Autonomous Institute)	ıgli				
			AY	2023-24					
	Course Information								
Progra	Programme B. Tech. (Mechanical Engineering)								
Class,	Semester		Third Year B. Te	ch., Sem. VI					
Cours	e Code		6ME321						
Cours	e Name		Machine Design						
Desire	d Requisit	tes:							
	-		<u> </u>						
	Teaching	Scheme		Examination Scheme	(Marks)				
Lectur	re	3 Hrs/week	MSE	ISE	ESE	Total			
Tutori	ial	1 Hrs/week	30	20	50	100			
				Credits: 4	1				
			1						
			Course	Objectives					
1	To take of	overview of coo	des, standards and	design guidelines for dif	ferent machine	e elements and			
	systems.								
2	To explai	n the effect of c	lifferent loading co	nditions on machine elem	ents with safet	y factor.			
3	To appra	ise the relations	hips between com	ponent level design and o	verall machine	system design			
		Course	Outcomes (CO) w	ith Bloom's Taxonomy l	evel				
At the	end of the	course, the stud	lents will be able to						
		,		,	Bloom's	Bloom's			
CO		Cours	se Outcome Staten	nent/s	Taxonomy	Taxonomy			
Level Descri									
<u>CO1</u>	I I an then	ing of failure :	n design of region	a maahina alamanta and		Description			
CO1	Use theo	ries of failure i	n design of variou	s machine elements and	III	Applying			
CO1 CO2	Use theo systems. Predict a	ries of failure i	n design of variou	s machine elements and f machine elements and	III	Applying			
CO1 CO2	Use theo systems. Predict a systems.	ries of failure i nd calculate de	n design of variou	s machine elements and f machine elements and	III IV	Description Applying Analysing			
CO1 CO2 CO3	Use theo systems. Predict a systems. Test the p	ries of failure ind calculate de	n design of variou sign parameters of machine elements	s machine elements and f machine elements and and systems subjected to	III IV V	Applying Analysing Evaluate			
CO1 CO2 CO3	Use theo systems. Predict a systems. Test the j different	ries of failure i nd calculate de performance of loading conditio	n design of variou sign parameters of machine elements ons.	s machine elements and f machine elements and and systems subjected to	III IV V	Applying Analysing Evaluate			
CO1 CO2 CO3	Use theo systems. Predict a systems. Test the p different	ries of failure i nd calculate de performance of loading conditio	n design of variou sign parameters of machine elements ons.	s machine elements and f machine elements and and systems subjected to	III IV V	Applying Analysing Evaluate			
CO1 CO2 CO3 Modu	Use theo systems. Predict a systems. Test the p different	ries of failure i nd calculate de performance of loading conditio	n design of variou ssign parameters of machine elements ons. Module (nd brakes	s machine elements and f machine elements and and systems subjected to Contents	III IV V	Applying Analysing Evaluate Hours			
CO1 CO2 CO3 Modu	Use theo systems. Predict a systems. Test the p different	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and	n design of variou sign parameters of machine elements ons. Module (nd brakes l wear theory, type:	s machine elements and f machine elements and and systems subjected to Contents	III IV V	Applying Analysing Evaluate Hours 6			
CO1 CO2 CO3 Modu I	Use theo systems. Predict a systems. Test the p different Unifo Desig	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C	n design of variou sign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an	III IV V nd its design	Description Applying Analysing Evaluate Hours 6			
CO1 CO2 CO3 Modu I	Use theo systems. Predict a systems. Test the p different Ile Desig Unifo Desig Types	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxi	n design of variou sign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transr	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m	III IV V nd its design	Description Applying Analysing Evaluate Hours 6 7			
CO1 CO2 CO3 Modu I II	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxi ogue.	n design of variou ssign parameters of machine elements ons. Module (nd brakes l wear theory, types Chain Drives mum power transr	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m	III IV V nd its design	Description Applying Analysing Evaluate Hours 6 7			
CO1 CO2 CO3 Modu I II	Use theo systems. Predict a systems. Test the p different Ile Desig Unifo Desig Types catalo Chain	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxingue. drives, polygon	n design of variou sign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transr nal effect, power ra	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting	III IV V nd its design	Description Applying Analysing Evaluate Hours 6 7			
CO1 CO2 CO3 Modu I II	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis	n design of variou ssign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting	III IV V nd its design anufacturer's	Applying Analysing Evaluate Hours 6 7 7			
CO1 CO2 CO3 Modu I II III	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig Desig	ries of failure i nd calculate de performance of loading condition n of clutches at rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalo	n design of variou sign parameters of machine elements ons. Module (nd brakes l wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact ogue	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting	III IV V N nd its design nanufacturer's earings from	Description Applying Analysing Evaluate Hours 6 7 7			
CO1 CO2 CO3 Modu I II III	Use theo systems. Predict a systems. Test the p different Desig Types catalo Chain Desig Desig manu Desig	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalon n of sliding con	n design of variou ssign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact ogue ntact bearing	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting ting bearings, selection of b	III IV V nd its design anufacturer's earings from	Description Applying Analysing Evaluate Hours 6 7 7			
CO1 CO2 CO3 Modu I II III	Use theo systems. Predict a systems. Test the p different Desig Types catalo Chain Desig Desig manu Desig	ries of failure i nd calculate de performance of loading condition n of clutches at rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalo n of sliding con	n design of variou sign parameters of machine elements ons. Module (nd brakes l wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact ogue ntact bearing of sliding contact b	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting t bearings, selection of b earings, hydrodynamic ar	III IV V N nd its design nanufacturer's nearings from nd hydrostatic	Applying Analysing Evaluate Hours 6 7 7 7			
CO1 CO2 CO3 Modu I II III	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig Desig manu Desig Desig bearin	ries of failure i nd calculate de performance of loading condition n of clutches a rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalor n of sliding con n and analysis of n and analysis of softer a second second second second results of the second second second second second n and analysis of n and analysis of negs, Reynold's	n design of variou ssign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transmal effect, power ransmal effect, power effect, power ransmal effect, power ransmal effect, power effec	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting t bearings, selection of b earings, hydrodynamic ar nerical solutions using o	III IV V N nd its design anufacturer's earings from ad hydrostatic limensionless	Description Applying Analysing Evaluate Hours 6 7 7 6			
CO1 CO2 CO3 Modu I II III	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig Desig Desig bearin param	ries of failure i nd calculate de performance of loading condition n of clutches at rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalo n of sliding con n and analysis of n of sliding con n and analysis of ngs, Reynold's meter	n design of variou sign parameters of machine elements ons. Module (nd brakes l wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact ogue ntact bearing of sliding contact b equation and nur	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting t bearings, selection of b earings, hydrodynamic ar nerical solutions using of	III IV V N nd its design nanufacturer's pearings from ad hydrostatic limensionless	Description Applying Analysing Evaluate Hours 6 7 7 6			
CO1 CO2 CO3 Modu I II III IV	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig Desig bearin param Desig	ries of failure i nd calculate de performance of loading condition n of clutches and n of Belt and C s of belts, maxing ogue. drives, polygon n of rolling con n and analysis facturer's catalor n and analysis facturer's catalor n and analysis of ngs, Reynold's neter n of Gears ification and s	n design of variou sign parameters of machine elements ons. Module (nd brakes I wear theory, types Chain Drives mum power transr mal effect, power ra ntact bearing of rolling contact ogue ntact bearing of sliding contact b equation and nur election of spur a	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting t bearings, selection of b earings, hydrodynamic ar nerical solutions using of and helical gears, termin	III IV V v nd its design anufacturer's earings from ad hydrostatic timensionless	Applying Analysing Evaluate Hours 6 7 7 7 6			
CO1 CO2 CO3 Modu I II III IV	Use theo systems. Predict a systems. Test the p different Desig Unifo Desig Types catalo Chain Desig Desig manu Desig Desig bearin param Desig	ries of failure i nd calculate de performance of loading condition n of clutches at rm pressure and n of Belt and C s of belts, maxi gue. drives, polygon n of rolling con n and analysis facturer's catalor n of sliding con n and analysis of n of sliding con n and analysis of ngs, Reynold's neter n of Gears ification and s sis, design for n	n design of variou sign parameters of machine elements ons. Module (nd brakes l wear theory, types Chain Drives mum power transr nal effect, power ra ntact bearing of rolling contact ogue ntact bearing of sliding contact b equation and nur election of spur a naximum power tra	s machine elements and f machine elements and and systems subjected to Contents s of clutches and brakes an nission, selection from m ting t bearings, selection of b earings, hydrodynamic ar nerical solutions using of and helical gears, termin nsmission capacity, gear l	III IV V v nd its design nanufacturer's mearings from ad hydrostatic limensionless hology, force ubrication	Description Applying Analysing Evaluate Hours 6 7 6 7 7 7 7 7 7			

VI	Cylinders and pressure vessels Thin and thick cylinders, Lame's equation, Clavarino's and Birnie's equation, Autofrettage	6						
	Textbooks							
1	V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill Publication 2008	n, 3 rd Edition,						
2 J.F. Shigley, "Mechanical Engineering Design", McGraw Hill Publication, 8 th Edition, 20								
3	R. L. Norton, "Design of Machinery", McGraw Hill Publication, 3rd Edition, 20	03						
	References							
1	Timothy Wentzell, "Machine Design", Cengage Learning, 1st Edition, 2009							
2	M. F. Spotts, T.E Shoup, Hornberger, Jayaram, Venkatesh, "Design of Mach Pearson Education, 8 th edition, 2011	ine Elements",						
3	PSG Design Data Book, Third Edition, 1978							
	Useful Links							
1	https://nptel.ac.in/courses/112/105/112105124/							

CO-PO Mapping														
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2		3									1	2	
CO2		1	2	2									1	
CO3		2		3								1		2
The stren	The strength of mapping is to be written as 1: Low, 2: Medium, 3: High													

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College	of Engineering	, San	gli			
			Government Aidea	l Autonomous Institute	e)				
			Course	nformation					
Progr	amme		B. Tech. (Mechar	nical Engineering)					
Class.	Semester		Third Year B. Te	ch., Sem. VI					
Cours	e Code		6ME322						
Course Name Mechatronics and Automation									
Desired Requisites:									
	Teaching	Scheme		Examination Sc	cheme	(Marks)			
Lectu	re	3Hrs/week	MSE	ISE		ESE	Total		
Tutor	ial		30	20		50	100		
				Credi	its: 3				
			C						
1	Undonato	nd the mechatic	Course	Objectives	aabate	ania			
1	To under	stand the import	tance of automation	ind advantages of fi	hine to	oncs.	ifacturing		
	To get th	e knowledge of	various elements o	f manufacturing aut	omatic	n - CAD/CAM	sensors		
3	pneumati	cs. hydraulics a	nd CNC.	i manufacturing aut	omain		, sensors,		
	privariati	Course	Outcomes (CO) w	ith Bloom's Taxon	omv I	Level			
At the	end of the	course, the stud	ents will be able to	·,					
						Bloom's	Bloom's		
СО		Cours	e Outcome Staten	nent/s		Taxonomy	Taxonomy		
						Level	Description		
CO 1	Identify systems f	basic elements for automation a	s of mechanical, nd analyze them.	electrical, and co	ontrol	III	Applying		
CO2	Employ optimizat	use of mechat	ronic system, soft for automation syst	tware's, controllers ems.	and	IV	Analysing		
CO3	Verify a	utomation sys	tems knowledge	into various mo	odern	¥7	D 1 .		
	applicatio	ons				V	Evaluate		
N <i>T</i> 1	1								
Wodu	Ter for a	J		Contents			Hours		
	Intro	auction to M	chatronics	Definition	A	1:			
Ι	Maak	n, scope, i	History, Evoluti	ion. Definition,	App	incation of	6		
	Nieci	al Vibration a	nd noise control	mig, sontware m	tegrat.	ion, motion			
	Sama	or, vibration a	du noise controi,	inicrosystems, opi	lics				
	Bala	ors and 1 rans	aucers	Concora in mod	otron	ia avatama			
	alaga	fightion of	nent systems, a	sensors in meet		alaction of			
п	Classi	rs Types of t	ansducers Displ	ance reminions	gy, o tion m		7		
11	Induc	tive transduce	ansuucers, Displa	accilient and position	ootrio	transducers			
	Senso	ors for robotic	systems Photo	electric transduce	re Fl	ow sensors			
	There	nal transducer	s SONAR Other	transducers	15, 11	ow sensors,			
	Signa	al Conditionin	o and Controle						
	Signa	1 generation	Transformers Se	miconductors Sid	onal n	naninulation			
ш	and c	onversion AF	C and DAC Rel	av and contactors	gnarn	nampulation	7		
	Micro	onversion, AL	ficrocontroller	U and DAC. Relay and contactors.					
	contro	ollers	nerocontroner,		ina N	uspoony II			
	Intro	duction to Au	Itomation						
	Why	automation.	current trends.	Rigid automati	on I	ntroduction.			
IV	Mech	anisation vs a	utomation. Appl	ications, Goals. S	locial	issues. Low	5		
	cost a	utomation, Ty	pes, Reasons for	automation, Issue	s, Ten	strategies.			

	NC and CNC						
	NC and NC part programming, CNC- adaptive control, automated						
	material handling, assembly, flexible fixtures.						
	Computer Aided design						
V	Fundamentals of CAD- Hardware in CAD- Computer graphics software and	7					
v	data base, Geometric modeling for downstream applications and analysis	/					
	methods						
	Modeling and Simulation						
	Product design, process route modeling, optimization techniques, case studies						
	and industrial applications						
	Robotics and automation						
VI	Introduction to robotics, mechanical and electro mechanical systems,	7					
	pneumatics and hydraulics, Illustrative examples and case studies						
1	I extbooks	C					
1	Prentice Hall, 2007	anufacturing",					
2	Serope Kalpakiain and Steven R. Schmid, "Manufacturing Engineering and Technology".						
2	edition, Pearson, 2013	2.					
3	Ibrahim Zeid, CAD/CAM : Theory & Practice, 2 nd edition, 2006						
4	R.K.Rajput - A textbook of mechatronics, - Education asia.						
	References						
1	YoramKoren, "Computer control of manufacturing system", McGraw Hill, 1st ed	ition, 2017					
2	Webb and Reis, "Programmable Logic Controller – Principles and Applications"	, Prentice Hall					
	of India, 5 th Edition, 2002						
3	Kolk R.A. and Shetty Devdas, "Mechatronics System Design", Thomson Lear	ning, 2007, 3 ^{ra}					
4	Bolton - Mechatronics - Pearson Third edition						
	Hasful Links						
1	bttns://nntal.aa.in/courses/112/102/112102202/						
2	https://oplinecourses.nptal.ac.in/noc20_me58/preview						
2							
1 1	https://nptel.ac.in/courses/112/104/112104288/						

CO-PO Mapping														
	Programme Outcomes (PO)								PS	50				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1												
CO2		1	2		1								2	
CO3	1			1	2	1							2	
						-								

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		W	alchand Colleg	ge of Engineer	ing, Sangli					
	(Government Aided Autonomous Institute)									
	AY 2023-24									
	Course Information									
Prog	Programme B.Tech. (Mechanical Engineering)									
Class	, Seme	ster	Third Year B. Te	ch., Sem VI						
Cours	se Cod	e	6ME323		1.51.11					
	Course Name Computational Methods for Structures and Fluids									
Desir	ed Red	uisites:								
Т	Taashing Sahama									
	caciii	ig Scheme		Examina (M	arks)					
Lectu	ire	3Hrs/	MS	7	Гоt					
		week	E		E		al			
Tutor	rial	-	30	20	50	1	100			
Inter	action	-		Cre	edits: 3					
-		1 • .1	Cou	rse Objectives						
1	To e	xplain the gene	eral steps in finite el	ement method.	1					
2		olve various fie	ld problems using I	inite element meth	od.	loma				
3		se modern soft	vare to simulate str	uctural thermal an	d fluid problems	lems.				
	10 0	se modern son	ware to simulate su	uctural, incrinar an						
		(Course Outcomes (CO) with Bloom's	s Taxonomy					
At the	e end o	f the course, the	e students will be ab	ble to.						
C	Exp	ain the use of r	nathematical model	ing and FEM.			Apply			
0	•			C						
1	T T	1 4 1	0 1 :		1 1 /1 11		A 1			
C	Use	modern tools, s	software, and equipr	s and	Analyz					
0	inter	pret the data					e			
2										
C	Ana	lyze mechanica	l components, syste	ms and projects re	quired for industry by	/	Evaluat			
0	USIN EEN	g f					e			
3	ΓĽΙV	1.								
	_									
Mod	ul			Module			Hours			
e	-	ntuadu atian ta	ETM	Contents						
		Resignments	of FEM - Historica	l background role	vance and scope for	FEM				
Ι		need for appro-	oximation application	ons of FEM in vari	ous fields advantage	s and	6			
	1	imitations of F	EM.		e as meras, au rantage	2 und				
•		ntroduction D	viscretization. inter	polation. shape f	unction, formulation	n of				
I T		lement charac	teristics matrices	assembly and so	lution.		1			
1		ntroduction C	eometrical approvi	mations Simplifi	ation through gumm	hetry				
	- I	Basic element s	hapes and behavior	mations, simplific ir Choice of elem	ent type Size and nu	mber				
I		of elements, E	lement shape and	distortion, Locat	ion of nodes, Node	and	7			

Ι

Ι

element numbering.

Introduction to CFD

I V	Philosophy of CFD, Governing equations of Fluid Dynamics, Presentations of Forms particularly suited for CFD, Mathematical behavior of PDEs	7
V	Basic Aspects of Discretization Finite Difference Method, Explicit Implicit approach, Errors and Stability analysis: A broader perspective, properties of discretization schemes, Solution techniques using FDM	6

V I	V I Finite Volume Method Introduction, FVM for one dimensional diffusion problem, steady state one dimensional convection diffusion problems, different schemes, assessment of different schemes.						
	Text Books						
1	S. S. Rao, "Finite Element Method in Engineering", Elsevier Publication, 4th Edition,	2004					
2	P. Seshu, "Textbook of Finite Element Analysis", 1st Edition. 2008.						
	M. J Fagan, "Finite Element Analysis- Theory and Practice"; Longman Scientific & Te	echnical,					
	1st Edition, 1992						
	References						
1	J. N. Reddy, "An Introduction to Finite Element Method", Tata McGraw Hill publicati Edition, 1993	on co. 2nd					
2	2 Logan D. L. "A first course in Finite Element Method", Cengage learning, 4th Edition, 2008.						
3	O. C, Zienkiewicz "The Finite Element Method – Basic Concepts and Linear Applicat McGraw Hill publication co., 5th Edition, 2000	ions", Tata					
4	Anderson, J.D., "Computational Fluid Mechanics The Basics with applications" McGraw-Hill Publication 2013	,					
5	H.K.Versteeg and W Malalasekera, "Introduction to Computational Fluid E 1995)ynamics"					
6	Muralidhar K. and Sundararajan T., " <i>Computational Fluid Flow and Heat Trans</i> , Narosa Publishing House, 2 nd edition, New Delhi 2011.	fer",					
7	Subas V. Patankar" <i>Numerical heat transfer fluid flow</i> ", Hemisphere I Corporation, 1980.	Publishing					
	Useful Links						
1	https://nptel.ac.in/courses/112/106/112106135/						
2	https://nptel.ac.in/courses/112/104/112104115/						

	CO-PO Mapping													
					Prog	ramm (P	e Outc	omes					PS O	
	1	1 2 3 4 5 6 7 8 9 1 1 1 1 2												
C 01	2										3	3		
C O2			1	2				2				2	2	
C O3		2						2			2		1	
The stren	oth of r	nannin	o is to	he wri	tten as	$1 \cdot Lox$	$v 2 \cdot M$	edium	3. Hi	σh			-	

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules

4 to 6.

		Wale	chand College	of Engineering, S	Sangli						
			(Government Alde	a Autonomous Institute) 2023-24							
Course Information											
Program	nme		B. Tech. (Mechan	ical Engineering)							
Class, Se	emester		Third Year B. Tech., Sem. VI								
Course	Code		6ME371								
Course l	Name		Computational me	ethods for structures an	d fluids Lab						
Desired	Requisi	tes:	l di								
Tea	aching S	cheme	Examination Scheme (Marks)								
Practica	l	2Hrs/Week	LA1	LA2	Lab ESE	Total					
Interact	ion	-	30	30	40	100					
				Credits: 1	 						
			1								
			Course	e Objectives							
1	To ex	plain the fini	ite element metho	d, its fundamentals a	nd general ste	ps.					
2	To de	scribe the ur	derlying theory, a	assumptions and mod	eling issues ir	n FEM					
	To pro	vide hands or	n experience using	finite element software	to model, anal	vze and design					
3	system	s of mechani	cal engineering.) Io and dough					
	To pro	ovide hands	on experience usi	ng finite element soft	ware to simul	ate structural.					
4	fluid	and thermal	problems			ale stractural,					
	india e										
		Course	Outcomes (CO) v	with Bloom's Taxonon	ıv Level						
At the er	nd of the	course, the st	tudents will be able	to.	19 20101						
		•••••••••		,	Bloom's	Bloom's					
СО		Cou	rse Outcome State	ement/s	Taxonomy	Taxonomy					
					Level	Description					
601	Execu	te the struct	ural, fluid, therma	l and dynamic	III	Understanding					
COI	analys	sis using FEI	M software.	2							
	Categ	orize the ma	thematical metho	ds and finite							
CO2	eleme	nt procedure	es for engineering	applications.	IV	Analysing					
	Select	the procedu	res for structural	thermal and fluid	V	Evaluating					
CO3	analys	$\sin of 1D 2\Gamma$	and 3D problem	s		2.000000					
	anarys	<u>, , , , , , , , , , , , , , , , , , , </u>	and 5D problem	5.							
			List of Experim	ents / Lab Activities							
List of E	xperime	nts									
Followin	g practi	cal's should b	e considered for IS	E and ESE evaluation.							
The stud	ents are	expected to s	olve the problems b	by using any FEM softw	vare.						
1. 4	Analysis	of stepped ba	ar								
2.	Thermal	and fluid ana	lysis of composite	wall							
3.	Torsiona	l analysis of s	shaft								
4. /	Analysis	of truss									
5. I	Problem	s on shape fui	nctions								
6. 5	Structura	and fluid 2I	O analysis								
7. 5	Structura	al and fluid 3I	O analysis								
8. N	Modal A	nalysis									
9.	Thermal	and fluid 2D	analysis								
10.	Thermal	and fluid 3D	analysis								
11. (Geometr	ical nonlinea	r analysis								
12. (Contact	nonlinear ana	lysis								
13. ľ	Material										
4.4 -	Industrial Visit to software company.										

	Text Books
	S. S. Rao, "Finite Element Method in Engineering", Elsevier Publication,
1	4 th Edition, 2004
2	P. Seshu, "Textbook of Finite Element Analysis", 1st Edition, PHI publication, 2008.
2	M. J Fagan, "Finite Element Analysis- Theory and Practice"; Longman Scientific &
3	Technical, 1st Edition, 1992
	References
1	J. N. Reddy, "An Introduction to Finite Element Method", Tata McGraw Hill
1	publication co. 2 nd Edition, 1993
2	Logan D. L. "A first course in Finite Element Method", Cengage learning, 4th
Z	Edition, 2008.
2	O. C, Zienkiewicz "The Finite Element Method – Basic Concepts and Linear
3	Applications", Tata McGraw Hill publication co., 4th Edition.
	Useful Links
1	https://www.udemy.com/course/ansys-mechanical-apdl-for-finite-element-simulation
2	https://www.youtube.com/watch?v=qx69C-UyxsE&list=PLtt6-
2	ZgUFmMKFfbOBhmCwG30KIVyvhDop

	CO-PO Mapping													
	Programme Outcomes (PO)													SO
	а	b	С	d	е	f	g	h	i	j	k		1	2
CO1		2		3				3						
CO2		2		2				2						
CO3		2	2									1		

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

	Assessment											
There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing (min 40 %) LA1+LA2 should be min 40%												
Assessment	Accessment Bosed on Conducted by Twicel Schedule Marks											
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30								
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30								
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40								

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

		Wa	alchand Colleg (Government At	ge of Engineerin	g, S 11e)	angli					
			A	Y 2023-24							
			Cour	se Information							
Progra	amme		B.Tech. (Mechani	ical Engineering)							
Class,	Semes	ster	Third Year B. Tec	ch., Sem VI							
Cours	e Code	9	6ME342								
Cours	e Nam	e	Mini Project 2								
Desire	ed Req	uisites:									
					_						
	eachin	g Scheme	T 1 4	Examination Sc	hemo	e (Marks)					
Practi	cal	2 Hrs./Week			I	Lab ESE	Total				
Interac	ction	100									
	Credits: 01										
			Сош	rse Ohiectives							
1	To fa	miliarize studen	ts with the concept	of project based learn	ning						
-		ive hands-on ex	perience to student	ts on developing pro	hlem	statement and	t methodology to				
2	108	attempt solvi	ng such problems.	in our developing pro	010111	Statement and	a memouorogy to				
3	To le	arn the technical	l report writing skil	ls.							
			U								
		Cour	rse Outcomes (CO) with Bloom's Taxo	nom	y Level					
At the	end of	the course, the	students will be abl	e to,							
со	Cour	rse Outcome Sta	atement/s			Bloom's Taxonomy Level	Bloom's Taxonomy Description				
CO1	Conc	eive a problem	statement either quirements raised f	from rigorous literat	ure	II	Understanding				
CO2	Design to sol	gn, and develop	the model / protot	ype / algorithm in or	der	III	Illustrating				
CO3	Write	e comprehensive	report on mini pro	ject work		V	Organising				
	1										
			Сот	urse contents							
	Guid	elines:									
	1. In	e mini-project is	s a team activity ha	Ving 3-4 students in a	team	1.					
	2. M discij	lini project sho plinary too.	ould include main	ly Mechanical Engi	neerii	ng contents b	out can be multi				
	2. Th	e mini project n	nay be a complete h	ardware or a combination	ation	of hardware a	nd software. The				
	softw	are part in mini	project should be l	ess than 50% of the to	otal v	vork.					
	3. Mi	ini Project shoul	d cater to a small sy	ystem required in labo	orato	ry or real life.					
	4. It s	should encompa	ss components, dev	vices etc. with which f	unct	ional familiari	ty is introduced.				
	5. Af	ter interactions	with course coordin	nator and based on con	npre	hensive literat	ure survey/ need				
	analy	sis, the student	shall identify the tit	le and define the aim	and	objectives of r	nini-project.				
	6. Sti	udent is expected	d to detail out speci	fications, methodolog	gy, re	sources requir	ed, critical issues				

involved in design and implementation and submit the proposal within first week of the semester.

7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.

8. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

Guidelines for Assessment of Mini Project Practical / Oral Examination:

Report should be prepared as per the guidelines issued by the department.

Mini Project shall be assessed through a presentation and demonstration by the student project group to faculty advisor / a panel of examiners.

Students shall be motivated to publish a paper based on the work in students competitions / Conferences / journals.

- 1. Mini Project shall be assessed based on following points;
- 2. Quality of problem and clarity
- 3. Proper use of knowledge and practices of mechanical and or other engineering disciplines.
- 4. Effective use of skill sets
- 5. Contribution of an individual's as member or leader
- 6. Clarity in written and oral communication

	Text Books
1 ●	
2	
	References
1	Meredith, Jack R., and Samuel J. Mantel Jr. Project management: a managerial
1	approach. John Wiley & Sons, 2011.
n	K. T. Ulrich, S. D. Eppinger, and M. C. Yang, Product Design & Development, , 7th
2	Edition, McGraw Hill, 2019.
2	M. Mahajan, Industrial Engineering and Production Management, 1st Edition, DhanpatRai
3	& Co. (P) Limited, 2015.
1	V. Balachandran and Chandrasekaran, Corporate Governance, Ethics and Social Responsibility,
4	PHI, 2nd Edition, 2011
	Useful Links
1	
2	

	CO-PO Mapping													
	Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		1		2				3			3	3	
CO2	2	2	3		2				3		3		2	1
CO3		3						3						1
The strong	ath of 1	nonnir	a is to	how	itton or	1 2 2.	whore	1.10		Andium	2. Ц	iah		

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

		Assessmer	ıt								
There are three	e components of lab	assessment, LA1, LA2	and Lab ESE.								
IMP: Lab ESE	IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%.										
Assessment	Based on	Conducted by	Typical Schedule	Marks							
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30							
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30							
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40							
Week 1 indicate experiments, menature and require related activitie	tes starting week of nini-project, present uirement of the lab es if any	a semester. Lab activiti tations, drawings, progra course. The experimenta	es/Lab performance shall include perfo amming, and other suitable activities, a al lab shall have typically 8-10 experim	rming s per the ents and							

		Walc	hand College (Government Aide	of Engineering, San d Autonomous Institute)	gli					
			AY	2023-24						
			Course	Information						
Progra	amme		B. Tech. (Mecha	5. 1 ecn. (Mechanical Engineering)						
Class,	Semester		Third Year B. Te	ech., Sem. VI						
Cours	e Code		6ME331							
Cours	e Name		Energy Conserva							
Desire	d Requisites:									
	Teaching Sch	eme	MCE	Examination Scheme	(Marks)					
Lectur	re 21	Irs/week	MSE	ESE	Total					
Tutori	ial		30	30 20 50						
				Credits: 2						
	T 1	1	Course	Objectives	1.4.					
1	To introduce energy and power scenario, electrical systems, energy auditing, energy conservation									
	and energy in	npact on en	vironment.	. 1 1		,•				
2	To provide K	nowledge of	t energy managem	ent, energy auditing and er	ergy conserva	tion.				
3	To develop s	kill to carry	out energy audit a	nd to suggest methodologi	es for energy s	avings.				
4	To prepare the	e students f	or higher studies a	ind research in the field of o	energy conserv	ration and				
	management	Course	Outcomes (CO) v	vith Bloom's Taxonomy I	evel					
At the	end of the cou	rse. the stud	ents will be able to	0.						
The une		150, 110 5144		.,	Bloom's	Bloom's				
со		Cours	se Outcome State	ment/s	Taxonomy	Taxonomy				
					Level	Description				
CO1	Explain ener	rgy and po	ower scenario, el	ectrical systems, energy	Level	Description				
CO1	Explain ener auditing, ene	rgy and por	ower scenario, elation and energy in	ectrical systems, energy mpact on environment.	Level III	Description Applying				
CO1 CO2	Explain ener auditing, ene Carryout ene	rgy and por rgy conserva	ower scenario, ele ation and energy in ing and balancing.	ectrical systems, energy mpact on environment.	Level III IV	Description Applying Analysing				
CO1 CO2 CO3	Explain ener auditing, ene Carryout ene Exercise ener	rgy and por rgy conserva rgy account ergy audit	ower scenario, elo ation and energy in ing and balancing. and suggest me	ectrical systems, energy mpact on environment. ethodologies for energy	Level III IV	Description Applying Analysing				
CO1 CO2 CO3	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and po rgy conserva rgy account ergy audit	ower scenario, ele ation and energy in ing and balancing. and suggest me	ectrical systems, energy mpact on environment. ethodologies for energy	Level III IV V	DescriptionApplyingAnalysingEvaluate				
CO1 CO2 CO3	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and por rgy conserva rgy account ergy audit	ower scenario, ele ation and energy in ing and balancing. and suggest me	ectrical systems, energy mpact on environment. ethodologies for energy	Level III IV V	Description Applying Analysing Evaluate				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and po rgy conserva rgy account ergy audit	ower scenario, ele ation and energy in ing and balancing. and suggest me Module	ectrical systems, energy mpact on environment. ethodologies for energy Contents	Level III IV V	Description Applying Analysing Evaluate Hours				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ene savings.	rgy and po rgy conserva rgy account ergy audit tion	ower scenario, ele ation and energy in ing and balancing. and suggest me Module	ectrical systems, energy mpact on environment. ethodologies for energy Contents	Level III IV V	Description Applying Analysing Evaluate Hours				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and por rgy conserva rgy account ergy audit tion tion to ene	ower scenario, el ation and energy in ing and balancing. and suggest me Module ergy and power	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati	Level III IV V ional energy	Description Applying Analysing Evaluate Hours				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and por rgy conserva- rgy account ergy audit tion tion to ene tion data, en	ower scenario, ele ation and energy in ing and balancing. and suggest me Module rrgy and power nvironmental aspe	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ	Level III IV V	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu	Explain energy a	rgy and por rgy conserva- rgy account ergy audit tion tion to ene ion data, en uditing - n	ower scenario, ele ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspet eed, types, meth	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro	Level III IV V ional energy y utilization, le of energy	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ene savings.	rgy and por rgy conserva- rgy account ergy audit tion tion to ene ion data, enuditing - n , instrument	ower scenario, ele ation and energy in ing and balancing. and suggest me Module ergy and power nvironmental aspe- eed, types, methors for energy auditi	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro	Level III IV V ional energy y utilization, le of energy	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise end savings.	rgy and por rgy conserva- rgy account ergy audit tion tion to ene ion data, enu uditing - n , instrument I Systems	ower scenario, ele ation and energy in ing and balancing. and suggest me Module ergy and power nvironmental aspe- eed, types, meth- is for energy auditi	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro	Level III IV V ional energy y utilization, le of energy	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and por rgy conserva- rgy account ergy audit tion ion to ene ion data, enuditing - n , instrument I Systems of EB	ower scenario, ela ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspe eed, types, meth is for energy auditi	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro- ing LT supply, transformers,	Level III IV V ional energy y utilization, le of energy cable sizing,	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and po rgy conserva- rgy account ergy audit tion tion to ene tion data, en- uditing - n , instrument I Systems of EB f capacitors	ower scenario, el ation and energy in ing and balancing. and suggest me Module orgy and power nvironmental aspe eed, types, methors for energy audition billing, HT and in , power factor imp	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, roing LT supply, transformers, provement, harmonics, elec	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors –	Description Applying Analysing Evaluate Hours 3				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise ener savings.	rgy and po rgy conserva- rgy account ergy audit tion tion to ene ion data, enu uditing - n , instrument I Systems ints of EB f capacitors ficiency cor	wer scenario, ele ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspe eed, types, meth- is for energy auditi billing, HT and 1 , power factor imp nputation, energy	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energy odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elect efficient motors, Illumin	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors – ation – Lux,	Description Applying Analysing Evaluate Hours 3 5				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise ene savings.	rgy and po rgy conserva- rgy account ergy audit tion tion to ene ion data, en uditing - n , instrument I Systems ents of EB f capacitors ficiency cor types of 1	ower scenario, ele ation and energy in ing and balancing. and suggest me Module ergy and power nvironmental aspe- eed, types, meth- is for energy auditi billing, HT and i , power factor imp nputation, energy ighting, efficacy,	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elec efficient motors, Illumin LED lighting and scop	Level III IV V tonal energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy	Description Applying Analysing Evaluate Hours 3 5				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise end savings.	rgy and po rgy conserva- rgy account ergy audit tion tion to ene ion data, er uditing - n , instrument I Systems ints of EB f capacitors ficiency cor types of 1 ion in lighti	wer scenario, ele ation and energy in ing and balancing. and suggest me Module ergy and power nvironmental aspe eed, types, meth is for energy auditi billing, HT and i , power factor imp nputation, energy ighting, efficacy, ng	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elect efficient motors, Illumin LED lighting and scop	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy	Description Applying Analysing Evaluate Hours 3 5				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise end savings.	rgy and por rgy conserva- rgy account ergy audit tion ion to ene- tion data, en- uditing - n , instrument I Systems of EB of capacitors ficiency cor types of 1 ion in lighti Managemen	wer scenario, ele ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspe eed, types, meth is for energy auditi billing, HT and 1 , power factor imp nputation, energy ighting, efficacy, ng t and Audit	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elect efficient motors, Illumin LED lighting and scop	Level III IV V ional energy y utilization, le of energy cable sizing, ctric motors – ation – Lux, e of energy	Description Applying Analysing Evaluate Hours 3 5				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise end savings.	rgy and por rgy conserva- rgy account ergy audit tion ion to ene- tion data, en- uditing - n , instrument I Systems of EB of capacitors ficiency cor types of 1 ion in lighti Managemen n, energy a	wer scenario, ela ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspe eed, types, meth s for energy auditi billing, HT and i , power factor imp nputation, energy ighting, efficacy, ng t and Audit udit, need, types	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energy odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elect efficient motors, Illumin LED lighting and scop	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy	Description Applying Analysing Evaluate 3 5				
CO1 CO2 CO3 Modu I II	Explain energy auditing, ene Carryout ene Exercise energy savings.	rgy and por rgy conserva- rgy account ergy audit tion tion to ene- tion data, en- uditing - n , instrument I Systems ficiency cor types of 1 ion in lighti Managemen h, energy a	wer scenario, ela ation and energy in ing and balancing. and suggest me Module rgy and power nvironmental aspe eed, types, methas for energy auditi billing, HT and i , power factor imp nputation, energy ighting, efficacy, ng t and Audit udit, need, types	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energy odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elec efficient motors, Illumin LED lighting and scop of energy audit. Energy rgy costs, bench mark	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy management ing, energy	Description Applying Analysing Evaluate Hours 3 5 5				
CO1 CO2 CO3 Modu I II	Explain energy auditing, ene Carryout ene Exercise energy savings.	rgy and por rgy conserva- rgy account ergy audit tion tion to ene ion data, en- uditing - n , instrument I Systems ficiency cor types of 1 ion in lighti Managemen n, energy a approach-un nce, match	wer scenario, ele ation and energy in ing and balancing. and suggest me Module rrgy and power nvironmental aspe eed, types, meth s for energy auditi billing, HT and f , power factor imp nputation, energy ighting, efficacy, ng t and Audit udit, need, types iderstanding energy ing energy use	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; natients ects associated with energy odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elect efficient motors, Illumin LED lighting and scop of energy audit. Energy rgy costs, bench mark to requirement, maximi	Level III IV V ional energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy management ing, energy zing system	Description Applying Analysing Evaluate Hours 5 5				
CO1 CO2 CO3 Modu I	Explain ener auditing, ene Carryout ene Exercise end savings. Ile Introduct consumpt energy a managers Electrica Compone concept o motor eff Lumens, conservat Energy M Definition (audit) a performate efficienci	rgy and por rgy conserva- rgy account ergy audit tion tion to ene ion data, er uditing - n , instrument I Systems ints of EB if capacitors ficiency cor types of 1 ion in lighti Managemen n, energy a approach-un nce, match	wer scenario, ele ation and energy in ing and balancing. and suggest me Module rrgy and power nvironmental aspe- eed, types, meth- is for energy auditi billing, HT and it , power factor imp nputation, energy ighting, efficacy, ng it and Audit udit, need, types iderstanding energy ing the input en- ing the input en-	ectrical systems, energy mpact on environment. ethodologies for energy Contents scenario of world; nati ects associated with energ odology and barriers, ro- ing LT supply, transformers, provement, harmonics, elec efficient motors, Illumin LED lighting and scop of energy audit. Energy rgy costs, bench mark to requirement, maximi nergy requirements, fuel	Level III IV V tonal energy y utilization, le of energy cable sizing, etric motors – ation – Lux, e of energy management ing, energy zing system and energy	Description Applying Analysing Evaluate Hours 5 5				

IV	Thermal Systems Thermal systems, boilers, furnaces and thermic fluid heaters- efficiency computation and energy conservation measures; steam distribution and usage, steam traps, condensate recovery, flash steam utilization; insulation & refractories	4
V	Energy Conservation in major utilities Energy conservation in major utilities, pumps, fans, blowers, compressed air systems, refrigeration& air conditioning systems, cooling towers, dg sets. energy economics- discount period, payback period, internal rate of return, net present value; life cycle costing- ESCO concept	5
VI	Energy and environment, air pollution, climate change United nations framework convention on climate change (UNFCC), sustainable development, Kyoto Protocol, Conference of Parties (COP), clean Development Mechanism (CDM), Prototype Carbon Fund (PCF)	4
	Textbooks	
1	Witte L.C. Schmidt P.S. and Brown D.R., "Industrial Energy Management an Hemisphere Publ., Washington, 1988	d Utilization",
2	Callaghn P.W., "Design and Management for Energy Conservation", Pergamon 1981	Press, Oxford,
3	Murphy W.R. and McKay G., "Energy Management", Butterworths, London, 20	03
4	Energy Manager Training Manual, Bureau of Energy Efficiency (BEE) und Power, GOI, 2008 (available at www.energymanager training.com)	er Ministry of
	References	
1	Recent reports of agencies: International Energy Agency (IEA), Ministry Renewable energy (MNRE), Technology and Action for Rural Advancement	of New and (TARA)
2	Dale R Patrick, Stephen W Fardo, "Energy Conservation Guidebook", 2 nd Edition	on, CRC Press
3	Albert Thumann, "Handbook of Energy Audits", 6th Edition, The Fairmont Press	s
4	Bureau of Energy Efficiency Reference book: No.1, 2, 3 4	
	Useful Links	
1	http://nptel.iitm.ac.in/	
2	www.bee.com	
3	www.powermin.nic.in	

	CO-PO Mapping													
		Programme Outcomes (PO)												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2								1			1		
CO2	2	2											2	
CO3		2	2	2	1		2						2	2
						_					1	1		

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College (Government Aided	of Engineering, Sar d Autonomous Institute)	ngli						
			AY	2023-24							
			Course]	Information							
Progra	amme		B. Tech. (Mechai	nical Engineering)							
Class,	Semeste	r	Third Year B. Te	ch., Sem. VI							
Cours	e Code		6ME332								
Cours	e Name		Power Plant Eng	gineering							
Desire	d Requis	sites:									
	Teaching	g Scheme		Examination Scheme	(Marks)						
Lectur	re	2Hrs/week	MSE	ISE	ESE	Total					
Tutori	ial		30	20	50	100					
		Credits: 2									
	1		Course	Objectives							
1	To intro	duces the studen	ts about different p	ower plants, energy audit	and economics	•					
2	To prep	are the students t	o analyze the powe	er plants and its various pa	rameters.						
3	To deve	elop the skill to se	elect, analyze the po	ower plant system and alli	ed parameters						
4											
		Course	Outcomes (CO) w	vith Bloom's Taxonomy	Level						
At the	end of th	e course, the stud	lents will be able to),							
СО		Cours	se Outcome Stater	nent/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description					
CO1	Describ diesel a	e energy harves nd hydrocarbon	ting from water,	fuels like coal, nuclear,	III	Applying					
CO2	Disting	uish and interpret	the parameters relation	ated to power plants.	IV	Analysing					
CO3	Select	the appropriate s	system, instrument	ts and allied parameters							
	based o	n performance, e	nergy consumption	and economics.	V	Evaluate					
		· · · ·									
Modu	le		Module (Contents		Hours					
Ι	Intr Ene plan	oduction rgy resources and ts, review of basi	l their availability, c thermodynamic c	types of power plants, se cycles used in power plant	election of the	4					
II	Hyd Rain estin and sele	Iro-Electric Pow Ifall and run-of nating stream flo operation of di ction, comparison	er Plants f measurements w and size of reser fferent components with other types of	and plotting of variou voir, power plants design s of hydro-electric powe of power plants	s curves for , construction er plants, site	5					
III	Steam Power Plants Flow sheet and working of modern-thermal power plants, super critical pressure steam stations, site selection, coal storage, preparation, coal handling systems, feeding and burning of pulverized fuel, ash handling systems, dust collection-mechanical dust collector and electrostatic precipitator										
IV	Oth Basi dies wor syst usec reac	er Power Plants ic principles and el plants ,operativity king principles of ems used in gas t l in gas turbine p tions, nuclear rea	types of diesel pl tion performance f gas turbine power urbine power plant power plants. Princ ctors-PWR, BWR,	ants, advantages and disa of a diesel engine, con plants, basic components is, different types of fuels ciples of nuclear energy, advantages and limitation	advantages of struction and and auxiliary and materials basic nuclear	5					

V	Power Plant Instrumentation and Energy Audit Steam pressure and steam temperature measurement, flow measurement of feed water, fuel, air and steam with correction factor for temperature, speed measurement, level recorders, smoke density measurement, dust monitor, flue gas oxygen analyzer – analysis of impurities in feed water and steam, dissolved oxygen analyzer, ph meter-fuel analyzer, and pollution monitoring instruments, current simple methods of energy auditing	4
VI	Power Plant Economics Load curve, different terms and definitions, cost of electrical energy, tariffs methods of electrical energy, performance & operating characteristics of power plants- incremental rate theory, input-output curves, efficiency, heat rate, economic load sharing and simple numerical	4
	Textbooks	
1	EL-Wakil, "Power plant Technology", M.M., McGraw Hill, 1 st Edition, 2017	
2	P.K. Nag, "Power Plant Engineering", Tata McGraw Hill,4 th Edition 2017	
3	Domkundwar, Arora, "Power plant Technology", Dhanpat Rai and Co. sixth edit	ion 2013
	References	
1	Weisman, J., and Eckert, L., "Modem Power Plant Engineering", Prentice Ha 1999.	all, 1 st edition.
2	Kam W. Li and A. Paul Priddy, "Power Plant System Design", John Wiley, 1st et al.	edition, 2018.
2	Recent reports of agencies: International Energy Agency (IEA), Ministry	of New and
3	Renewable energy (MNRE), Technology and Action for Rural Advancement (TA	ARA)
	Useful Links	
1	NPTEL Course on POWER PLANT ENGINEERING, Department of Mechanic IIT Roorkee - https://nptel.ac.in/courses/112/107/112107291/	al Engineering
2	Course on Power Plant Engg., IIT Kharagpur, https://youtube list=PLwOhSTeCfDgmA7LFqMnT0yb83dmr9esWZ	e.com/playlist?

	CO-PO Mapping													
	Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2		2											2	
CO3	2	2	2		1								2	2
The streng	The strength of mapping is to be written as 1: Low, 2: Medium, 3: High													

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)											
	AY 2023-24										
			Course	nformation							
Progr	amme		B. Tech. (Mechar	nical Engineering)							
Class,	Semester		Third Year B. Te	ch., Sem. VI							
Cours	se Code		6ME333								
Cours	se Name		Operations Resea	rch							
Desire	ed Requisi	tes:									
	Teaching	Scheme		Examination S	cheme ((Marks)					
Lectu	ure 2Hrs/week MSE ISE ESE Total										
Tutor	ial		30	20		50	100				
				Cred	its: 2						
			0								
1	To crab!	a tha atu danta ta	Course	Objectives	ina musl	alama					
1	To prepa	e the students to	o use mathematical	models for solving	nig prot	zation problem	25				
2	To prepa	te me sudents to a	o use mainematical	models for solving	5 optimi F finding	continual solut	ions				
3	Touann		Outcomes (CO) w	ith Bloom's Taxo	nomy I	evel	10115.				
At the	end of the	course the stud	lents will be able to		uomy L	ever					
				,		Bloom's	Bloom's				
СО		Cours	se Outcome Staten	nent/s		Taxonomy	Taxonomy				
						Level	Description				
CO1	Solve lin	ear programmin	g problems.			III	Applying				
CO2	Formulat	e mathematical	models for real life	cases.		IV	Analysing				
CO3	Select m	odels for optimi	zation under differe	ent constraints.		V	Evaluate				
	-										
Modu	ile	•	Module (Contents			Hours				
- T	Linea	ir programmin	g problem	11 1.	1 1 0		~				
	Form	ulation of line	ar programming	problem, graphica	ii solut	ion method,	5				
		ex memou.	integar program	nina							
п	Duali	ty concept dual	simplex method for	nng or LPP Gomerv's o	utting r	lane method	4				
11	for in	teger programm	ing problem	JEIT, Contery 50	Juning F	nune memou	•				
	Tran	sportation mod	lola								
	Math	L	Transportation models								
	III Mathematical formulation, methods to obtain initial basic feasible solution, 5										
conditions for testing optimality, MODI method for testing optimality solution											
	condi of bal	ematical formutions for testing anced and unba	lation, methods to optimality, MODI lanced problems, d	obtain initial bas method for testing egeneracy and its r	ic feasi g optima esolutio	ble solution, ality solution n.	5				
	condi of bal Assig	ematical formutions for testing anced and unba anment models	lation, methods to optimality, MODI lanced problems, d	obtain initial bas method for testing egeneracy and its r	ic feasi g optima esolutio	ble solution, llity solution n.	5				
IV	condi of bal Assig Math	ematical formutions for testing anced and unba anment models ematical formu	lation, methods to optimality, MODI lanced problems, d lation, balanced a	obtain initial bas method for testing egeneracy and its r nd unbalanced as	ic feasi g optima esolutio signmer	ble solution, ality solution n. nt problems,	5				
IV	condi of bal Assig Math maxiu	ematical formu- tions for testing anced and unba mment models ematical formu nization proble	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions,	ic feasi g optima esolutio signmer travelir	ble solution, ality solution n. nt problems, ng salesman	5				
IV	condi of bal Assig Math maxii probl	ematical formu- tions for testing anced and unba nment models ematical formu- nization proble	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions,	ic feasi g optima esolutio signmer travelir	ble solution, ality solution n. nt problems, ng salesman	5				
IV	condi of bal Assig Math maxin probl Gam	ematical formu tions for testing anced and unba nment models ematical formu nization proble em e theory	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions,	ic feasi g optima esolutio signmer travelir	ble solution, ality solution n. ht problems, ng salesman	5				
IV V	condi of bal Assig Math maxii probl Gam Game	ematical formu- tions for testing anced and unba ment models ematical formu- nization proble em e theory es theory: introc	lation, methods to coptimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi	ic feasi g optima esolutio signmer travelir ple, solu	ble solution, ality solution n. ht problems, ng salesman ution of zero	5 4 4				
IV V	condi of bal Assig Math maxii probl Gam Gam Gam	ematical formu- tions for testing anced and unba nment models ematical formu- nization proble em e theory es theory: introc wo persons gam ical method	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a nes, saddle point, al	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do	ic feasi g optima esolutio signmer travelir ple, solu	ble solution, ality solution n. ht problems, ng salesman ution of zero re properties,	5 4 4				
IV V	condi of bal Assig Math maxin probl Gam Game sum t graph Repl	ematical formu tions for testing anced and unba nment models ematical formu nization proble em e theory es theory: introc wo persons gan ical method acement model	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a nes, saddle point, al	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do	ic feasi g optima esolutio signmer travelir ple, solu pminanc	ble solution, ality solution n. ht problems, ng salesman ution of zero re properties,	5 4 4				
IV V	condi of bal Assig Math maxin probl Gam Game sum t graph Repla	ematical formu tions for testing anced and unba ment models ematical formu nization proble em e theory es theory: introc wo persons gan ical method acement model	lation, methods to optimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a nes, saddle point, al	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do maintenance cost	ic feasi g optima esolutio signmer travelir ple, solu ominanc	ble solution, ality solution n. ht problems, ng salesman ution of zero re properties, es with time	5 4 4				
IV V VI	condi of bal Assig Math maxii probl Gam Gam Gam Gam Gam Repla Repla (mon	ematical formu tions for testing anced and unba ment models ematical formu nization proble em e theory es theory: introd wo persons gan ical method acement model ey value consta	lation, methods to coptimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a nes, saddle point, al for items whose cont) and with char	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do maintenance cost age in money valu	ic feasi g optima esolutio signmer travelir ple, solu pminanc increase	ble solution, ality solution n. ht problems, ng salesman ation of zero re properties, es with time ction of best	5 4 4 4				
IV V VI	condi of bal Assig Math maxin probl Gam Gam Gam Gam Gam Repla Repla (mon mach	ematical formu tions for testing anced and unba nment models ematical formu nization proble em e theory es theory: introc wo persons gan ical method acement model ey value consta ine, replacement	lation, methods to coptimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a hes, saddle point, al for items whose ant) and with char nt of items that	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do maintenance cost ige in money valu fail suddenly, ind	ic feasi g optima esolutio signmer travelir ple, solu ominanc increase le, selec dividual	ble solution, ality solution n. nt problems, ng salesman ation of zero re properties, es with time ction of best and group	5 4 4 4 4				
IV V VI	condi of bal Assig Math maxin probl Gam Gam Gam Gam Gam Gam Repla (mon mach repla	ematical formu tions for testing anced and unba ment models ematical formu nization proble em e theory es theory: introc wo persons gan ical method acement model ey value consta ine, replacement cement policies.	lation, methods to coptimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a hes, saddle point, al for items whose ant) and with char nt of items that	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do maintenance cost ge in money valu fail suddenly, ind	ic feasi g optima esolutio signmer travelir ple, solu ominanc increase increase dividual	ble solution, ality solution n. ht problems, ng salesman ution of zero re properties, es with time tion of best and group	5 4 4 4 4				
IV V VI	condi of bal Assig Math maxin probl Gam Game sum t graph Repla (mon mach replac	ematical formu tions for testing anced and unba ment models ematical formu nization proble em e theory es theory: introc wo persons gam ical method acement model ey value consta ine, replacement cement policies.	lation, methods to poptimality, MODI lanced problems, d lation, balanced a ems, assignment luction, minimax a nes, saddle point, al for items whose ant) and with char nt of items that	obtain initial bas method for testing egeneracy and its r nd unbalanced as with restrictions, nd maximin princi gebraic method, do maintenance cost ige in money valu fail suddenly, ind	ic feasi g optima esolutio signmer travelir ple, solu ominanc increase ie, selec dividual	ble solution, ality solution n. ht problems, ng salesman ution of zero re properties, es with time ction of best and group	5 4 4 4 4				

1	Hira D.S. and Premkumar Gupta, "Operation Research", S. Chand and Co. Ltd., Revised Edition, 2008								
2	Sharma J.K., "Operations Research: Theory and Applications", Macmillan publishers India Ltd., 4 th Edition, 2009								
3	Sharma S. D., "Operation Research", Kedarnath and Rannath & Co, 5th Edition, 2005								
	References								
1	R. Panneerselvam, "Operations Research", Prentice Hall India Pvt. Ltd., 2004								
2	Vohra N.D., "Quantitative Techniques in Management", McGraw Hill, 4th Edition, 2010								
3	Mahajan Manohar, "Operations Research", Dhanpat Rai and Company Pvt. Ltd., 1 st Edition 2006								
	Useful Links								
1	https://www.youtube.com/watch?								
1									

$\sqrt{-2}$		I R KAL H / YCNITCOX
v-uzguudktk		LDJUCIZICNUSUA

	CO-PO Mapping													
	Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3			3								2	2	
CO2		3		3	1									
CO3			2	2	1									
The streng	gth of n	napping	g is to b	e writt	en as 1	:Low,	2: Med	ium, 3:	High					

Each CO of the course must map to at least one PO.

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College	of Engineering	, San	gli	
			AV	2023-24	c)		
			Course	nformation			
Progra	amme		B. Tech. (Mechar	nical Engineering)			
Class.	Semester		Third Year B. Te	ch., Sem, VI			
Cours	e Code		6ME334				
Cours	e Name		Design and Optin	nization of Mechan	ical Ele	ements	
Desire	d Requisi	tes:					
	• •						
	Teaching	Scheme		Examination Second	cheme	(Marks)	
Lectur	•e	2Hrs/week	MSE	ISE		ESE	Total
Tutori	al		30	20		50	100
				Cred	its: 2		
			Course	Objectives			
1	To design as econor sustainab	n a system, com nic, environmer ility.	ponent, or process t ntal, social, ethical,	to meet desired nee health and safety, r	ds with nanufa	in realistic c cturability, a	onstraints such nd
2	To use th	e optimization t	echniques and tool	s for necessary engi	ineerin	g practice.	
3	To use m optimizat	athematical met ion problems.	hods and computer	s to make rational o	decision	ns in solving	a variety of
		Course	Outcomes (CO) w	ith Bloom's Taxor	iomy L	Level	
At the	end of the	course, the stud	ents will be able to	,			
СО		Cours	se Outcome Staten	nent/s		Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Impleme	nt different metl	nods for optimum d	lesign		III	Applying
CO2	Analyze	different optimiz	zation techniques.			IV	Analysing
CO3	Evaluate	and interpret so	lution of an optimiz	zation problem.		V	Evaluate
		•	• •	•			
Modu	le		Module (Contents			Hours
Ι	Intro Intro design Optin exam	duction luction to Design n process, optim num design prol ples, A general p	gn- The design Pr num design versus of blem formulation- mathematical mode	rocess, Convention optimal control The problem formu el for optimum desig	al vers ulation gn	us Optimun process witl	4
II	Optin Defin conce posto Optin	num design Co itions of globa pts, Unconstra ptimality analys nality, Engineer	ncepts al and local mini ained and constr sis: Physical mean ing design example	ma, review of so rained Optimum ing of Langrange s	ome ba desigi Multip	asic calculu 1 problems liers, Globa	5
III	Grap Graph Desig Infeas	hical Optimiza nical solution p n problem with sible problem, C	tion rocess, Use of ma n multiple solution fraphical solution for	thematica for grap s, problem with U or different applicat	ohical Inbound	optimization ded solution	5
IV	Linea Defin linear Two	r Programmin ition of a standa programming ohase simplex m	g Methods for Op and linear programn problems, Basic id nethod	timum Design ning problem, Basic eas and steps of th	c conce ne Simj	pts related to plex method	4
V	Num Gener for st metho	erical Methods ral concepts rela ep size determi od, conjugate gra	for Unconstraine ated to Numerical ination, search dire adient method	d Optimum Desig algorithms, basic id ection determinatic	n leas an on: stee	d algorithms pest descen	4

VI	Numerical Methods for Constrained Optimum Design Basic Concepts and Ideas, Linearization of constrained problem, sequential linear programming algorithm, Quadratic programming sub problem, Constrained steepest descent method	4					
	Textbooks						
1	Jasbir. Arora, Introduction to optimum Design, Elsevier, 4th edition						
2	Johnson Ray, C., "Optimum design of mechanical elements", Wiley , John & Son	ns, 1981.					
3	Singeresu S. Rao, "Engineering Optimization - Theory and Practice" New Age Intl. Ltd., Publishers, 2000.						
	References						
1	Kalyanamoy Deb, "Optimization for Engineering design algorithms and Ex India,199	kamples", PHI					
2	Goldberg, D.E., "Genetic algorithms in search, optimization and machine", Barnen, Addison- Wesley, NewYork, 1989						
3	PSG Design Data Book, Third Edition, 1978						
	Useful Links						
1	https://www.youtube.com/watch?v=LL20TZGXp3Q						

CO-PO Mapping														
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		2										1	
CO2		2											1	
CO3		2		1									1	
The stren	oth of r	nannin	g is to l	ne writt	en as 1	·Low	2. Mec	lium 3	High					

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli											
	AV 2023-24										
				se Information							
Programme B. Tech. (Mechanical Engineering)											
Class	Semest	er	Third Year B Tec	ch Sem VI							
Cours	e Code		6ME372								
Cours	e Name		Mechatronics Sys	tems Lab							
Desire	d Requ	isites:									
Τ	eaching	Scheme		Examination Scheme	e (Marks)						
Practi	cal	2Hrs/Week	LA1	LA2 I	Lab ESE	Total					
Intera	ction	-	30	30	40	100					
				Credits: 1							
			Cou	rse Objectives							
1	To rev	ise basic electr	onic/electrical conc	epts and understand use o	f basic electronic	s components					
-	like di	odes, transistor	rs etc. and their use	in amplification and swite	hing.						
2	To De	monstrate use of	of sensors and their	integration with microcon	troller and PLC a	and use of					
	microc	ontroller for d	oing various tasks.	1 1 1 1	1. 1						
	To ma	ke students fan	niliar with various r	nodern and advanced cont	rol tools.						
		Com	ma Autoomog (CA) with Dloom's Toyonom	v I ovol						
At the	and of t	be course the	rse Outcomes (CO) with Bloom's Taxonom	y Levei						
At the		ne course, me	students will be able		Bloom's	Bloom's					
	Bloom's Bloom's										
L CO	CO Course Outcome Statement/s Taxonomy Taxonomy										
СО	Cours	e Outcome Sta	atement/s		Taxonomy Level	Taxonomy Description					
CO	Cours Select	e Outcome Sta	atement/s	components like diodes,	Taxonomy Level	Taxonomy Description					
CO CO1	Cours Select transis	e Outcome Sta appropriate ele tors etc. to forr	atement/s ectrical/ electronic c n meaningful circui	components like diodes, its.	Taxonomy Level III	TaxonomyDescriptionApplying					
CO CO1	Cours Select transis Analyz	appropriate ele tors etc. to forr ze logic for ope	atement/s ectrical/ electronic c n meaningful circui erating a particular s	components like diodes, its. system by using a PLC o	r IV	Taxonomy Description Applying					
CO CO1 CO2	Cours Select transis Analyz a micro	e Outcome Sta appropriate electors etc. to forr ze logic for ope ocontroller	atement/s ectrical/ electronic c n meaningful circui erating a particular s	components like diodes, its. system by using a PLC o	Taxonomy Level III r IV	Taxonomy Description Applying Analysing					
CO CO1 CO2	Cours Select transis Analyz a micro Summ	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requir	atement/s ectrical/ electronic c n meaningful circui erating a particular s rements of process of	components like diodes, its. system by using a PLC o elements and equipment's	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3	Cours Select transis Analyz a micro Summ availab	e Outcome Sta appropriate electors etc. to forr ze logic for ope ocontroller arize the require ole in modern e	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process o era	components like diodes, its. system by using a PLC o elements and equipment's	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3	Cours Select transis Analyz a micro Summ availat	e Outcome Sta appropriate electors etc. to forr ze logic for ope ocontroller arize the require ble in modern e	atement/s ectrical/ electronic c n meaningful circui erating a particular s rements of process o era	components like diodes, its. system by using a PLC o elements and equipment's	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3	Cours Select transis Analyz a micro Summ availat	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requir ble in modern e	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3	Cours Select transis Analyz a micro Summ availat	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requin ole in modern e	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process o era List of Exper periments from fo	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities llowing list:	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1.	Cours Select transis Analyz a micro Summ availat work sh Demon	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requir ole in modern e nall contain ex nstration and d	atement/s ectrical/ electronic c n meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based c	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities llowing list: on Relay logic control	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO1 CO2 CO3 Term 1. 2. 3	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requir ole in modern e nall contain ex nstration and d ased Ladder lo	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based co ogic programming p for three road cro	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities ilowing list: on Relay logic control	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO1 CO2 CO3 Term 1. 2. 3. 4	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper speriments from fo evelopment based co ogic programming n for three road croop	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities llowing list: on Relay logic control ssing.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO1 CO2 CO3 Term 1. 2. 3. 4. 5	Cours Select transis Analyz a micro Summ availat work st Demon PLC b Traffic Traffic	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requin- ble in modern e nall contain ex nstration and d ased Ladder lo c control system c control system	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based c ogic programming n for three road cross n for six road cross	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities llowing list: on Relay logic control ssing. sing	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo c control syster c control syster	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based co ogic programming m for three road cross n for six road cross n for six road cross n for six road cross	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities llowing list: on Relay logic control ssing. sing	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ble in modern e nall contain ex nstration and d ased Ladder lo c control syster c control syster c control syster	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based co ogic programming m for three road cross n for six road cross n for six road cross ntrolling for lift/ ele ntrolling for coin co	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing ing evator system.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra Progra	e Outcome Sta appropriate ele- tors etc. to forr- ze logic for ope- ocontroller arize the requir- ole in modern e nall contain ex- nstration and d ased Ladder lo- c control syster c control syster	ectrical/ electronic c m meaningful circui erating a particular s rements of process of the second second second the second second second second second programming m for three road cross m for four road cross n for six road cross n for six road cross n for six road cross n for six road cross second sec	components like diodes, its. system by using a PLC of elements and equipment's iments / Lab Activities llowing list: on Relay logic control ssing. sing evator system. ounter systems.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Progra Progra Demon Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo c control syster c control syster c control syster c control syster mming and co mming and co	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based c ogic programming n for three road cross n for six road cross n for six road cross n trolling for lift/ ele ntrolling for coin co se of star delta start ntrolling for HMI	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing. sing evator system. ounter systems. er.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra Demon Progra	e Outcome Sta appropriate ele- tors etc. to forr ze logic for ope- ocontroller arize the requir- ble in modern e nall contain ex- nstration and d ased Ladder lo- c control syster c c control syster c c control syster c c c c c c c c c c c c c c c c c c c	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based co ogic programming m for three road cross n for six road cross n for six road cross n for six road croad cross n for si	components like diodes, its. system by using a PLC of elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing. sing ing evator system. ounter systems. er.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra Demon Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo c control system c	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from for evelopment based co ogic programming n for three road cross n for four road cross n for six road cross n for six road cross n for six road cross n trolling for lift/ ele ntrolling for coin co se of star delta start ntrolling for HMI. ntrolling for Vendin	components like diodes, its. system by using a PLC of elements and equipment's iments / Lab Activities llowing list: on Relay logic control ssing. sing evator system. ounter systems. er. ng machine operation.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Progra Progra Demon Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the requin- ble in modern e nall contain ex nstration and d ased Ladder lo c control syster c control syster c control syster c control syster mming and co mming and co mming and co	atement/s ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based c ogic programming n for three road cross n for six road cross n for six road cross n trolling for lift/ ele ntrolling for coin co se of star delta start ntrolling for HMI. ntrolling for Vendin	components like diodes, its. system by using a PLC o elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing. sing evator system. ounter systems. er. ng machine operation.	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Cours Select transis Analyz a micro Summ availab work sh Demon PLC b Traffic Traffic Traffic Progra Demon Progra Demon Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo c control syster c	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from fo evelopment based co ogic programming m for three road cross n for six road croad cross n for si	components like diodes, its. system by using a PLC of elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing. sing evator system. ounter systems. er. ng machine operation. Fext Books n International Publishing	Taxonomy Level III r IV V	Taxonomy Description Applying Analysing Evaluating 2.					
CO CO1 CO2 CO3 Term 1. 2. 3. 4. 5. 6. 7. 8. 9. 10	Cours Select transis Analyz a micro Summ availat work sh Demon PLC b Traffic Traffic Traffic Progra Demon Progra Demon Progra	e Outcome Sta appropriate ele tors etc. to forr ze logic for ope ocontroller arize the require ole in modern e nall contain ex nstration and d ased Ladder lo c control system c	ectrical/ electronic c m meaningful circui erating a particular s rements of process of era List of Exper periments from for evelopment based co ogic programming n for three road cross n for six road cross n for six road cross n for six road cross n trolling for lift/ ele ntrolling for coin co se of star delta start ntrolling for HMI. ntrolling for Vendin T on of 8085", Penran ckworth D. It, "Pro	components like diodes, its. system by using a PLC of elements and equipment's iments / Lab Activities ilowing list: on Relay logic control ssing. sing evator system. ounter systems. er. ng machine operation. Fext Books n International Publishing ogrammable Logic Control	Taxonomy Level III r IV V V (I) Pvt. Ltd, 200 oller Program	Taxonomy Description Applying Analysing Evaluating 2. ming Methods					

	References									
1	"Manufacturer's Manuals for different PLC Systems".									
2	Gary Dumming, "Introduction to PLC", Delmar Publication									
	Useful Links									
1	https://www.youtube.com/watch?v=J89K1x7b6Ec&list=PLg0bf3Cfp1mwNBrZ-									
L	oERNOAVU_iMpaclW									

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2	1												
CO2		1	2										2	
CO3			2											
The stre	noth of	fmonni	na ia ta	ho um	tton or	1 2 2	vhana	Low	2. Ma	lium ?	Iliah			

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

Assessment										
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%										
Assessment Based on Conducted by Typical Schedule Ma										
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
	performance	applicable	Week 19							
Week 1 indicat	es starting week o	f a semester. Lab activities/	Lab performance shall include perfo	orming						
	•••	A A CONTRACTOR AND AND A CONTRACTOR AND A CONTRACTOR AND A CONTRACTOR AND A CONTRACTOR AND AND A CONTRACTOR AND	with a second set on sector 1.1 a set of the							

experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli												
(Government Alaea Autonomous Institute)												
Course Information												
Programme B. Tech. (Mechanical Engineering)												
Class.	Semester		Third Year B. Teo	ch., Sem, VI	·							
Cours	e Code		6ME373	,								
Cours	e Name		Automation Lab									
Desire	d Requisi	tes:										
	Leaching Scheme Examination Scheme (Marks) Practical 2Hrs/Week LA1 LA2 Lab ESE Tatal											
Practi	cal	2Hrs/Week			Lab	ESE	Total					
Intera	ction	-	30	30	4()	100					
				Cr	eants: 1							
			Cours	e Objectives								
	To study	various applica	tions of automated	systems for impro	oving the p	roductivity of	the					
1	manufact	turing industry.		-)	P							
n	To demo	nstrate effective	e use of various mic	croprocessors, mic	rocontrolle	ers, PLC and	other modern					
	control s	ystems for vario	ous applications.									
3	To devel	op student's abi	lity to demonstrate	different control s	ystems							
A + 11	1 6 1	Cours	e Outcomes (CO)	with Bloom's Tay	konomy L	evel						
At the	end of the	course, the stud	ients will be able to),		DI 9	Di 9.					
0		Соц	rsa Autooma Stata	mont/s		BIOOM'S Taxonomy	Bloom's Taxonomy					
		Cou	ise Outcome State	menus		Level	Description					
CO1	Apply kr	nowledge to ma	ke simple automate	ed system for indu	strial use							
	to pick a	nd place applica	tions, welding, pair	nting etc.		111	Applying					
CO2	Analyse	logic for operat	ing particular syste	m using higher en	d control	IV	Analysing					
	system					1 V	Anarysing					
CO3	Create in	dependent smal	ll application orient	ed PLC based des	ign	VI	Create					
			list of Exporimon	ts / Lab Activitios	Topics							
List of	f Lah Acti	vities:	List of Experiment	is / Lab Activities	ropics							
1.	Automat	ed bottle filling	plant									
2.	Automat	ic object detecti	on and identification	on								
3.	PLC base	ed motor and ac	tuator control									
4.	Program	ming and contro	olling of automated	fluid mixer syster	n							
5.	Program	ming and contro	olling for spot weld	ing mechanism								
6. 7	Program PLC base	ming and control ed control of va	rious sensor interfa	nting								
8	Program	ming and control	olling for nick and t	nlace								
9.	Program	ming and control	olling for annunciat	or								
Autom	ation base	d analysis on ca	se study in specific	e manufacturing do	omain							
			Те	extbooks								
1	R The	omas Wright, "l	Manufacturing and	Automation Tech	nology", T	ata Mc Hill, 2	2002.					
2	Serop	be Kalpakjain a	ind Steven R. Sch	mid, "Manufactui	ing Engin	eering and I	echnology", 7 th					
	eanto	n, reaison, 201	J.									
			Re	eferences								
1	"Man	ufacturer's Mai	nuals for different F	PLC Systems".								
2	Gary	Dumming, "In	troduction to PLC"	, Delmar Publicati	on							
			Use	eful Links								
1	https:	//www.youtube	.com/watch?v=J89	K1x7b6Ec&list=P	Lg0bf3Cf	p1mwNBrZ-						
	oERN	NUAVU_iMpac	IW	02202/								
2	nttps:	//nptei.ac.in/cot	urses/112/103/1121	03293/								

	CO-PO Mapping													
	Programme Outcomes (PO)									PS	50			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		3											
CO2		1		2								1		2
CO3				1	2								2	
The stre	ength of	mappi	ng is to	be wri	tten as	1,2,3; v	where, 1	: Low,	2: Med	lium, 3	: High			-

Each CO of the course must map to at least one PO, and preferably to only one PO.

	Assessment									
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE	is a separate head	l of passing.(min 40 %), LA	1+LA2 should be min 40%							
Assessment	Based on	Conducted by	Typical Schedule	Marks						
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
	performance	applicable	Week 19							
Lab ESE	journal/ performance	External Examiner as applicable	Marks Submission at the end of Week 19	40						

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

		Wa	alchand Colleg	e of Engineerin	ig, San	ıgli			
			(Government Aid	ded Autonomous Instit	ute)				
				Y 2023-24					
Due au			P. Tech (Mechanical Engineering)						
Progra	amme		B. Lech. (Wechanical Engineering)						
Class,	Semes	ter	Infru Fear B. Tech., Sem. VI						
Cours	e Code		6ME374	· 1D (* *	r 1				
Cours	e Name	•••	Industrial Hydraul	ics and Pneumatics	Lab				
Desire	a kequ	lisites:							
T	eaching	Scheme	Examination Scheme (Marks)						
Practi	cal	2 Hrs/Week	LA1	LA2	Lal) ESE	Total		
Intera	ction	_	30	30		40	100		
				Cred	its: 1	I			
			I						
			Cour	se Objectives					
1	To dev	velop an interes	t in oil hydraulic an	d pneumatic system	s.				
2	To pr	epare the stud	ents to select an a	appropriate system	for an	industrial p	roblem with due		
	referen	nce to the advar	ntages, limitations, c	cost, economy, etc.					
3	To des	sign a hydraulic	e and pneumatic syst	tem for various appl	ications.				
		Cou	rse Outcomes (CO)	with Bloom's Tax	onomy l	Level			
At the	end of t	the course, the s	students will be able	e to,					
CO		Co	ourse Outcome Stat	tement/s	Bloom's	Bloom's			
		Ct	Jurse Outcome Stat	centent/5			Description		
CO1	Opera	te and control t	he hydraulic and pro-	eumatic systems.		III	Applying		
~~~	Analy	se different con	nponents and circuit	ts of hydraulic and					
CO2	pneun	natic systems.	- <b>F</b>			IV	Analysing		
CO3	Design	n and build hyd	raulic and pneumati	ic circuits for automa	ation.	VI	Creating		
	C	•	•						
			List of Experi	iments / Lab Activi	ties				
Labor	atory w	vork shall cont	ain any 8 experime	ents from following	list :				
	a Basi	a hydraulia aira	uit for linear and ro	towing circuits					
	a. Dasi h Raga	e nyuraune ene		tary motion.					
	o. Rege c. Trav	erse and feed c	ircuit						
	d Mete	erse and feed e	and bleed-off circuit	it					
	e. Seau	encing circuit y	with sequence valve						
	f. Svnc	hronization mc	otion of cylinders.						
2. Ex	perime	nts on pneumat	ic trainer kit with fo	ollowing circuits					
	a. Pneu	matic circuits f	for linear and rotary	motion					
1	b. Sequ	encing circuit o	of type A+ B+ A—B	3—					
.	c. Sequ	encing circuit f	for A+ B+ B- A-	_					
	d. Sequ	encing of cylin	ders with electric ar	nd electronic control					
			Т	ext Books					
1	S R. N Delhi,	/lajumdar, "Oil 2006	Hydraulic Systems	-Principles and Mai	ntenance	e ", Tata Mc	Graw-Hill, New-		
2	S.R. N	Majumdar, "Pn	eumatic Systems: F	Principles and Main	tenance'	', Tata McC	Graw-Hill, New-		

	Delhi, 2006
	References
1	D.A. Pease, "Basic Fluid Power", Prentice Hall Ltd., 1988
2	J.J. Pipenger, "Industrial Hydraulics". McGraw-Hill Publications, 1979
3	Goodwin, "Power Hydraulics
	Useful Links
1	https://www.youtube.com/watch?
	v=dxAsr14DW6Y&list=PLbMVogVj5nJTKwm1WjlutrAEZrLE995Ja

	CO-PO Mapping													
		Programme Outcomes (PO)								PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b>CO1</b>	1		3											
CO2		3	3									1	2	
CO3		3	1	1										
CO4														
The stre	ength of	f mappi	ng is to	be wri	itten as	1.2.3: v	where.	: Low.	2: Me	dium. 3	: High			

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 5: High Each CO of the course must map to at least one PO, and preferably to only one PO.

	Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.									
IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%									
Assessment	Based on	Conducted by	Typical Schedule	Marks					
	Lab activities,		During Week 1 to Week 8						
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30					
	journal		Week 8						
	Lab activities,		During Week 9 to Week 16						
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30					
	journal		Week 16						
	Lab activities,	Lab Course Faculty	During Week 18 to Week 19						
Lab ESE	journal/	and External Examiner	Marks Submission at the end of	40					
	performance	as applicable	Week 19						
Week 1 indicat	tes starting week o	of a semester. Lab activition	es/Lab performance shall include perfo	rming					
experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the									
nature and requ	uirement of the lal	b course. The experimenta	I lab shall have typically 8-10 experim	ents and					
related activitie	es if any.								

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
			AY	2023-24						
			Course	Information						
Progr	amme		B. Tech. (Mechanical Engineering)							
Class,	, Semester		Third Year B. Tech., Sem. V							
Cours	se Code		6ME375	6ME375						
Cours	se Name		Mechanical Meas	Mechanical Measurement and Control Lab						
Desire	Desireu Kequisnes:									
	Teaching	Schomo		<b>Evamination</b> S	chome	(Marks)				
Practi	ical	2 Hrs/Week	LA1	LA2	L	ah ESE	Total			
Interg	nction		30	30		40	100			
mera			50	Cred	lits• 1	10	100			
					1051 1					
			Course	Objectives						
1	Students	will be able to	use various experin	nental techniques re	elevan	t to the subje	ct.			
2	Students	will acquire has	nds on experience of	on the various test-	rigs, E	xperimental	setup.			
3	Students	will be able to	function as a team	member						
		Course	Outcomes (CO) w	ith Bloom's Taxo	nomy	Level				
At the	end of the	course, student	s will be able to,							
		~ ~ ~ ~				Bloom's	Bloom's			
CO	Course (	Jutcome State	ment/s			Taxonomy	Taxonomy			
<u>CO1</u>	Maagunga		vical assantition			Level	Description			
$\frac{cor}{cor}$	Colibrata	various mechan	nical quantities.	trumonta			Analysing			
C02	Campare	different meas	urement techniques				Analysing			
	Compare	amerent meas	urennent teeninques			1 V	Anarysing			
			List of Experim	ents / Lab Activiti	es					
List o	f Experim	ents								
1. Cal	ibration of	Bourdon Tube	Pressure Gauge.							
2. Spe	ed measure	ement.	· · · ·							
3. Stra	in measure	ement using resi	stance strain gauge	2.						
4. D1s	placement	measurement by	y using LVD1.							
6 Cal	ibration of	Rota meter for	fluid flow measure	ment						
7. For	ce measure	ment using dyn	amometer.	ment.						
8. Mea	asurement	of the vibration	parameters of a rol	tary machine.						
9. Noi	se measure	ment and addit	ion /subtraction of	noise levels.						
10. M	easurement	t of the torque.								
11. Ca	alibration o	f thermocouple	and measurement	of the temperature u	using v	arious temp	erature sensors.			
	V D	C M 1 1 1	Tex	t Books	·/ D	1 C D (				
1	4th Editio	.S., Mechanical on, 2007.	Measurement and	Control, Metropol	itan Bo	ook Co. Pvt.	Ltd., New Delhi,			
2	2 Beckwith and Buck, Mechanical Measurement, Pearson Education Asia, 5th Edition, 2001.									
3	Rao S. S.,	, Mechanical Vi	brations, Pearson e	ducation, 5th edition	on, 201	10				
	Doebel in	Emesto Measu	irement Systems N	AcGraw Hill Intern	ationa	l Publication	Co New			
1	York, 4th	Edition, 1990								
2	Kettinger York, 1st	Michael, Acou edition, 19	stic Design and No	oise Control, Vol. I	&11, (	Inemical Pul	blishing Co. New			

	Useful Links						
1	http://mdmv-nitk.vlabs.ac.in/						
2	http://va-coep.vlabs.ac.in/						
3	https://sm-nitk.vlabs.ac.in/						

	CO-PO Mapping													
		Programme Outcomes (PO)								PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1			2					2				1	
CO2		3		1								2		
CO3		3							2			2	1	
The stren	gth of 1	mappir	ng is to	be wr	itten as	1.2.3:	where	. 1: Lo	w. 2: N	Mediur	n. 3: H	igh		

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

		Assessment		
There are three of IMP: Lab ESE i	components of lab a s a separate head of	assessment, LA1, LA2 a passing.(min 40 %), LA	nd Lab ESE. \1+LA2 should be min 40%	
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicate	s starting week of a ni-project presenta	semester. Lab activities		orming

experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

		Wal	chand College	e of Engineerin	ng, Sang	gli							
			(Government Ala AY	2023-24	(uie)			_					
			Course	Information									
Progra	amme		B.Tech. (Mechani	B.Tech. (Mechanical Engineering)									
Class,	Semester		Third Year B. Tech., Sem VI										
Cours	e Code		6ME376	6ME376									
Cours	e Name		Robotics Lab										
Desire	d Requisi	tes:						_					
, , , , , , , , , , , , , , , , , , ,	Taaahing	Sahama		Evamination	Sahama (	Marka)		_					
Practi	reaching cal	2 Hrs /Week	LA1	LA2	Jeneme (Jene Lab 1	FSE	Total	_					
Intera	ction		30	30	40	)	100	_					
				Cre	dits: 1	<u> </u>							
								_					
			Cours	e Objectives									
1	To delive	er the knowledg	e of advance conce	pts and implementa	ation of In	ndustrial Au	utomation and						
	Robot pr	ogramming.			• .		1000	_					
2	To provi	de the basic und	lerstanding of Hydr	aulic and Pneumat	ic systems	s, SCADA a	and DCS systems						
		re knowledge of	e in modern maust	tems in industries	Industrial	distributio	n systems huses	_					
3	protocols	Electrical con	trols of motors etc.	stems in moustries,	musuiai	uistiitutto	in systems, buses,						
	protocol	Cours	e Outcomes (CO)	with Bloom's Tax	onomy L	evel							
At the	end of the	course, the stud	lents will be able to	),	v								
CO       Course Outcome Statement/s       7						Bloom's Taxonom Level	s Bloom's 1y Taxonomy Description	L					
CO1	Estimate transmiss	continuous-tim sion, and record	e control using soft ing of data.	tware for the manip	oulation,	IV	Analyze						
CO2	Decide embedde	suitable actuated actuated actuated actuated actual	ors and sensors	and integrate the	m with	V	Evaluate						
CO3	Design s synchron	static and dyna	umic logic systems ronous sequential l	s used for combinogics.	national,	VI	Create						
		· · · · · · · · · · · · · · · · · · ·											
		]	List of Experiment	ts / Lab Activities/	/Topics								
List of 1. Var 2. Vari 3. Rob 4. Rob 5. Rob 6. Rob 7. Rob 8. Rob 9. Rob 10. Stu 11. Stu 12. Stu	List of Experiments / Lab Activities/Topics         List of Lab Activities: (10 experiments from the list given below)         1. Various features of Gripper system in Robot         2. Various Robot programming parameters         3. Robot programme for simple pick and place         4. Robot programming for complex pick and place         5. Robot programming for simple palletization         6. Robot programming for complex palletization         7. Robot programming for colour based object identification         8. Robot programming for shape based object identification         9. Robot programming for comparison of two or more jobs         10. Study, designing system and demonstration of various drive systems used in robotics         12. Study, designing system and demonstration of various sensors used in robotics												
	C			extbooks	7	T							
1	Groo Prent	ver M.P., "Aut ice Hall Interna	tional, 2004	on Systems and (		Integrated	Manufacturing,"	,					
2	Groo Appli	ver M.P., Nage cations", McGr	a K.N., Ordey N.C.	a., "Industrial Rot al, 1999	ootics- Te	chnology,	Prentice Hall International, 2004 Groover M.P., Nagel R.N., Ordey N.G., "Industrial Robotics- Technology, Programming and Applications", McGraw Hill International, 1999						

3	R.K. Mittal, I.J. Nagrath, "Robotics and Control,", Tata McGraw Hill, 1997
4	Pradeep Chaturvedi, N.K. Tewari, P.V. Rao, G.S. Yadav, "Modern Trends in Manufacturing
	Technology,", IE India, New Delhi, 2002
	References
1	Richard M. Murrai, Zexiang Li, S Shankar Sastry, "Robotic Manipulation," CRC Press, 2001
2	S.R. Deb, "Robotics Technology and Flexible Automation," Tata McGraw Hill, 2000
3	Urich Rembold, "Computer Integrated Manufacturing Technology and System," 1995
	Useful Links
1	https://nptel.ac.in/content/storage2/112/105/112105249/MP4/mod01lec01.mp4
2	NPTEL Link: https://youtu.be/a6_fgnuuYfE
3	NPTEL Link: https://youtu.be/49RET0N-ITY
4	NPTEL Link: https://youtu.be/9fqygvj-O2s

CO-PO Mapping														
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1		2											2	2
CO2				3								1		1
CO3			3						3					

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

		Assessment								
There are three components of lab assessment, LA1, LA2 and Lab ESE.										
IMP: Lab ESE	IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%									
Assessment	Based on	Conducted by	Typical Schedule	Marks						
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19							
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40						
performance applicable Week 19										
Week 1 indicat	Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing									
evperiments m	ini_project prese	ntations drawings program	ming and other suitable activities a	is ner the						

experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

Walchand College of Engineering, Sangli										
(Government Aided Autonomous Institute)										
AY 2025-24 Course Information										
Programme B Tech (Mechanical Engineering)										
Class. Semester Third Year B Tech Sem VI										
Course Code 6ME377										
Course Name Internal Combustion Engines Lab										
Desire	Desired Requisites:									
	Teachi	ng Scheme		Exami	nation	Scheme (Mark	(s)			
Practi	ical	2Hrs/Week	LA1	LA2	La	ıb ESE		Total		
Intera	nction		30	30		40		100		
					Cre	edits: 1				
	1		Co	urse Objectives	5					
1	To stud	y Engines performa	nce parameter	s such as BMEF	P, Torqu	ie, BSFC and th	neir rela	ationship to		
	operatin	ng conditions.								
2	To stud	y Ideal air standard	cycles and fue	l/air cycles.	~ .			•		
3	To unde	erstand roll of Paran	neters affecting	g volumetric eff	riciency	, valve timing, j	port de	sıgn.		
4	To kno	w about Turbocharg	ing: compress	or and turbine p	ertorm	ance, matching	compo	onents,		
		ction to impeller des	sign.		·	mition and in a	flores	atmiatires		
5	10 stud	y combustion Proce	sses in both sp	fuel injection	etono n	gnition engines:	dolow	structure,		
6	To stud	v Emissions: NOv	CO UHC Sm	oke and Catali		uiiioei, igiiiuoii rters	uelay,	cetalle liuliller.		
0	10 stud	Course	Outcomes (C	(0, 0) with Bloom	's Taxo	nomy Level				
At the	end of th	e course the studer	ts will be able	to	5 1 4 10					
		ie course, the studen		0,		Bloom's		Bloom's		
CO		Course Ou	tcome Statem	nent/s		Taxonomy Level		Taxonomy Description		
CO1	Underst 2 stroke	tand the Basics of e es, 4 stroke petrol ar	engine construe ad diesel engin	ction and workings.	ing of	III		Applying		
CO2	Analyze engines	e the heat balance by taking trials.	sheet of 4 stro	oke petrol and	diesel	IV		Analysing		
CO3	Evaluat stroke e	te the performance engine.	of computeriz	zed multi cylin	ider 4	V		Evaluate		
		Li	st of Experim	ents / Lab Acti	ivities/7	Горісѕ				
List o Term Study 1. 2. 3. 4. 5. 6. Test g 7. 8. 9. 10 11	f Lab Ac work sh group:- Constru- Dismar Study of Study of Study of Study roup:- Test on Test on D. Morse . Test on 2. Measur	tivities: all contain any 5 to uctional details of I. ntling and assembly of Engine air inlet, e of Ignition system and of carburetor and pe of fuel injection system a slow speed diesel e a high speed diesel e a variable speed four test on multi cylinded a computerized I.C.	<b>6 experimen</b> C. Engines of I.C. Engine xhaust, coolin nd starting syst trol injection s tem of diesel e engine. stroke petrol er engine. engine test rig- e emissions.	ts from followi c. g and lubricatio tem. system. engine. engine.	ng list	ms.				
				Textbooks						
1	Gane	eshan, "Internal Con	nbustion Engi	nes ", Tata Mac	Hill Pu	blication, 2 nd E	Edition.	, 1999		
2	Matl	nur and Sharma, "In	ternal Combus	stion Engines", I	Dhanpa	t Rai publicatio	n, 2 nd	Edition, 2000		

	References									
1	Y. Obert, "Internal Combustion Engines and Air Pollution ", In-text Educational Publishers, 51 st Edition, 1973									
2	John B Heywood, "Internal Combustion Engines fundamentals", McGraw-Hill, Revised 2 nd Edition, 1988									
	Useful Links									
1	https://www.youtube.com/watch? v=lMkioRm5ZTs&list=PLkUEX3IbW7leYWEB0baTgg6SbS2zVE-Au									

	CO-PO Mapping													
	Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
<b>CO1</b>	2													
CO2		2									2		2	
CO3	2	2	2		1						2		2	2
The stre	The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High													
Each CO	Each CO of the course must map to at least one PO, and preferably to only one PO.													

Assessment There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40% Assessment Based on Conducted by **Typical Schedule** Marks Lab activities, During Week 1 to Week 5 Marks Submission at the end of LA1 attendance, Lab Course Faculty 30 journal Week 5 During Week 6 to Week 9 Lab activities, LA2 attendance, Lab Course Faculty Marks Submission at the end of 30 journal Week 9

Lab Course Faculty and

External Examiner as

Lab activities,

journal/

Lab ESE

performanceapplicableWeek 12Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing<br/>experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the<br/>nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and<br/>related activities if any.

During Week 10 to Week 12

Marks Submission at the end of

40

		Wal	chand College	e of Engineeri	ng, San	gli					
(Government Aided Autonomous Institute) AY 2023-24											
Course Information											
ProgrammeB.Tech. (Mechanical Engineering)											
Class,	Semester		Third Year B. Te	ch., Sem VI							
Cours	e Code		6ME378								
Course Name Industry 4.0 Lab											
Desire	d Requisi	tes:									
D	Teaching	Scheme	T A 1	Examination	Scheme	(Marks)					
Practi		2Hrs/week	LAI 20	LA2		ESE	100				
Intera	ction		30		44 Adjter 1	J	100				
					euns. 1						
			Cours	se Obiectives							
	To provi	de the knowleds	ge of Fourth Indust	rial Revolution wh	nich is ver	y much drive	en by the				
	smartnes	s in automating	decision making a	nd processes.		•	2				
2	To provi	de a comprehen	sive coverage on, a	among others, the	role of dat	a, manufactu	ring systems,				
	various I	ndustry 4.0 tech	nologies, applicati	ons and case studi	es.						
-	To draw	input from rese	archers and practiti	oners on what are	the oppor	tunities and o	challenges				
3	brought a	about by Industr	ry 4.0, and how org	ganizations and kno	owledge v	vorkers can b	e better prepared				
	to reap ti	Cours	a Outcomes (CO)	with Bloom's Tay	vonomy I	aval					
At the	end of the	course the stur	dents will be able to		AUHUHI'Y L						
		course, the stat				Bloom's	Bloom's				
со		Cou	rse Outcome State	ement/s		Taxonomy	Taxonomy				
						Level	Description				
CO1	Explain manufac	various revolut turing.	ions going on in	industrial automa	tion and	II	Understanding				
CO2	Able to c	outline the vario	ous systems used in 4 0 world	a manufacturing p	plant and	IV	Analyze				
CO3	Use integ	gration of data v	with manufacturing	system effectively	٧.	V	Evaluate				
				• •							
		]	List of Experimen	ts / Lab Activities	s/Topics						
List of	f Topics (A	Applicable for 1	Interaction mode)	:							
1. Pr	edictive M	aintenance Opt	imization								
$2. \ln 2$	dustrial Ini	fernet of Things									
	oud Manu igital Twin	lacturing,									
5 Cy	vber securi	tv									
6. Vi	irtual/ Aug	mented Reality									
7. H	uman-Rob	ot Collaboration	n Optimization								
8. Bi	g Data and	l Analytics									
9. Ai	utonomous	Robots									
10.	Cybersed	curity in Industr	ial Control System	s ·							
11.	Additive	Manufacturing	Process Optimizat	101							
12.	Smart M	anuracturing									
			Т	extbooks							
1	Alasc	lair Gilchrist, I	ndustry 4.0: The I	Industrial Internet	of Thing	s, Apress, IS	BN-1484220463,				
2	2017.	Sahwah Tha I	Fourth Industrial D	avalution Doutfali	o Donguin	ISDN 0241	200754 2017				
	<b>N</b> Iaus	s senwau, The f			orenguin	, ISDIN-0241	500754,2017.				
			R	eferences							
1	Klaus	Schwab, Nich	olas Davis, Shapin	g the Future of the	e Fourth I	ndustrial Re	volution: A guide				
	to bu	Ilding a better w	vorld, Portfolio Pen	iguin, 2018.	T	of This of					
2	Indus	trial IoT infrast	ructure using Indus	stry 4.0, 2018.	Internet	or Things: C	reate a powerful				

	Useful Links
1	https://www.industry.gov.au/sites/default/files/July%202018/document/pdf/industry-4.0-testlabs-report.pdf?acsf_files_redirect
2	https://www.wichita.edu/academics/engineering/ime/_centers_and_labs/Industry40_Lab.php
3	https://www.industry40lab.org/

	CO-PO Mapping													
	Programme Outcomes (PO)											PS	<b>50</b>	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2					3			3			1	3	
CO2	2			3				3					2	
CO3			2		2									1
The stre Each CO	The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.													

		Assessment			
There are three	components of la	b assessment, LA1, LA2 an	d Lab ESE.		
IMP: Lab ESE	is a separate head	of passing.(min 40 %), LA	1+LA2 should be min 40%		
Assessment	Based on	Conducted by	Typical Schedule	Marks	
	Lab activities,		During Week 1 to Week 8		
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30	
	journal		Week 8		
	Lab activities,		During Week 9 to Week 16		
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30	
	journal		Week 16		
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19		
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40	
	performance	applicable	Week 19		
Week 1 indicate	es starting week o	f a competer I ab activities	I ab performance shall include perfo	rmina	

Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.
	Walchand College of Engineering, Sangli
	(Government Aided Autonomous Institute)
	AY 2023-24
	Course Information
Programme	B.Tech. (Mechanical Engineering)
Class, Semester	Third Year B. Tech., Sem VI
Course Code	6ME379
Course Name	Advanced Manufacturing Technology Lab
<b>Desired Requisites:</b>	Basic knowledge of machining, tool engineering and measuring instruments

Teaching Scheme		Examination Scheme (Marks)								
Lecture	-	LA1	LA2	Lab ESE	Total					
Tutorial	-	30	30	40	100					
Practical	2Hrs/Week									
Interaction	-		Credit	s: 1						

	Course Objectives
1	To summarize the tooling techniques.
2	To illustrate the knowledge on various concepts of advanced manufacturing technology.
3	To explore the importance of measurement of various parameters and various methods of measuring the dimensions of manufactured parts.

# Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

СО	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
			Description
CO1	Demonstrate the tooling techniques.		Applying
CO2	Compare the various latest manufacturing technologies.	Ш	Analyzing
CO3	Use dimensional measuring instruments, calibrate	V	Evaluating
	and examine accuracy of components.		

1. Demonstration of CNC machine and hands on experience of tool and component settings on Job.

2. Demonstration and hands-on experiment with component on micromachining-center.

3. Experiment on Machining of non-metals using fiber laser machine set-up and examine the job under metallurgical microscope.

4. Demonstration and one Case study on Micro-Electro Discharge machine [EDM]

5. Demonstration and one Case study on Micro- Wire Electro Discharge machine [WEDM]

6. Demonstration and one Case study on Electro Chemical machine [ECM].

7. Demonstration and hands on job on 3-D Printing machine set-up with hardness testing.

8. Reports on industry visits/ R&D organizations related to advanced Manufacturing Processes.

	Text Books
1	Kalpakjian and Schmid, "Manufacturing Processes for Engineering Materials", Pearson India, 5th Edition, 2014
2	Jagadeesha T., "Nontraditional Machining Processes", Wiley India-Dreamtech Presss ,2020
3	Jagadeesha T., "Unconventional Machining Processes", Wiley India-Dreamtech Presss ,2020

4	P.C	.Shar	ma, "I	Fext B	ook of	Produc	tion E	Inginee	ring",	S. Cha	nd Cor	npany,	, New ]	Delhi,	2008	
5	R.K	C. Jair	n, "Eng	gineeri	ng Me	trology	", Kh	anna Pi	ıblishe	r, 21st	Editio	n				
	1						]	Refere	nces							
1	P.H ISB	I.Josh N:97	i,"Jigs '80070	ance 68073	l Fiz 9, 2010	xtures" )	, Ta	ata N	AcGrav	v-Hill	Pub	lishing	; Ltc	I., 1	New	Delhi,
2	J.F.W. Gayler and C.R. Shotbolt, "Metrology for Engineers", Cassell, 1990															
3	Pandey P. C., Shan H. S. "Modern Machining Processes", , Tata McGraw-Hill Publishing Co. Ltd, New Delhi (ISBN 0-07-096553-6) 1977															
4	Ben 0-82	nedict 247-7	: G. F. 7352-7	, "Non ), 1987	traditio	onal M	anufa	cturing	Proce	sses", i	Marcel	Dekk	er, Inc	. New	York	(ISBN
5	Bob 13:9	) Ba 97803	bson, 359753	"3D 3284,2	Printin 016	ıg" -T	he C	omplet	e Gui	de, Pl	UBLIS	HER-A	Abbott	Prop	erties,	ISBN
						. 1.0	U	seful I	links							
1	http v=F	s://w FqSJh	ww.yo Y_lete	outube. c&list=	com/w PLkU	atch? EX3Ib	W7le4	Okwm	_qe4a	1h6634	4USZT	ĩ				
2	http CC	os://w	ww.yc	outube.	com/w	atch?v	=5sa	aq-oYE	E&list	=PLrc	SDk_g	;Q7jiQ	CfWE:	zw932	ZMaxH	lkg2v-
3	http	os://w	ww.yc	outube.	com/w	atch?v	=7yzv	no4Av	′Kw							
4	http	s://nj	otel.ac	.in/cou	rses/11	2/103	11210	)3202/								
5	http	os://w	ww.yc	outube.	com/w	atch?v	=yWF	3Gnkh(	GKz8							
6	http	os://w	ww.yc	outube.	com/w	atch?v	=Cz-k	KsEBL	WNI							
7	http	os://w	ww.yc	outube.	com/w	atch?v	=r4Qv	ws2G31	f8E							
8	http	os://w	ww.yc	outube.	com/w	atch?v	=cxU	1zUOp	GLk							
9	http	os://w	ww.yc	outube.	com/w	atch?v	=QJ-k	KIdAI	_Rk							
10	http	os://yo	outu.be	e/sFFc	PPj4Ti	8										
11	http	os://w	ww.yc	outube.	com/w	atch?										
	v=6	SXYC	QIXfsZ	ZwU&p	p=ygl	JfM2Q	gcHJp	obnRpt	mcgZ	XhhbX	BsZSI	32aWF	RlbyBu	cHRI	5A%31	D%3D
12	http	os://w	ww.yc	outube.	com/w	atch?v	=t7yv	4gSnN	kE&lis	st=PLv	vdnzlV	3ogoW	VI8QE	u4hsT	-	
	<u>n</u> r	8Ub\	√bquy				00	DOM	•							
							0.0	- <u>PO M</u>	apping						DCO	
		1	2	2	4 P	rograi	nme (	Jutcon	ies (PC	<i>)</i> )	10	11	10	1	<u>PSC</u>	<b>)</b>
		1	2	<u> </u>	4	3	0 2	/	ð	9	10	11	12	1 2	2	
	L   )			2			2							2		
				3	2								2	2		
	,				2											
The st	renotl	hofr	nannin	o is to	he wri	tten as	123.	⊥ Where	1.I.o	w 2.N	l Iedium	3.Hic	∟ ⊽h			<u> </u>
Each C	$\frac{100}{10}$ of	the c	course	must r	nap to	at leas	one F	<u>PO.</u>	, 1.1.0	···, 2··IV	rearum	, 2.1118				

There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

min - Luo Lob lo diseptitute neuro of pussing. (min +6 /0), Dirt - Dirtz should be min 10/0										
Assessment	Based on	Conducted by	Typical Schedule	Marks						
	Lab activities,		During Week 1 to Week 8							
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 8							
	Lab activities,		During Week 9 to Week 16							
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30						
	journal		Week 16							
	Lab activities,	Lab Course Faculty	During Week 18 to Week 19							
Lab ESE	journal/	and External Examiner	Marks Submission at the end of	40						
	performance	as applicable	Week 19							
Week 1 indicat	tes starting week	of a semester. Lab activition	es/Lab performance shall include perfo	orming						

experiments, mini-project, presentations, drawings, programming, and other suitable activities, as per the nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

		Wa	alchand Colleg	ge of Engineeri	ng, San	gli							
			A	Y 2023-24	inune)								
			Cour	se Information									
Progra	amme		B. Tech. (Mechar	nical Engineering)									
Class.	Semes	ter	Third Year B. Te	ch., Sem, VI									
Cours	e Code		6ME336	,									
Cours	e Namo	2	Basics of Automobile Engineering										
Desire	d Reai	isites:		• • •									
Т	eachin	g Scheme		Examination S	Scheme (N	(larks)							
Lectur	re	3 Hrs./week	MSE	ISE	E	SE	Total						
Tutori	ial	_	30	20	5	0	100						
				Cre	dits: 3	-							
			Cou	rse Objectives									
1	To ma	ake students fan	niliar with various t	pasic of Engine and	modern a	utomobile.							
•	To int	roduce the math	nematical treatment	ts required for vehic	ele perform	nance and for s	ome of						
2	impor	tant systems such	ch as steering syste	m and brake system	ı.								
3	To ma fully a	ake students awa	are about latest tren	nds in transportatior	n towards a	safe, pollution	n free and						
4	To en	nower students	to face the real life	automotive usage	with great	er confidence							
	10 011	ipower students		cutomotive usage	with great	er connachee.							
		Сош	se Outcomes (CO	) with Bloom's Ta	xonomy I	evel							
At the	end of	the course, the s	students will be able	e to.	Aonomy L								
				,		Bloom's	Bloom's						
CO	Cour	se Outcome Sta	atement/s			Taxonomy Level	Taxonomy Description						
<b>CO1</b>	Comp	prehend about I	C Engines, various	automotive system	s,	II	Understand						
CO2	Apply	vehicle dynam	ics concepts to inve	estigate influence of	f various	III	Applying						
	param	ieters in automo	tive system.	<u> </u>	1 • 1	13.7	A 1						
CO3	in dif	ferent driving co	barking and steering onditions.	ng performance of a	a vehicle		Analyze						
Modu	le		Modu	le Contents			Hours						
Ι	Er	<b>troduction, cla</b> agine cycles, C ntrol techniques	ssification, Types ombustion in SI & Engine performation	of I C Engine. & CI engines, Sup	ercharging	& emission	6						
II	In In an Re co	troduction, cla troduction, Broa d their functio equirements of nsiderations. Er	ssification and Au ad classification ns. Types of vehicle automotive powngine cycles.	itomotive power pl of Automobiles e layouts, Types of ver plants, Comp	l <b>ants</b> . Major bodies. arison an	components d suitability	6						
III	Vo Re Ac G1 We ax	ehicle Performations essistance to vecceleration, radeability and eight, Power re le ratio.	ance /ehicle motion, / draw bar pull, Tra quired for vehicle	Air, Rolling and action and Tractive propulsion, Select	Gradien e effort, D ion of gea	t resistance, istribution of ar ratio, Rear	8						
IV		assification and	nd working of	Electric and Hyl	orid vehi	cles, Design	6						

	considerations, Electric and Hybrid vehicles- Layout, advantages and limitations Present scenario of Electric vehicles issues and challenges in the	
	Electric Vehicle.	
	Transmission System ,Suspension, Steering, Braking and Electrical System	
v	Automobile clutch requirements, Types & functions - clutches, gearboxes, construction and Working, Principle of operation of automatic transmission, Torque converter, Epicyclic gear train, Propeller shaft, Universal joint, Final drive, Differential, Rear axles. Suspension requirements, Sprung and Unsprung mass, Types of automotive suspension systems. Function of steering, Steering system layout, Automotive steering mechanism, Types of steering gear boxes, , Types of braking mechanism, Calculation of braking force required, stopping distance and dynamic weight transfer Automotive batteries, Automotive electric systems, Engine electronic control modules, Safety devices	8
	Recent trends in Automotive Development	
VI	NVH and crashworthiness of vehicles, Emission norms and control, Testing and certification of vehicles. Introduction to Electric and Hybrid power trains	5
	and certification of venicles. Introduction to Electric and Hybrid power trains.	
	Text Books	
1	V Ganesan, "Internal combustion Engine", McGraw Hill Education ,4th Edition, 2012	
2	Kripal Singh, "Automobile Engineering Vol. II", Standard Publishers Distributors, Tenth 2007	Edition ,
3	P S Gill, "Automobile Engineering II", S K Kataria and Sons, Second Edition, 2012	
4	R K Rajput, "Automobile Engineering", Laxmi Publications, First Edition, 2007	
	References	
1	John B Heywood, "Internal Combustion Engines fundamentals", McGraw-Hill, Revi Edition, 2017	ised 2 nd
2	Newton, Steeds and Garrett, "The Motor Vehicle", Butterworths International Edition, 1 1989	1 th Edition,
3	Crouse and Anglin, "Automotive Mechanics", McGrawhill Publication, Tenth Edition, 2	007
4	P W Kett, "Motor Vehicle Science Part - 2, "Chapman & Hall", 2nd Edition, 1982	
	Useful Links	
1	https://onlinecourses.nptel.ac.in/noc21_me69/preview	
2	https://nptel.ac.in/courses/107/106/107106088/	
3	https://nptel.ac.in/courses/107/106/107106080/	
4	https://ed.iitm.ac.in/~shankarram/Course_Files/ED5160/ED5160_Journal_Complete_No	tes.pdf

						<b>CO-</b>	PO Ma	pping									
	Programme Outcomes (PO) Civil														PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2			
CO1		1	1								1						
CO2	1	1		1													
CO3		1		2								1					
				Progr	amme	Outco	mes (P	O) Ele	ctrical					PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2			
CO1			2								1						
CO2	3			2													
CO3		3		2								1					
				Progra	mme (	Outcon	nes (PO	D) Elec	tronic	S				PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2			
C01		2	2								1						
CO2				1													

CO3		1		2								1			
		Programme Outcomes (PO) Information technology										PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
CO1		1									1				
CO2		1		1											
CO3				1								1			
	Programme Outcomes (PO) Computer science and engineering														
		Progr	amme	Outco	mes (F	<b>O)</b> Co	mpute	r scien	ce and	engine	eering			PSO	
	1	Progr 2	<b>camme</b> 3	Outco 4	mes (F 5	<b>O) Co</b> 6	mpute 7	r scien 8	ce and 9	engine 10	eering	12	1	<b>PSO</b> 2	
 CO1	1	<b>Progr</b> 2 1	<b>ramme</b> 3 1	Outco 4	omes (F 5	<b>O) Co</b> 6	mpute 7	r scien 8	ce and 9	engine 10	<b>eering</b> 11 1	12	1	<b>PSO</b> 2	
CO1 CO2	1	Progr 2 1 1	<b>amme</b> 3 1	Outco 4	omes (F 5	°O) Co 6	mpute 7	r scien 8	ce and 9	engino 10	eering 11 1	12	1	<b>PSO</b> 2	
CO1 CO2 CO3	1	Progr 2 1 1	<b>amme</b> 3 1	<b>Outco</b> 4 1	omes (F 5	<b>O) Co</b> 6	mpute 7	r scien 8	ce and 9	engine 10	eering 11 1	12	1	<b>PSO</b> 2	

#### Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Wa	alchand Colleg	ge of Engineering, S	Sangli	
			( <u>Govennineni</u> A	Y 2023-24		
			Cou	rse Information		
Progra	amme		B.Tech. (Mechani	ical Engineering)		
Class,	Semes	ter	Third Year B. Teo	ch., Sem VI		
Cours	e Code	!	6ME380			
Cours	e Nam	e	H-2 Project Mana	igement		
Desire	d Requ	uisites:				
Т	eachin	a Scheme		Examination Schem	e (Marks)	
Lectur	re	-	LA1	LA2 I	ab ESE	Total
Intera	ction	2 Hour/week	30	30	40	100
			- *	Credits: 2		*
			Cou	Irse Objectives		
1	To pr and p	epare the studer reparing the buc	its to manage projection	cts by exploring both techn	ical and manage	erial challenges
2	To ma	ake aware the st	udents about leader	ship and ethical qualities ir	n dealing with r	eal life project
3	To in	duce qualities for spication skills	or working in interd	isciplinary and cross functi papagerial challenges and c	onal teams with	n effective
	comm	idification skins	, ccononnear and m	lanagerial enanenges and e	Similerenar man	
		Cou	rse Outcomes (CC	)) with Bloom's Taxonom	v Level	
At the	end of	the course, the	students will be able	e to,	<i>.</i>	
СО	Cour	se Outcome S	tatement/s		Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Grasp and c	and perceive the onstraints of fea	ne project activities sibility or completi	with respect to resources on time	II	Understanding
CO2	Estim comm	ate and prepare nercial managen	budget for project	completion and	IV	Analyzing
CO3	Figur critica	e out and schedu al path networks	ule the project and a	assess for controlling	V	Evaluating
				Contents		
Modu	ıle N	Module content				Hours
1	1       Introduction to Project Management.       4         Phases in the life cycle of projects and their significance, characteristics of projects from conventional organizations, objectives of the project and interdependence of cost on schedules       4					4
2	2Project Cost, Planning, feasibility, risk. Controlling Schedules, Cost, specifications or quality, Monitoring both the cost and schedule of a project in financial terms, Baseline Cost Curves and their significance in the overall project cost impact4					4
3		Critical Path No	etworks - Principle	es of Resource Scheduling	•	4

	Numeric Models of Project, Non-Numeric Models of Project, Scoring Models of Project, Project Network and CPM, Gantt Charts, Resource allocation and Controlling phases of a project						
4	<ul> <li>Executing and Controlling.</li> <li>Audit schedules and auditing a project and identifying deviations, quality needs in a project, applying relevant quality tools in a project and interpreting the results of the tools to monitor the quality</li> <li>Commercial Management and various regulations.</li> <li>Potential risks in a project, Categorizing of project risks, and defining the strategies for managing the project risks</li> </ul>	4					
5	Study and use of software related to Project Management System.	3					
6	Human Values and Professional Ethics Need, basic guidelines, content & process for value education, understanding harmony in the human being- harmony in myself, understanding harmony in the family & society- harmony in human relationship, understanding harmony in the nature & existence, implications of the above holistic understanding of harmony on professional ethics.	7					
	Text Books						
1	Dennis Lock, Project Management - Gower Publishing Limited, 2013						
2	Samuel J. Mantel, Jr., Jack R. Meredith, Scott M. Shafer, Margaret M. Sutton, Proje in Practice - JOHN WILEY & SONS, INC., 2011	ct Management					
3	Horald Kerzner, Project Management: A systems approach to planning, scheduling a John Wiley & Sons Inc., 2009	and controlling,					
	5.4						
1	Keterences						
2	R. Nagarajan, Floject Management, New Age Int., 200 eu. 2004.						
3	William R Duncan A guide to the project management body of knowledge PMI Publications 1006						
4	<ul> <li>Winnam R Dancar, A guide to the project management body of knowledge, FWH Fublications, 1990</li> <li>The factories act 1948 – Government of India 6. Meri Williams, The Principles of Project</li> <li>Management By – Site point Pvt Ltd., 2008</li> </ul>						
1	Useful Links						
1	https://www.apm.org.uk/resources/what-is-project-management/						
2	nttps://www.projectmanager.com/project-management						

CO-PO Mapping														
	Programme Outcomes (PO)										PS	0		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1								1					1	1
CO2									2					2
CO3							1						2	
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High														
Each CO	Each CO of the course must map to at least one PO.													

AssessmentThere are three components of lab assessment, LA1, LA2 and Lab ESE.IMP: Lab ESE is a separate head of passing.(min 40 %), LA1+LA2 should be min 40%

Assessment	Based on	Conducted by	Typical Schedule	Marks
	Lab activities,		During Week 1 to Week 8	
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 8	
	Lab activities,		During Week 9 to Week 16	
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30
	journal		Week 16	
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19	
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40
	performance	applicable	Week 19	
Week 1 indicat	es starting week c	of a semester. Lab activities	Lab performance shall include perfo	rmino

			Walchand Col	lege of Enginee	ering, Sangli				
AY 2023-24									
			Co	ourse Information					
Programme B. Tech. (Mechanical Engineering)									
Class,	Semes	ter	Third Year B. Tec	h., Sem. V					
Cours	e Code		6ME301						
Cours	e Name	e	Heat Transfer						
Desire	d Requ	uisites:							
Te	eaching	g Scheme		Examinatio	n Scheme (Mar	ks)			
Lectur	re	3Hrs/week	MSE	ISE	ESE		Total		
Tutori	ial	-	30	20	50		100		
				C	redits: 3				
	Taint			ourse Objectives	fou that all ansata		hereisal		
1	10 IN	nouice the vari	ous mechanisms of	neat and mass trans	ter that character	nzes a given p	mysical		
2	To m	n. ake the students	s familiarize conserv	vation equations alo	ng with models f	for heat transfe	er processes		
-	To nr	epare the student	nts for analysis of o	ne-dimensional stead	dy and unsteady	partial differe	ntial		
3	equati	ions.				r china difficite			
4	To tra	in the students	to develop represen	tative models of rea	l-life heat transf	er processes a	nd systems		
		0	Course Outcomes (	CO) with Bloom's '	Taxonomy Leve	el			
At the	end of	the course, the	students will be able	e to,					
~~~			~ ~ ~	~		Bloom's	Bloom's		
CO			Course Outcome	Statement/s		Taxonomy	Taxonomy		
<u>CO1</u>	Domo	natrata tha hasi	a laws of heat and r	ness transfor and as	mputa haat	Level	Description		
	transf	er rates	ic laws of fleat and f	hass transfer and co	inpute neat	III	Applying		
CO2	CO2 Analyze problems involving steady and transient state heat transfer IV						Analysing		
CO3	Asses	s the performan	ice of thermal system	ms under different o	perating and	V	Evaluating		
	geom	etrical condition	ns.				U		
Modu	le		Mo	dule Contents			Hours		
	In	troduction				_			
I	In	troduction to H	leat transfer, differe	nce between thermo	odynamics and l	neat transfer,	4		
	m	odes of heat tra	inster. laws of heat	transfer, thermal con	nductivity coeffi	cient of heat			
		unster and Bolli	$mg \propto Condensation$	(Theory part)					
		mule steady st	ate problems in hea	t conduction conce	nt of thermal re	sistance and			
		nductance. Ge	neral equation of te	emperature field in	three dimensior	al Cartesian			
	co	ordinate system	ns. Application of	above (one dimens	sional case) equ	ation to the			
	sy	stem of plane	wall (including con	nposite structure) as	s well as to the	system with			
II	ra	dial heat cond	uction i.e. cylinder	s and Sphere (inclu	uding composite	structures).	9		
	St	eady state cond	luction one dimension	onal) through extend	ded surface (fins) of constant			
	cre	oss section. O	ne dimensional ste	eady state heat cor	nduction with u	iniform heat			
	generation, (plane wall and solid cylinder) critical radius of insulation. Concept of								
	un	isteady state he	eat conduction. Trai	isient heat flow sys	stem with neglig	ible internal			
		adiation					0		
		aulauoli ature of thermo	al radiation definition	one of absorptivity	reflectivity tw	ansmissiwity	צ		
		onochromatic 4	emissive nower to	tal emissive nower	and emissivity	concent of			
	h	ack body and a	ray body. Kirchhof	f laws. Wien's law	and Planck's lay	w. deduction			
	of	Stefan Boltzm	ann equation. Lam	bert's cosine rule. i	ntensity of radia	ation, energy			
	ch	ange by radia	tion between two	black surfaces with	non-absorbing	medium in			
	be	tween and in	absence of reradia	ting surfaces, geoi	metric shape fa	ctor, energy			

	exchange by radiation between two gray surfaces without absorbing medium and absence of radiation and radiosity, radiation network method, network for two surfaces					
IV	Free Convection Mass, momentum and energy conservation equations, non-dimensional numbers, hydrodynamic and thermal boundary layers, basics of heat transfer in external and internal laminar and turbulent flows, and use of co-relations. Free Convection and use of its co-relations	6				
V	 Forced Convection External flow: Thermal analysis of Flow over flat plate, cylinder, sphere and flow across tubes. Internal flow: Convection correlations, Hydrodynamic and thermal considerations, thermal analysis and convection correlations for circular and non-circular tubes. 	6				
VI	VIHeat Exchangers Exchangers, Tubular heat exchangers, Extended surface heat exchangers. Classification according to flow arrangement. Fouling factor, mean temperature difference, LMTD for parallel flow, counter flow, mean temperature for cross flow, 					
-	Text Books					
1	P. K. Nag, "Heat Transfer", Tata McGraw Hill Publishing, 3 th Edition, 2011	2017				
2	Y unus. A. Cengel, "Heat Transfer – A Practical Approach", Tata McGraw Hill,5" Edition	$\frac{1,2017}{\text{Edition},2012}$				
3	Incropera and Dewitt, Fundamentals of Heat and Mass Transfer, whey publications, 7	Edition, 2013				
	References					
1	H. Schlichting, K. Gersten, "Boundary Layer Theory" Springer, 8 th Edition, 2000					
2	2 K Ramesh Shah, Dusan P. Sekulic, "Fundamentals of Heat Exchanger Design" Wilev. 5 th Edition. 2012					
3	3 J P Holman, Souvik Bhattacharyaa, "Heat Transfer" McGraw-Hill, 10th Edition, 2017					
	Useful Links					
1	https://nptel.ac.in/courses/112/101/112101097/					
2	https://www.youtube.com/watch?v=IedD23t5jI4					
3	https://web.iitd.ac.in/~pmvs/course_mel242.php					

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			3									1		
CO2	1	2		3									2	2
CO3			3								2		2	
The st	rength	of mapp	ing is to	be writ	ten as 1	: Low. 2	2: Medi	um. 3: F	ligh					

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

Walchand College of Engineering, Sangli						
(Government Aided Autonomous Institute)						
	AY 2023-24					
Course Information						
Programme	B. Tech. (Mechanical Engineering)					
Class, Semester	Third Year B. Tech., Sem. V					
Course Code	6ME302					
Course Name	Applied Thermodynamics					
Desired Requisites:						

Teaching	g Scheme		Examination S	cheme (Marks)				
Lecture	3 Hrs/week	MSE	ISE	ESE	Total			
Tutorial	-	30	20	50	100			
			Credits: 3					

Course Objectives							
1	To learn about gas and vapor cycles and their first-law and second-law efficiencies						
2	To learn about gas dynamics of airflow						
3	To learn about compressors with and without inter-cooling.						
4	To analyze the performance of steam turbines.						

Course Outcomes (CO) with Bloom's Taxonomy Level

At the end of the course, the students will be able to,

СО	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Understand various practical power cycles.	II	Understanding
CO2	Recognize phenomena occurring in high-speed compressible flows.	III	Applying
CO3	Analyze energy conversion in various thermal devices such as steam turbines and compressors.	IV	Analyzing

Module	Module Contents	Hours
Ι	Combustion Introduction to solid, liquid, and gaseous fuels – stoichiometry, exhaust gas analysis – the first law analysis of combustion reactions- heat calculations using enthalpy tables – adiabatic flame temperature.	4
II	Vapor Power Cycles Revision of basic Rankine Cycle. Rankine cycle with superheating, reheat, and regeneration. Numerical treatment.	8
III	Gas Power Cycles Air standard Otto, Diesel, and Dual cycles, Air standard Brayton cycle, the effect of reheat, regeneration and intercooling	8
IV	Compressible Flow Basics of compressible flow, stagnation properties, Isentropic flow of a perfect gas through a nozzle, choked flow, subsonic and supersonic flows-normal shocks- use of ideal gas tables for isentropic flow and normal shock flow	5
V	Compressors Reciprocating compressors: construction, work input, the necessity of	7

	 cooling, isothermal efficiency, heat rejected, the effect of clearance volume, volumetric efficiency, the necessity of multistage, optimum intermediate pressure for minimum work required, after cooler, free air delivered, air flow measurement, capacity control. Rotodynamic Air Compressors: Centrifugal compressor, velocity diagram, theory of operation, losses, adiabatic efficiency, effect of compressibility, diffuser, pre-whirl, pressure coefficient, slip factor, performance. 							
VI	Steam Turbines Types of steam turbines, Analysis of steam turbines, velocity and pressure compounding of steam turbines. Numericals on steam turbines.	7						
	Text Books							
1	P. K. Nag "Engineering Thermodynamics", Tata McGraw Hill Publication, 6th Ec	lition, 2017						
2	2 R. Yadav, "Fundamentals of Thermodynamics", Central Publication house, Allahabad, Revised 7th Edition, 2011							
	References							
1	Cengel and Boles, "Thermodynamics an Engineering Approach", Tata McGraw-I Revised 9th Edition, 2019	Hill publication,						
2	Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., "Fundamentals of Thermood Wiley and Sons, 7th Edition, 2009	lynamics", John						
3	Moran, M. J. and Shapiro, H. N., "Fundamentals of Engineering Thermodynamic and Sons, 8th Edition, 1999	cs", John Wiley						
	Useful Links							
1	https://nptel.ac.in/courses/112/105/112105123/							
2	https://nptel.ac.in/content/storage2/courses/112104117/ui/Course_home-lec6.htm							

CO-PO Mapping													
Programme Outcomes (PO) PSG													50
1	1 2 3 4 5 6 7 8 9 10 11 12 1 2												2
3	3										1	2	2
3	2	1	2	3			3	3	1	3		2	2
3	2	1		2	1	1		3					1
	1 3 3 3	1 2 3 3 3 2 3 2	1 2 3 3 3 - 3 2 1 3 2 1	P 1 2 3 4 3 3 - - 3 2 1 2 3 2 1 2 3 2 1 2	I 2 3 4 5 3 3 -	I 2 3 4 5 6 3 3	I 2 3 4 5 6 7 3 3 -	CO-PO Mapping Programme Outcomes (PO 1 2 3 4 5 6 7 8 3 3 4 5 6 7 8 3 3 4 5 6 7 8 3 2 1 2 3 4 5 6 7 8 3 3 4 5 6 7 8 6 7 8 3 2 1 2 3 4 5 6 7 8 3 2 1 2 3 4 5 6 7 8 6 3 2 1 2 3 4 5 6 7 8 6 7 8 6 7 8 6 7 8 6 7 8 6 7 8 7 8 7 8 7	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 3 3 4 5 6 7 8 9 3 3 4 5 6 7 8 9 3 2 1 2 3 4 5 6 7 8 9 3 3 4 5 6 7 8 9 3 2 1 2 3 4 5 6 7 8 9 3 2 1 2 3 4 5 6 7 8 9 3 2 1 2 3 4 5 6 7 8 9 3 2 1 2 1 1 3 3	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 3 3	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 3 3	CO-PO Mapping Programme Outcomes (PO) 1 2 3 4 5 6 7 8 9 10 11 12 3 3 1 12 3 2 1 1 12 3 2 1 <th>CO-PO Mapping Programme Outcomes (PO) PS 1 2 3 4 5 6 7 8 9 10 11 12 1 3 3 </th>	CO-PO Mapping Programme Outcomes (PO) PS 1 2 3 4 5 6 7 8 9 10 11 12 1 3 3

Assessment

The assessment is based on MSE, ISE, and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of a teacher's assessment. The mode of assessment can be field visits, assignments, etc., and is expected to map at least one higher-order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Walc	hand College	of Engineering, Sa	ngli									
	(Government Aided Autonomous Institute) AY 2023-24 Course Information													
	Course Information													
Progr	amme		B Tech (Mechar	nical Engineering)										
Class.	Semeste	r	Third Year B Te	ch Sem V										
Cours	e Code	· •	6ME303											
Cours	e Name		Engineering Metr	ology and Manufacturin	g Technology									
Desire	d Requi	sites:		ology and Manufacturin	<u>g reennorogy</u>									
Desire	u nequi	510051												
	Teaching Scheme Examination Scheme (Marks)													
Lectu	re	3Hr/week	MSE	ISE	ESE	Total								
Tutor	ial		30	20	50	100								
Tutor	141		50	Credits: 3	20	100								
				Creatis: 5										
	Course Objectives													
1	To elab	orate basic conce	nts of standards and	d methods of dimension:	1 measuremen									
-	To trai	the students to a	pus of standards and poly principles of r	nagnification interferon	etry and instru	ments for screw								
2	threads	and gears inspect	ion	naginneation, interferon	ieu y and mstre	intents for serew								
	To illu	trate the knowled	ge to students on v	arious concepts of metro	logy and mani	Ifacturing								
3	technol	ogy.	Se to students on v		logy and main	inaetai ing								
		Course	Outcomes (CO) w	ith Bloom's Taxonomy	Level									
At the	end of th	e course, the stud	ents will be able to		20101									
		ie eouise, une stat		,	Bloom's	Bloom's								
CO		Cours	se Outcome Staten	nent/s	Taxonomy	Taxonomy								
00		Cours	coulcome states	nends	Level	Description								
CO1	Compa	re and utilize s	tandards and mea	asuring instruments for										
001	differe	nt dimensional par	ameters.	as an ing more annentes i to	III	Applying								
CO2	Estima	te the limits of	gauges and dev	viation in measuremen										
	parame	ters.	00		IV	Analysing								
CO3	Illustra	te the knowled	ge to students of	n various concepts of	2	P 1 4								
	metrol	gy and manufact	uring technology.	-	v	Evaluate								
Modu	le		Module (Contents		Hours								
	Lin	ear and angular	measurements											
т	Me	trology and meas	urement, Errors in	n measurement, Slip gan	iges and other	. 7								
1	dev	ices of linear m	easurements; Beve	l protractor, spirit leve	l, clinometers									
	ang	le dekkor, sine ba	r, angle slip gauges	6										
	Tol	erances and gau	ging											
II	Uni	lateral and bilater	al tolerances, limit	and fits, types of fits, pl	ain gauges and	7								
	gau	ge design, interch	angeability and sel	ective assembly										
	Ma	gnification and I	nterferometry											
Ш	Me	chanical, optical	, electrical, pne	umatic methods of	magnification	6								
	con	iparators; Princip	oles of interferom	etry and application in	h checking of									
	flat	ness and height												
	Scr	ew thread and G	ear Inspection	c · · · · · · · · · · · · · · · · · · ·	• ••									
	Err	ors in screw thre	ads, measurement	of major, minor, effec	ive diameters									
10	pite	h and thread angl	e, floating carriage	diameter measuring ma	nine; Errors ir	0								
	gea	rs, checking of	matviaual elemen	us and composite erro	rs, gear tooth									
		mer camper 1001	wakers microscope	e, prome projector,										
	Sui	Tace Finish Meas	surement	a anamation dimention	f low tout									
V	Iy	bes of textures o	biained during m/	c operation, direction	or ray, texture	6								
	syn	ioois, instruments	used in surface fit	insi assessment; Coordi	iate measuring	,								
	ma	anne												

M	Jigs and Fixtures	7
V I	Holding tools, Jigs and fixtures, principles, applications and design	/
	Textbooks	
1	R.K. Jain, "Engineering Metrology", Khanna Publisher, 2009	
2	P. H. Joshi, "Jigs and Fixtures", Tata McGraw-Hill Publishing Ltd., New Delhi,	2010
3	I.C. GUPTA, "Engineering Metrology", Dhanpat Rai & Sons, 2018	
	References	
1	J.F.W. Gayler and C.R. Shotbolt, "Metrology for Engineers", Cassell, 5th Edition	n, 2015
2	K.W.B. Sharp, "Practical Engineering Metrology", Pitman London, 1 st Edition 1	973
3	Edward Hoffmann, "Jig and fixture design", Cengage Learning, 5th edition, 2008	
	Useful Links	
1	https://nptel.ac.in/courses/112/104/112104250/	
2	https://nptel.ac.in/courses/112/106/112106179/	
3	https://www.youtube.com/watch?y=7yzyno4AyKw	

	CO-PO Mapping														
	Programme Outcomes (PO)												PS	PSO	
	1	1 2 3 4 5 6 7 8 9 10 11 12 1													
CO1	3	1													
CO2			3	2									2		
CO3			2	3								1			
The stren	oth of r	nonnin	r is to k	a writt	on oc 1	·Low	2. Mad	lium 3	High						

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		Wal	chand College	of Engineering, S	Sangli								
(Government Aided Autonomous Institute) AY 2023-24													
AY 2023-24 Course Information													
Programme B. Tech. (Mechanical Engineering)													
Close S	linne		D. Tech. (Wechar Third Veer B. Te	ch Sem V									
Class, S	Code	<u>r</u>	AME251										
Course	Nomo		UNESSI Hoot Transfor Lal										
Desired	Rame	sitos.	Theat Transfer La	0									
Desireu	Nequi	51105.											
Те	aching	Scheme		Examination Schem	ne (Marks)								
Practic	al	2Hrs/Week	LA1	LA2	Lab ESE	Total							
Interac	tion		30	30	40	100							
Interac	- 30 30 40 100												
	Credits: 1												
			Course	e Obiectives									
	Intro	duce the variou	is mechanisms of h	eat and mass transfer th	at characterize	s a given							
1	phys	ical system.											
	Form	ulate conserva	tion equations alon	g with models for heat	transfer proces	ses and use of							
2	analy	tical to solve c	ne-dimensional ste	ady and unsteady partia	l differential e	quations.							
-	To de	evelop represer	ntative models of re	al processes and system	ns and draw co	nclusions							
3	conc	erning process/	system design or p	erformance from attend	ant analysis.								
	To de	evelop a profes	sional approach to	lifelong learning in des	ign of some th	ermal systems to							
4	inclu	de the awarene	ess of social and env	vironment issues associa	ated with engin	neering							
	pract	ices.											
		Course	Outcomes (CO)	with Bloom's Taxonon	1y Level								
At the e	nd of th	e course, the s	tudents will be able	e to,	1								
60		C	O () S()		Bloom's	Bloom's							
0		Cou	rse Outcome State	ement/s	Taxonomy	Taxonomy Decemination							
	Unde	rstand the basi	a laws and concept	c of Conduction	II	Understanding							
COL	Conv	ection and Rad	tiation Boiling and	S of Condensation heat	11	Understanding							
	trans	fer	nation, bonnig and	Condensation near									
	Anal	vze problems c	of Radiation Conve	ection Heat Transfer									
CO2	and r	problems involved	ving steady and trai	nsient state heat	IV	Analysing							
	cond	uction in simpl	e geometries.			i interior a starting							
	Eval	late the heat ex	changer performar	nce by using the	V	Evaluating							
CO3	meth	od of log mean	temperature differ	rence and									
	effec	tiveness metho	ds.										
			List of Experim	nents / Lab Activities									
List of I	Tynerim	ente											
		ients.											
Followi	ng prac	tical's should b	e considered for IS	E and ESE evaluation.									
Followi Experin	ng prac nents	tical's should b	be considered for IS	E and ESE evaluation.									
Followi Experin	ng prac nents To find	tical's should b Thermal Cond	be considered for IS ductivity of metal b	E and ESE evaluation. ar, insulating powder.	noutour or c-	of Din fin							
Followi Experin 1. 2.	ng prac nents To find To find	tical's should b Thermal Conduction thermal conduction	be considered for IS ductivity of metal b activity of Composition	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the	e performance	of Pin fin.							
Followi Experin 1. 2. 3.	ng prac nents To find To find To veri	Thermal Cond thermal Cond thermal condu fy the Stefan –	be considered for IS ductivity of metal b activity of Composi Boltzmann constant	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the it and find the emissivit	e performance y of non-black	of Pin fin. surface.							
Followi Experin 1. 2. 3. 4.	ng prac nents To find To find To veri To find	Thermal Cond thermal Cond thermal condu fy the Stefan – the Heat Tran	be considered for IS ductivity of metal b activity of Composi Boltzmann constant sfer coefficient in P	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the it and find the emissivity Natural Convection.	e performance y of non-black	of Pin fin. surface.							
Followi Experin 1. 2. 3. 4. 5. 6	ng prac nents To find To find To veri To find To find	tical's should b Thermal Conduction thermal conduction fy the Stefan – the Heat Tran the Heat Tran	be considered for IS ductivity of metal b activity of Composi Boltzmann constant sfer coefficient in P sfer coefficient in F	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the it and find the emissivity Natural Convection. Forced Convection.	e performance y of non-black	of Pin fin. surface.							
Followi Experin 1. 2. 3. 4. 5. 6. 7	ng prac nents To find To find To find To find Trial of To con	tical's should the Thermal Conduction thermal conduction fy the Stefan – the Heat Tran the Heat Tran the Heat Tran	be considered for IS ductivity of metal b activity of Composi Boltzmann constan sfer coefficient in P sfer coefficient in F ger – parallel / coun ment on Pool Boili	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the and find the emissivity Natural Convection. Forced Convection. ter flow.	e performance y of non-black	of Pin fin. surface.							
Followi Experin 1. 2. 3. 4. 5. 6. 7. 8	ng prac nents To find To find To find To find Trial of To con To find	tical's should b Thermal Conduction thermal conduction fy the Stefan – the Heat Tran the Heat Tran the Heat exchang duct the experi- the Heat Tran	be considered for IS ductivity of metal b activity of Composi Boltzmann constan sfer coefficient in N sfer coefficient in F ger – parallel / coun ment on Pool Boili	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the it and find the emissivity Natural Convection. Forced Convection. ter flow. ng, critical heat flux.	e performance y of non-black tion	of Pin fin. surface.							
Followi Experin 1. 2. 3. 4. 5. 6. 7. 8. 9.	ng prac nents To find To find To find To find Trial of To con To find Experiu	Thermal Cond thermal Cond thermal condu fy the Stefan – the Heat Tran the Heat Tran Heat exchang duct the experi the Heat Tran nent on unstea	be considered for IS ductivity of metal b activity of Composi Boltzmann constan sfer coefficient in N sfer coefficient in F ger – parallel / coun ment on Pool Boili sfer coefficient in I dy state heat transfi	E and ESE evaluation. ar, insulating powder. ite wall and evaluate the it and find the emissivity Natural Convection. Forced Convection. ter flow. ng, critical heat flux. Drop and film condensater.	e performance y of non-black tion.	of Pin fin. surface.							

Demonstration / Study

- 1. Heat Pipe Demonstration.
- 2. Various applications of heat exchanger in process and food industries.
- 3. Visit to / Demonstration of Heat exchanger manufacturing plant/dairy plant

	Text Books
1	P. K. Nag, "Heat Transfer", Tata McGraw Hill Publishing, 3 rd Edition, 2011
2	Yunus. A. Cengel, "Heat Transfer – A Practical Approach", Tata McGraw Hill, 5 th Edition, 2017
3	Incropera and Dewitt, "Fundamentals of Heat and Mass Transfer", Wiley publications, 7 th Edition, 2013
	References
1	H. Schlichting, K. Gersten, "Boundary Layer Theory" Springer, 8th Edition, 2000
2	K Ramesh Shah, Dusan P. Sekulic, "Fundamentals of Heat Exchanger Design" Wiley, 5 th Edition,2012
3	J P Holman, Souvik Bhattacharyaa, "Heat Transfer" McGraw-Hill, 10th Edition, 2017
	Useful Links
1	https://nptel.ac.in/courses/112/101/112101097/
2	https://www.youtube.com/watch?v=IedD23t5jI4
3	https://web.iitd.ac.in/~pmvs/course_mel242.php

	CO-PO Mapping														
	Programme Outcomes (PO)													PSO	
	1	1 2 3 4 5 6 7 8 9 10 11 12 1 2													
CO1	2														
CO2		2									2		2		
CO3	2	2	2		1						2		2	2	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High															
Each C	CO of t	he cou	rse mu	st map	to at le	east on	e PO, a	and pre	ferably	y to on	ly one	PO.			

		Assessm	ent									
There are three IMP: Lab ESE	e components of la	ab assessment, LA1, LA l of passing.(min 40 %),	2 and Lab ESE. LA1+LA2 should be min 40%									
Assessment Based on Conducted by Typical Schedule Marks												
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30								
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30								
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40								
Week 1 indica	tes starting week o	of a semester. Lab activi	ties/Lab performance shall include per	forming								

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)													
AY 2023-24													
Course Information													
Progr	Programme B. Tech. (Mechanical Engineering)												
Class,	Semes	ter	Third Year B. Tec	h., Sem. V									
Cours	e Code		6ME352										
Cours	e Nam	e	Applied Thermody	ynamics Lab									
Desired Requisites:													
Teaching Scheme Examination Scheme (Marks) Prostical 2Hrs/Wook LA1 LA2 Lab ESE Total													
Practi	cal	2Hrs/Week	LA1	LA2	La	b ESE	Total						
Intera	nteraction - 30 30 40 100												
				Cred	its: 1								
1	Tala	m about differ	Cour	se Objectives									
		ann adout differe	ent power cycles	a the isontronic flow	y and no	rmal choole +	o some flow						
2	syster	velop nie studel	in a skins in applyin	ig the isentropic nov	v anu 110	iniai shock l	o some now						
3	To de	velop students'	ability to investigate	e the engines and ro	todynam	nic machines	performance						
	10 40	rerop students	dennej te nivestigat		io a j man		periormanee.						
		Cou	rse Outcomes (CO)	with Bloom's Tax	onomy]	Level							
At the	end of	the course, the	students will be able	e to,	v								
						Bloom's	Bloom's						
CO	Cour	se Outcome Sta	atement/s			Taxonomy	Taxonomy						
Level Description													
CO1	CO1 Understand different power cycles II Understanding												
CO2	Analy	ze the sonic, su	bsonic, and superso	nic flow situations			Analyzing						
CO3	Inves	tigate the perfor	mance of the engine	es and rotodynamic		111	Applying						
	mach	mes.											
			List of Experi	ments / Lab Activi	ties								
List of	f Exper	iments:	List of Experi										
1	. Stud	y of factors affe	ecting the performan	ice of the Rankine c	yele thro	ough numeric	al.						
2	. Stud	y of reheat cycl	e with the help of n	umerical.	·	e							
3	. Stud	y of the regener	rative cycle with the	help of numericals									
4	. Stud	y of factors affe	ecting the performan	ice of Gas Power cy	cles thro	ough numeric	als.						
5	. Stud	y of stagnation	properties through r	numericals.									
6	. Stud	y of centrifugal	compressor and its	performance throug	h numer	icals.							
/ List of	. Stud Fornor	y of velocity an	a pressure compour	aing in steam turbir	ies.								
	Trial	on a gasoline ei	ogine to understand	air standard Otto cy	cle								
9	. Trial	on diesel engine	e to understand air s	tandard Diesel cycle	2.								
1	0.Trial	on the reciproca	ating compressor.		•								
1	1.Trial	on steam power	r plant and demonstr	ration on Power Plar	nt simula	ator.							
1	2. Trial	of Gas Power I	Plant on the simulate	or.									
			T	ext Books			-4						
1	P. K.	Nag "Engineeri	ng Thermodynamic	s", Tata McGraw Hi	II Public	cation, 2017,	6 th Edition						
2	R. Y. Revis	adav, "Fundam ed 7 th Edition	entals of Thermod	ynamics", Central	Publicat	ion house, A	Allahabad, 2011,						
1	C	1 10 1 "		References	1 11 75		TT-11 1.19 -1						
	Ceng	el and Boles, "	Thermodynamics an	Engineering Appro	ach", Ta	ata McGraw	Hill publication,						

	Revised 9 th Edition, 2019
2	Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J., "Fundamentals of Thermodynamics", John Wiley and Sons. 7 th Edition, 2009
3	Moran, M. J. and Shapiro, H. N., "Fundamentals of Engineering Thermodynamics", John Wiley and Sons, 8 th Edition, 1999
	Useful Links
1	https://www.youtube.com/watch?
1	v=v36FiXcxt0k&list=PLkUEX3IbW7leYWEB0baTgg6SbS2zVE-Au&index=3
2	https://www.youtube.com/channel/UC-znD1sQHOQIRqZBrs1UJbA/videos

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2											1	2
CO2	3	2	1		3			3	3		3		1	2
CO3	3	2	3		2	1			3				1	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High														
Each CO	of the	course	must r	nap to	at leas	t one P	O, and	l prefer	ably to	only o	one PC).		

Assessment There are three components of lab assessment, LA1, LA2 and Lab ESE. IMP: Lab ESE is a separate head of passing. LA1, LA2 together is treated as In-Semester Evaluation. Marks Based on Conducted by **Typical Schedule** Assessment During Week 1 to Week 5 Lab activities. LA1 attendance, Lab Course Faculty Marks Submission at the end of 30 Week 5 journal During Week 6 to Week 9 Lab activities, attendance, Lab Course Faculty Marks Submission at the end of 30 LA2 journal Week 9 Lab activities, Lab Course Faculty and During Week 10 to Week 12 External Examiner as Marks Submission at the end of Lab ESE journal/ 40 performance applicable Week 12

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)									
	AY 2023-24								
	Course Information								
Progr	amme		B. Tech. (Me	echanical Engine	ering)				
Class,	Semeste	r	Third Year B	B. Tech., Sem V					
Cours	e Code		6ME353				x 1		
Cours	e Name	•.	Engineering	Metrology and N	Manufa	cturing Technolog	y Lab		
Desire	Desired Requisites:								
	Teel	C. h		F	4	Sahama (Maulaa)			
Dreat		ng Scheme	T A 1		1ation	Scheme (Iviarks)	Total		
Practi	cal	2Hrs/week	20	20	La		100		
Intera	Cradita 1								
					Cre				
			Cou	urse Obiectives					
1	To elab	orate various techni	ques for measu	uring the dimens	sions of	manufactured part	ts.		
2	To expl	ore the importance	of measuremer	nt of various par	ameter	s of linear, angular	and surface		
L	characte	eristics measuremen	t.	_		_			
3	To illus	trate the knowledge	to students on	various concep	ts of m	etrology and manu	facturing		
5	technol	ogy.							
		Course	Outcomes (CO	O) with Bloom's	s Taxo	nomy Level			
At the	end of th	e course, the studer	ts will be able	to,					
~~		a a				Bloom's	Bloom's		
CO		Course Ou	tcome Statem	ient/s		Taxonomy	Taxonomy		
CO1	I.I.a.a				4	Level	Description		
COI	Use i	neasuring instrum	ients for	various param	leters	III	Applying		
CO^{2}	Calibrat	te and analyze m	etrological in	struments used	l for				
	linear a	angular and surface	characteristics	measurements		IV	Analysing		
CO3	Illustrat	te the knowledge to	o students on	various concen	ots of				
000	metrolo	gy and manufacturi	ng technology.			V	Evaluate		
			<u> </u>						
		Li	st of Experim	ents / Lab Activ	vities/7	Topics			
List of	f Lab Ac	tivities:							
1.	To calibr	ate micrometer usin	g slip gauges.						
2.	To calibr	ate dial gauge using	dial gauge cal	libration tester.					
3.	To measu	are angle by using s	ne bar.						
4.	10 study	and use of compara	tors.	nfonor star					
5. 6	To use op	ptical flat for demon	stration of inte	erferometry.	a a dia		a a hima		
0. 7	To measu	are parameters of sc	oth vornior col	ing moating carrie	age dia	meter measuring n	lachine.		
7. 8	To use pr	ofile projector and '	fool Maker's t	nper. microscope					
0. 0	To use pi To study	and use surface rou	ahness tester	interoscope.					
10	To study	and use coordinate	measuring mag	chine					
11.	To design	and draw drilling i	igs	ennie.					
12.	To design	n and draw milling f	ixture						
	8								
				Textbooks					
1	R.K.	Jain, "Engineering	Metrology", K	Khanna Publisher	r, 21 st]	Edition			
2	I.C.	GUPTA, "Engineer	ing Metrology'	", Dhanpat Rai &	& Sons.	, 2nd Edition, 1988			
3	P. H.	Joshi, "Jigs and Fiz	xtures", Tata N	AcGraw-Hill Pul	blishing	g Ltd., New Delhi,	2010		
					`				
				References					
1	J.F.V	V. Gayler and C.R.	Shotbolt, "Met	rology for Engin	neers",	Cassell, 1990			
2	K.W	.B. Sharp, "Practica	1 Engineering	Metrology", Pitr	man Lo	ondon, 1st Edition	1973		
3	Edw	ard Hoffmann, "Jig	and fixture des	sign", Cengage I	Learnir	ng, 5 th edition,2008	}		

	Useful Links							
1	https://www.youtube.com/watch?							
I	v=FqSJhY_lctc&list=PLkUEX3IbW7le4Okwm_qe4a1h6634USZTi							
2	https://www.youtube.com/watch?v=5saq-oYBE&list=PLrcSDk_gQ7jiQCfWEzw93ZMaxHkg2v-							
2	CC							
3	https://www.youtube.com/watch?v=7yzvno4AvKw							

	CO-PO Mapping													
	Programme Outcomes (PO)						PSO							
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			3			2							2	
CO2			3			2							2	
CO3				3								2	2	
The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High														
Each CO	O of the	e course	e must i	map to	at least	one PC), and p	referab	ly to or	ily one	PO.			

		Assessment						
There are three	There are three components of lab assessment, LA1, LA2 and Lab ESE.							
IMP: Lab ESE	is a separate head	of passing.(min 40 %), LA	1+LA2 should be min 40%					
Assessment	Based on	Conducted by	Typical Schedule	Marks				
	Lab activities,		During Week 1 to Week 8					
LA1	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 8					
	Lab activities,		During Week 9 to Week 16					
LA2	attendance,	Lab Course Faculty	Marks Submission at the end of	30				
	journal		Week 16					
	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19					
Lab ESE	journal/	External Examiner as	Marks Submission at the end of	40				
	performance	applicable	Week 19					

		W	alchand C	ollege of En	ngineering	, Sangli				
				AY 2023-2	24	,				
				Course Inform	nation					
Progra	amme		B.Tech. (Mee	chanical Engine	eering)					
Class,	Semest	er	Third Year B	. Tech., Sem V						
Cours	e Code o Nomo		0ME311 Plastic Techr							
Desire	d Requ	isitas.	Flastic Techi	lology						
Desire	u nequ	151(05.								
Те	aching	Scheme		Exam	nination Sche	me (Marks)				
Lectur	re	3Hrs/week	MSE	ISE	ESE	Tot	al			
Tutori	ial	-	30	20	50	10	0			
		-			Credits:	03				
	-			Course Objec	ctives					
1	To ma	ke the student	s to understand	d fundamental p	principles of p	lastics technology.				
2	To pro	vide the stude	ents the knowle	edge of new con	icepts like po	lymers, types of pla	stics and			
	To pre	s plastic proce	essing techniq	ues. / suggest imple	mentation of	nlastics and nolyme	r moulding			
3	metho	ds.		, suggest imple		products and polyme	mounting			
	metilo									
		Cou	arse Outcome	s (CO) with Bl	oom's Taxon	omy Level				
At the	end of t	he course, the	students will l	be able to,		•				
CO1	CO1 Understand different polymers and their characteristics. II Understandin									
CO2Articulate various plastic moulding processes.IIIArticulate							Articulate			
CO3	Analys	se different typ	pes of plastic n	noulds and the	design	IV	Analyzing			
05	proced	lure for the same	me.							
	-									
Modu		TRODUCTI		Aodule Conten	ts	<u> </u>	Hours			
	IN		ON - Classific	ation of materia	als, history of	classification of				
I	nla	stics thermor	plastic thermo	set plastics ela	stomers and r	olymers Polymer	6			
	str	uctures, prope	rties of polyme	ers, additive me	thods to mod	ify polymers				
	Co	mmodity Th	nermoplastics	- Properties -	and applica	tions of LDPE -				
11		DPE- HDPE,	HMWHDPE-	OHMWHDPE	, Polypropyle	ene, vinyi plastics	/			
	<u> </u>		OF PLASTI	[CS - Injection]	n molding e	xtrusion molding				
	blc	w molding.	rotational n	nolding. vacu	um molding	thermoforming.				
III	coi	npression mo	olding, resin	transfer moldi	ing, calendar	ing process, etc.	0			
	Se	condary proce	sses for plastic	es i.e. machining	g, joining, pai	nting, etc. Defects	δ			
	du	ring processin	g of plastic pro	oducts.						
	De	sign of Plasti	c Moulds		_					
IV	De	sign of Com	pression mou	lds, different t	types of con	pression moulds,	7			
	Mu	ilti-cavity mo	oulds, Transfe	er moulds, M	oulds heatin	g principles and				
	me DI	ASTICS DEC	VCI NG AN	ID WASTE M	ANAGEMEN	IT Applieshility				
		ASTICS REC	f plastics in	various sectors	ANAGEMEN	challenges with				
	plastics Impact of plastics on environment and its remedies. Utility of									
V	pla	stics wastes.	waste manag	ement practice	s. plastic red	voling processes.	6			
	Ca	se studies for	recycling and	waste managem	ient.					
				C						
		forent place	nnonacine 4	ahniques						
		trusion Sheet	extrusion Pr	ofile extrusion	Calendaring	Blow Moulding				
VI		ermoforming.	Finishing and	machining play	stics. Equipm	ents for extrusion	6			
	cal	endaring, blow	w moulding	-0 r 1) — 1 F	······································	-			

	Text Books
1	Bikales, Compression and Transfer Moulding, Wiley, 2 nd Edition, 1986
2	Bullers, A guide to Injection Molding of Plastics, Wiley, 1st Edition, 2000
3	J.H. DuBois, W.I. Pribble, Plastic Mold Engineering, Van Nostrand Reinhold, 1 st edition, 2000
	References
1	R.P. Singh L.K. Das S.K. Mustafi, Polymer Blends & Alloys, Asian Book Pvt. Ltd., New Delhi, 2 nd edition, 2001
2	John Briston, Advances in plastics packaging technology, John Wiley & sons, New York, 2 nd edition, 2005
3	Handbook of Engineering Plastics – by Brown / Derock
4	Plastic Engineering Handbook – by Joel Frados
	Useful Links
1	https://nptel.ac.in/courses/112/107/112107221/
2	https://nptel.ac.in/courses/112/107/112107086/
3	https://onlinecourses.nptel.ac.in/noc20_ch41/preview

	CO-PO Mapping														
		Programme Outcomes (PO)									PSO				
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3					2				2			2		
CO2					2										
CO3		2				1		1							
CO4															
The stren	The strength of manning is to be written as 1.2.3. Where 1:Low 2:Medium 3:High														

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		W٤	Ichand College	e of Engineer	ing, San	ngli				
			(Government All	V 2023-24						
	Course Information									
Progr	amme		B. Tech. (Mechan	ical Engineering)						
Class.	Semeste	r	Third Year B. Tec	h., Sem, V						
Cours	se Code	-	6ME312							
Cours	se Name		Advanced Strengt	Advanced Strength of Materials						
Desire	ed Prere	auisites:	Strength of Materi	als						
		1	8							
r	Teaching	g Scheme		Examination	Scheme	(Marks)				
Lectu	re	3 Hrs/week	MSE	ISE	E	SE	Total			
Tutor	ial	-	30	20	5	50	100			
				 Cr	edits: 3	<u> </u>	100			
		1	1		-411010					
			Cour	se Obiectives						
-	To pro	vide students a	sound knowledge i	n strength of mat	erials real	uired to solv	ve the problems in			
	industr	y	0	8	1		1			
•	To teac	h the mathemat	ical and physical pr	inciples in underst	tanding th	e linear con	tinuum behavior of			
2	solids.			-	-					
		Cour	se Outcomes (CO)	with Bloom's Ta	xonomy l	Level				
At the	end of th	ne course, the stu	idents will be able to	о,						
						Bloom's	Bloom's			
CO		Cou	irse Outcome State	ement/s		Taxonom	y Taxonomy			
						Level	Description			
CO1	Explair	the concept of	theory of elasticity			II	Understanding			
CO2	Analys	e the deformation	on behavior of solic	ls under different	types of	IV	Analyzing			
	loading	and obtain mat	hematical solutions	for simple geomet	ries.					
CO3	Show 1	pasic relations b	between stress and	strains from the t						
	elastici	ty perspective	and use energy me	ethods to solve s		Applying				
	probler	ns.								
3.7.1	•			C ()			TT			
Modu		1 4 4	Nodule	Contents			Hours			
	Int	roduction to str	ess analysis	of electicity De	der Formo	aunto a fana				
I I	Ass	strong tongor T	prication of theory	a point Normal	ly Force, Shoor and	Surface force	e 6			
	stre	suess tensor, r	Stress components	on an arbitrary n	lane Equ	ality of cross				
	she	ars	Stress components	on an aronnary p	iane, Equ	unty of cros				
	Ans	alvsis of stress								
	Prir	ncipal stresses.	Stress invariants.	Octahedral stre	sses. Cau	ichy's stres	s _			
	for	nula, Differenti	al equations of eq	uilibrium, Equati	ons of ea	quilibrium i	n 7			
	cylindrical coordinates									
	Ana	alysis of Strain								
	Cor	ncept of strain,	Deformations in th	ne neighborhood	of a poin	t, Change i	n			
III	leng	gth of a linear	element, Interpreta	tion of shear stra	ain compo	onents, Plan	e 6			
	stra	ins in polar coor	rdinates, Compatibi	lity conditions, St	rain rosett	es and Strai	n			
	Me	asurement.								
	Str	ess-Strain Relat	tions			_				
I IV	Ger	neralized statem	ent of Hooke's la	w, Stress-strain	relations	for isotropi	ic 7			
	1 4		botwoon the electio	constants Plane	Strees and	Plane strain	n ′			

Mohr's circles for the 3-D state of stress

V	Energy Methods Introduction, Work done in deformation, Reciprocity theorem, Castigliano theorem, Principle of virtual work, Principle of minimum potential energy, Rayleigh-Ritz method							
VI	VI Bending of Beams, Shear stress distribution and shear centre for thin walled open sections							
	Text Books							
1	S.P. Timoshenko and J.N. Goodier, "Theory of Elasticity", McGraw-Hill Publishi Edition, 1970.	ng Co. Ltd., 3 rd						
2 Beer and Johnston, "Mechanics of Materials", McGraw Hill, 6th Edition, 2012								
3 L.S. Srinath, "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co. Ltd, 3 rd 2009.								
	References							
1	Shames, I.H. and Pitarresi, J.M, "Introduction to solid Mechanics", PHI learning Pvt. Edition, 2009	Ltd, 3 rd						
2	Hulse, R and Cain J, "Solid Mechanics", Palgrave publisher, 2 nd Edition, 2004.							
3	F.B Seely and Smith, "Advanced Mechanics of Materials", John Wiley & Sons, 2 nd E	dition, 1978.						
	Useful Links							
1	https://nptel.ac.in/courses/112/101/112101095/							
2	https://nptel.ac.in/courses/105/105/105105177/							
3	https://nptel.ac.in/courses/112/107/112107146/							

	CO-PO Mapping													
	Programme Outcomes (PO) PSO													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO 1	2												2	
CO 2			2								3	3	2	
CO 3	2		2									3	2	

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

	Walchand College of Engineering, Sangli									
	Course Information									
Progra	amme		B.Tech. (Mechani	cal Engineering)						
Class,	Semes	ter	Third Year B. Tec	h., Sem V						
Course Code 6ME313										
Cours	e Namo	9	Composite Materia	als						
Desire	Desired Requisites:									
T	eaching	Scheme		Examination Sche	ne (Marks)					
Lectur	re	3Hrs/week	MSE	ISE	ESE	Total				
Tutor	ial	-	30	20	50	100				
				Credits:	3					
1	Та	donator d 41	Cou	rse Objectives						
1 2	10 un	t an overview	echanical behavior	or composite materials.	materiala					
	10 ge	i an overview (or the methods of ma	anulaciuming composite	materials.					
		Cou	rse Outcomes (CO) with Bloom's Taxond	my Level					
At the	end of	the course, the	students will be abl	e to,						
			_		Bloom's	Bloom's				
СО		Taxonomy	Taxonomy							
<u>CO1</u>	Summ	onizo odvonto	annlightions of	compositor and Effort	Level	Understanding				
COI	reinfo	rcements	ges, applications of	composites, and Effect		Understanding				
CO2	Outlin	e usage, pror	perties various la	ninates and its role a	nd					
001	Manu	facturing of co	mposite materials	und no rore a	III	Applying				
CO3	Evalu	ate mechanics	of laminates.		V	Evaluating				
Modu	le		Modul	e Contents		Hours				
	IN	TRODUCTIO	N: Definition –	Classification and cl	naracteristics of					
I	Co	mposite mater	rials. Advantages ar	id application of compo	sites. Functional	4				
	rec	quirements of	reinforcement and	matrix. Effect of rein	forcement (size,					
	- SII Fil	ape, distributio	arbon ceramic or	on overall composite pe	trices polymer					
П	or	anhite ceramic	and metal matrices	characteristics of fiber	and matrices	4				
	La	mina- assum	tions. macroscopic	viewpoint. generalize	d Hookes law					
	red	duction of h	omogeneous ortho	tropic lamina, isotro	oic limit case.	_				
	or	thotropic stiffn	ess matrix, commer	cial material properties,	rule of mixtures,	5				
	tra	insformation m	atrix, transformed s	tiffness.						
IV	M	anufacturing	of composite ma	aterials, bag mouldin	g, compression	4				
	- III Re	usic assumptio	ns of laminated at	nig, other manufacturing	processes petric laminates					
	an	gle ply lami	nates, cross ply l	aminates, laminate st	uctural moduli.					
	ev	aluation of lan	nina properties, dete	ermination of lamina str	esses, maximum					
V	str	ess and strain	criteria, von Mises	Yield criterion for isc	tropic materials,	5				
	generalized Hill's criterion for anisotropic materials, Tsai-Hill's criterion for									
	co	mposites, prec	liction of laminate	failure, thermal analys	is of composite					
	laı	ninates								
X 7T	A	nalysis of lan	ninated plates- equ	illibrium equations of	motion, energy					
VI		tural frequenci	uc bending analys	is, buckling analysis,	iree vibrations,	4				
	Па	iarai nequenci	03							
			7	Text Books						

1	Krishan K. Chawla Composite Materials: Science and Engineering, 3rd ed. 2012 edition, Springer.					
2	Krishan K. Chawla Metal Matrix Composites ,2006 edition, Springer-Verlag New York Inc.					
3	Mulmudi Hemant Kumar, Applications of Composite Materials, Arcler Education Inc, 2018 Edition.					
	References					
1	Gibson R.F. Principles of Composite Material Mechanics, second edition, McGraw Hill, 1994					
2	Hyer M.W., Stress Analysis of Fiber- Reinforced Composite Materials, McGraw Hill,					
3	ASM handbook Vol.21, Composites, Editor: D.B. Miracle and S.L. Donaldson, Edition 2020.					
	Useful Links					
1	https://www.twi-global.com/technical-knowledge/faqs/what-is-a-composite-material					
2	https://netcomposites.com/guide/					

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2					2		1					2	1
CO2	2			2					2					1
CO3					1	2					2		2	1
The strength of mapping is to be written as 1: Low, 2: Medium, 3: High														
Each CO	of the i	course	must r	nan to	at leas	t one P	0			-				

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

		W	alchand Colleg	e of Engineerin	g, Sa	ngli										
		AY 2023-24 Course Information														
			Cours	se Information												
Progra	amme		B.Tech. (Mechanie	cal Engineering)												
Class,	Semes	ter	Third Year B. Tec	h., Sem V												
Cours	e Code		6ME314													
Cours	e Name	e	PE-1 CAD/CAM													
Desire	d Requ	isites: AutoCa	AD, basic drafting te	chniques etc.												
Те	eaching	Scheme		Examination Sc	heme (Marks)										
Lectur	re	3Hrs/week	MSE	ISE]	ESE	Total									
Tutori	ial	-	30	20		50	100									
				Credi	ts: 3											
			Com	na Ohiaatiwaa												
	Taim	nart the know	Coul	rse Objectives	a and	working of	variaus NC CNC									
1	machi	nes and CMM		idamentais, principie	es and	working of	various NC, CNC									
2	To ex metho	plain the stud ods for CNC tui	ents about recent ming and milling op	developments in CN erations.	IC mac	hines and p	art programming									
3	To ma	ike students av	ware of different typ	es of cutting tools fo	r mach	ining operat	ions.									
4	To de	velop the stud	ents for mathemati	cal representation o	f geom	etries and d	ifferent tolerance									
5	Toma	ike students av	ware of computer us	e for data exchange	format	s and tools										
	101110				lonnat											
		Cou	rse Outcomes (CO) with Bloom's Taxo	onomy	Level										
At the	end of	the course, the	students will be able	e to,												
CO		Co	ourse Outcome Stat	ement/s		Bloom's Taxonomy	Bloom's Taxonomy									
						Level	Description									
	Explai	n appropriate	operation and CNC	machines for machin	ing.		Understanding									
CO2	Devel	op part progra	ms for CNC machini	ng.		111	Applying									
COS	Арріу	mathematical				TTT	Develop part programs for CNC machining. III Applying									
Modu			Apply mathematical model to transform the geometries. III Applying													
MIUUU	ام		Model to transform	the geometries.		III	Applying									
	le	traduction to (Model to transform Modul	e Contents		III	Applying Hours									
	le Int	troduction to (Model to transform Modul CAD/CAM and CNC	e Contents Tools	withou	III	Applying Hours									
	le Int Au	troduction to (Itomation in n	Model to transform Modul CAD/CAM and CNC nanufacturing, prod	e Contents Tools	withou	III t CAD/CAM	Applying Hours									
	le Int Au Ty	troduction to (Itomation in n pes of produ	Model to transform Modul CAD/CAM and CNC nanufacturing, prod ictions, Numerical NC system NC P	e Contents Fools	withou and hi	III t CAD/CAM story. Mair trol system	Applying Hours									
I	le Int Au Ty co	troduction to (itomation in n pes of produ mponents of lyantages and	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N	e Contents Fools luct cycle with and control definition rocedure, NC motic C. CNC. DNC. etc. Cl	withou and hi on con	III t CAD/CAM story. Mair trol system chine tools	Hours 4									
Ι	le Int Au Ty co Ac pr	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor	e Contents Tools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Cf instruction features i	withou and hi on con VC ma ncludin	III t CAD/CAM story. Mair trol system chine tools g structure	Hours 4									
Ι	le Int Au Ty co Ac pr dr	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen	e Contents Tools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Cf hstruction features i t actuation system,	withou and hi on con NC ma ncludin feedb	III t CAD/CAM story. Mair trol system chine tools g structure ack system	Hours Hours 4									
Ι	le Int Au Ty co Ac pr dr ma	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system.	Contents Fools Juct cycle with and control definition rocedure, NC motion C, CNC, DNC, etc. Cf instruction features in t actuation system,	withou and hi on con NC ma ncludin feedb	III t CAD/CAM story. Mair trol system chine tools g structure ack system	Hours Hours 4									
I	le Int Au Ty co Ac pr dr ma Di	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo	Model to transform Modul CAD/CAM and CNC nanufacturing, prod ictions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools	the geometries. e Contents Tools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. CP istruction features i t actuation system,	withou and hi on con NC ma ncludin feedb	III t CAD/CAM story. Mair trol system chine tools g structure ack system	Hours 4									
I	le Int Au Ty co Ac pr dr ma Di CN	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di	Model to transform Modul CAD/CAM and CNC nanufacturing, prod ictions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools fferent types of to	e Contents Fools Juct cycle with and control definition rocedure, NC motion C, CNC, DNC, etc. CM instruction features in t actuation system, pools and tool hold	withou and hi on con NC ma ncludin feedb ers use	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC	Applying Applying Hours 4 4 4									
I	le Int Au Ty co Ac pr dr ma Di CN	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools fferent types of to neters for selectio	e Contents Fools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Cf instruction features i t actuation system, pols and tool hold on of configuration	withou and hi on con VC ma ncludin feedb ers use of cu	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools	Hours Hours									
I	le Int Au Ty co Ac pr dr ma CN CN ma	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools fferent types of to neters for selectio and fixtures, use of	Contents Fools Juct cycle with and control definition rocedure, NC motion C, CNC, DNC, etc. Ch istruction features in t actuation system, pools and tool hold on of configuration of pallets for work	withou and hi on con NC ma ncludin feedb ers use of cu holding	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools ;, palletizing	Hours Hours 4									
I	le Int Au Ty co Ac pr dr ma CN ma Mi of	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools fixtures.	Model to transform Modul CAD/CAM and CNC nanufacturing, productions, Numerical NC system, NC P disadvantages of N eration of CNC, corr pol-work movemen system. nents of CNC tools fferent types of too neters for selection and fixtures, use of the second second se	e Contents Fools Juct cycle with and control definition rocedure, NC motion C, CNC, DNC, etc. Ch instruction features in t actuation system, pools and tool hold on of configuration of pallets for work	withou and hi on con NC ma ncludin feedb ers use of cu holding	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools t, palletizing	Applying Applying Hours ,									
I	le Int Au Ty co Ac pr dr ma CN ma Mi of	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools fixtures.	Model to transform Module CAD/CAM and CNC nanufacturing, productions, Numerical NC system, NC P disadvantages of N eration of CNC, corr pol-work movemen system. nents of CNC tools fferent types of too neters for selection and fixtures, use of ng	e Contents Fools Juct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Cf istruction features i t actuation system, pols and tool hold on of configuration of pallets for work	withou and hi on con VC ma ncludin feedb ers use of cu holding	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools g, palletizing	Applying Applying Hours 4 4 4 5									
I II III	le Int Au Ty co Ac pr dr ma Di CN ma Mi of CN	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools fixtures. IC Programmi IC Programmi	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools fferent types of to neters for selection and fixtures, use of ng ng - Detailed mar	e Contents Fools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Ch nstruction features i t actuation system, pols and tool hold on of configuration of pallets for work	withou and hi on con NC ma ncludin feedb ers use of cu holding	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools g, palletizing	Applying Applying Hours 4 4 4 5									
I II III	le Int Au Ty co Ac pr dr ma CN ma Of CN Mi of	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools fixtures. IC Programmi achining centre	Model to transform Modul CAD/CAM and CNC nanufacturing, prod actions, Numerical NC system, NC P disadvantages of N eration of CNC, cor pol-work movemen system. nents of CNC tools fferent types of to neters for selection and fixtures, use of ng ng - Detailed mar es using G and M co	e Contents Fools luct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Ch nstruction features i t actuation system, pols and tool hold on of configuration of pallets for work hual part programmides, APT programmides, APT programmides	withou and hi on con NC ma ncludin feedb ers use of cu holding ning or ng-Pun	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools tructing tools the cols the cols the cols the cols the cols the cols the cols the cols the cols	Applying Hours 4 4 5 5									
I	le Int Au Ty co Ac pr dr ma CN ma CN ma Of CN CN CN CN	troduction to (itomation in n pes of produ mponents of lvantages and inciple of ope ive system, to achine control fferent compo IC Tooling- Di achines, paran odular tools fixtures. IC Programmi achining centre C, tape codi	Model to transform Module CAD/CAM and CNC nanufacturing, productions, Numerical NC system, NC P disadvantages of N eration of CNC, corr pol-work movemen system. nents of CNC tools fferent types of to neters for selection and fixtures, use of ng - Detailed mar es using G and M co ng and formats,	e Contents Fools Juct cycle with and control definition rocedure, NC motio C, CNC, DNC, etc. Cl instruction features i t actuation system, pols and tool hold on of configuration of pallets for work mual part programmi APT language, Ci	withou and hi on con NC ma ncludin feedb ers use of cu holding ning or ng-Pun rcular	III t CAD/CAM story. Mair trol system chine tools g structure ack system ed on CNC utting tools t, palletizing Lathe and ched tape ir and linea	Hours Hours 4 4 5 4 5									

	compensation, sub routine, DO loop, Canned Cycle, etc. Optimization of tool	
	path (to reduce machining time).	
IV	Geometric Modeling and Analysis Types of mathematical representation of curves, surfaces, Solid Representation - Boundary Representation (B-rep), Constructive Solid Geometry (CSG) and other methods, Feature Based Modeling, Assembly Modeling, Behavioral Modeling, Conceptual Design & Top-down Design, Modeling of product in CAE softare and analysis techniques using approximation and matrix method. Data exchange formats like IGES, STEP etc.	4
V	Geometry Transformation Introduction and need of transformation, Mathematical models of Translation, scaling, reflection, rotation, homogeneous representation, concatenated transformation. Mapping of geometric model, visual realism, projections of geometric model.	5
VI	Computer Aplication in Design, Manufacturing and Analysis Collaborative Design, Principles, Approaches, Tools, Design Systems. Product Data Management (PDM), concurrent engineering, PLM concept.	4
	Text Books	
1	Geoffrey Boothroyd and Winston A. Knight, "Fundamentals of machining and Third Edition, CRC Mechanical Engineering.2000	machine tools",
2	Jon Stenerson and Kelly Curran " <i>Computer Numerical Control: Operations and</i> Prentice-Hall of India Pvt. Ltd. New Delhi, 2007.	Programming",
3	B.S. Pabla, M.Adithan, " CNC Machines", New Age International (P) Publishers, Fir Reprint 2005.	st Edition 1994,
	References	
1	Mikell P. Groover, Emory W. Zimmers, "CAD/CAM: Computer-Aided Design and I Prentice-Hall, 1984.	Manufacturing",
2	Ibrahim Zeid, " <i>Mastering CAD/CAM</i> ", Tata McGraw Hill Education Pvt Ltd., Ne Indian Edition, 2007, Ninth Reprint 2010.	w Delhi, Special
3	Ibrahim Zeid, R. Sivasubramanian, "CAD/CAM: Theory and Practice", Tat Companies, Special Indian Edition, 2009.	a McGraw Hill
	Useful Links	
1	https://archive.nptel.ac.in/courses/112/102/112102101/	
2	https://nptel.ac.in/courses/112104031	
3	https://archive.nptel.ac.in/courses/112/102/112102103/	

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		2										2	1
CO2					2									1
CO3						2							2	1
The steen	ath af			1	44.0.0.00	. 1. T		I a diama	2.11	~1.				

Assessment

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO. ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on

		Wa	alchand Colleg	e of Engineering	g, S	angli							
			(Government Ai	ded Autonomous Institu V 2022 24	ite)								
			A	Y 2023-24									
Drogre	Course Information 'ogramme B.Tech. (Mechanical Engineering)												
Frogra	gramme B. Tech. (Mechanical Engineering) is, Semester Third Year B. Tech., Sem V												
Class,	o Code		6ME241	II., Selli V									
Cours	e Cour o Nam	•	Mini Project 1										
Desire	d Rea	v uisites•											
Desire													
T	eachin	g Scheme		Examination Scl	heme	e (Marks)							
Practi	cal	2 Hrs./Week	LA1	LA2	Ι	Lab ESE	Total						
Interac	ction	-	30	30		40	100						
				Credits	s: 01								
			Cour	se Objectives									
1	To fa	miliarize studen	ts with the concept	of project based learn	ning.								
2	To g	ive hands-on ex	perience to student	s on developing prol	blem	statement and	d methodology to						
3	To le	arn the technical	l report writing skill	s									
	1010		report writing bith										
		Cou	rse Outcomes (CO)) with Bloom's Taxo	nom	y Level							
At the	end of	the course, the	students will be able	e to,		•							
СО	Cour	se Outcome St	atement/s			Bloom's Taxonomy Level	Bloom's Taxonomy Description						
601	Conc	eive a problem	statement either f	from rigorous literat	ure	II	Understanding						
	surve	y or from the re	quirements raised fr	om need analysis.									
CO2	Design to sol	gn, and develop	the model / prototy d problem.	ype / algorithm in or	der	III	Illustrating						
CO3	Write	e comprehensive	report on mini proj	ect work		V	Organising						
			Cou	irse contents									
	Guid	elines:											
	1. Th	e mini-project is	s a team activity hav	ving 3-4 students in a	team	1.							
	2. M disci	lini project sho plinary too.	ould include mainl	y Mechanical Engir	neerii	ng contents ł	out can be multi						
	2. Th	e mini project n	nay be a complete h	ardware or a combina	ntion	of hardware a	nd software. The						
	softw	vare part in mini	project should be le	ess than 50% of the to	otal v	vork.							
	3. M	ini Project shoul	d cater to a small sy	stem required in labo	orator	ry or real life.							
	4. It :	should encompa	ss components, dev	ices etc. with which f	uncti	ional familiari	ty is introduced.						
	5. Af	ter interactions	with course coordin	ator and based on cor	npre	hensive literat	ure survey/ need						
	analy	vsis, the student	shall identify the tit	le and define the aim	and	objectives of r	nini-project.						
	6. St	udent is expected	d to detail out speci	fications, methodolog	gy, re	sources requir	ed, critical issues						

involved in design and implementation and submit the proposal within first week of the semester.

7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.

8. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.

Guidelines for Assessment of Mini Project Practical / Oral Examination:

Report should be prepared as per the guidelines issued by the department.

Mini Project shall be assessed through a presentation and demonstration by the student project group to faculty advisor / a panel of examiners.

Students shall be motivated to publish a paper based on the work in students competitions / Conferences / journals.

- 1. Mini Project shall be assessed based on following points;
- 2. Quality of problem and clarity
- 3. Proper use of knowledge and practices of mechanical and or other engineering disciplines.
- 4. Effective use of skill sets
- 5. Contribution of an individual's as member or leader
- 6. Clarity in written and oral communication

	Text Books
1 ●	
2	
	References
1	Meredith, Jack R., and Samuel J. Mantel Jr. Project management: a managerial
1	approach. John Wiley & Sons, 2011.
n	K. T. Ulrich, S. D. Eppinger, and M. C. Yang, Product Design & Development, , 7th
2	Edition, McGraw Hill, 2019.
2	M. Mahajan, Industrial Engineering and Production Management, 1st Edition, DhanpatRai
3	& Co. (P) Limited, 2015.
1	V. Balachandran and Chandrasekaran, Corporate Governance, Ethics and Social Responsibility,
4	PHI, 2nd Edition, 2011
	Useful Links
1	
2	

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3		1		2				3			3	3	
CO2	2	2	3		2				3		3		2	1
CO3		3						3						1
The strong	ath of 1	nonnir	a is to	how	itton or	1 2 2.	whore	1.10		Andium	2. Ц	iah		

The strength of mapping is to be written as 1,2,3; where, 1: Low, 2: Medium, 3: High Each CO of the course must map to at least one PO, and preferably to only one PO.

		Assessmer	ıt	
There are three	components of lab	assessment, LA1, LA2	and Lab ESE.	
IMP: Lab ESE	is a separate head of	of passing.(min 40 %), I	LA1+LA2 should be min 40%.	
Assessment	Based on	Conducted by	Typical Schedule	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 8 Marks Submission at the end of Week 8	30
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 9 to Week 16 Marks Submission at the end of Week 16	30
Lab ESE	Lab activities, journal/ performance	Lab Course Faculty and External Examiner as applicable	During Week 18 to Week 19 Marks Submission at the end of Week 19	40
Week 1 indicat experiments, m nature and requ related activitie	es starting week of nini-project, present nirement of the lab es if any	a semester. Lab activiti ations, drawings, progra course. The experimenta	es/Lab performance shall include performance shall include performance shall include performance, and other suitable activities, a al lab shall have typically 8-10 experimental shall sha	rming s per the ents and

	Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)												
	AY 2023-24 Course Information												
	Course Information												
Progra	amme		B. Tech. (Mechani	cal Engineering)									
Class,	Seme	ster	Third Year B. Tec	h., Sem. V									
Cours	e Cod	e	6OE329										
Cours	e Nam	e	OE 1-Non Conven	tional Machining Pro	ocesses								
Desire	ed Req	uisites:											
			-										
Т	eachin	aching Scheme Examination Scheme (Marks)											
Lectur	re	3Hrs/week	MSE	ISE	ESE]	ſotal						
Tutori	ial	- 30 20 50 10											
Practi	cal												
Intera	ction	-		Credi	ts: 3								
	-		Cour	rse Objectives									
1	To le chara	Γο learn about various nonconventional machining processes the various techniques, performance characteristics and their applications											
2	To in	ntroduce studen	ts with various mad	chine tools and their	peculiars used for	r nonco	nventional						
	To fi	ain the student	s to identify main w	variables of nonconv	entional machining	proces	ses and to						
3	judg	e their effect on	developed products			5 pro to s							
A (11	1		rse Outcomes (CO) with Bloom's Taxo	onomy Level								
At the	end of	the course, the	students will be able	e to, hining processes t	acting and equip	mont'a	underste						
CO1	requi	red for various no	manufacturing appli	cations.	ooning and equip	ment s	nding						
CO2	Expl	oit the capabilit	ies and applications	of nonconventional r	nachining processe	s.	Apply						
CO3	Anal	yze effect of a	lifferent parameters	influencing on nor	nconventional mac	hining	Analyze						
	proc	esses and compa	are with other techni	que applications.									
Modu	ile		Mod	lule Contents			Hours						
	I	Introduction.											
Ι		Introduction to nontraditional machining methods -Need for non -traditional machining -Sources of metal removal, Classification on the basis of energy 6											
	s	ources -Paramet	ers influencing select	ction of process.									
П	N A U e	Iechanical Ty brasive Jet Mac Iltrasonic Mach quipment used -	pe AMPs: chining – Water Jet hining.(AJM, WJM, - Process parameters	Machining – Abrasiv AWJM and USM 5– MRR- Application	ve Water Jet Machi). Working Princi	ning – ples –	7						

Ш	Thermal Type AMPs: Electric Discharge Machining (EDM)- working Principle-equipments-Process Parameters-Surface Finish and MRR- electrode / Tool – Power and control Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications- Micro-EDM, Micro-WEDM.	7
IV	Chemical Type AMPs: Principles of Chemical machining and Electro-Chemical machining (CHM and ECM)-Etchants – Maskant -techniques of applying maskants - Process Parameters – Surface finish and MRR-Applications- equipments-Surface Roughness and MRR, Electrical circuit-Process Parameters- ECG and ECH – Applications	7
V	Medium Assisted AMPs: Laser Beam Machining: Material removal mechanism, types of Lasers, LBM equipment, process characteristics, applications. Electron Beam Machining: Basic equipment and metal removal mechanism, process characteristics, applications. Plasma Beam Machining: Machining systems, material removal rate, accuracy and surface quality, applications. Ion Beam Machining: Introduction, material removal rate, accuracy and surface effects, applications	7
VI	Advanced MPs: Basics and definitions: Principle of layer-based technology, advantages, classification. Rapid Prototyping Process Chain: 3D Modeling, Data Conversion and Transmission, Checking and Preparing, model building, post processing. Rapid prototyping techniques: Stereo lithography, Solid Ground Curing (SGC), Fused Deposition Modeling (FDM)	6
	Text Books	020
	Jagadeesha T., "Nontraditional Machining Processes", Wiley India-Dicameen Tresss,2	2020
2	Jagadeesha 1., Onconventional Machining Processes, whey India-Dreamtech Presss,	,2020
3	Mishra P. K., "Non-Conventional Machining", The Institution of Engineers (India), Series, New Delhi, 1997	Text Book
4	Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd, New Delhi,	2009.
	References	Maalinin
1	Processes", McGraw-Hill Co, New York (2005).	wachining
2	Benedict, Gary F., "Non-Traditional Manufacturing Processes", Marcel Dekker Inc., 1 (1987)	New York
3	Garry F. Benedict, "Unconventional Machining Process", Marcel Dekker Publication, N 1987	New York,
	Useful Links	
1	https://www.youtube.com/watch? v=oI3RIAvyVxc&list=PLbMVogVj5nJSzoQXmu7dsj9ZKJyZ1P4O8	
2	https://www.youtube.com/watch?v=P8zdXuIxQt4	
3	https://www.youtube.com/watch?v=Hc6mfNWT8oQ&t=5s	
4	https://nptel.ac.in/courses/112/105/112105212/	
5	https://nptel.ac.in/courses/112/103/112103202/	
6	https://www.youtube.com/watch?v=yWBGnkhGKz8	

7	https://www.youtube.com/watch?v=Cz-KsEBLWNI
8	https://www.youtube.com/watch?v=r4Qws2G3f8E
9	https://youtu.be/Sfj8_9oRCNk
10	https://www.youtube.com/watch?v=cxU1zUOpGLk
11	https://www.youtube.com/watch?
	v=PaYInS9axxw&list=PLzCSUZGIUJkaSyCzPiQMWynGyxmC8hrpl
12	https://www.youtube.com/watch?v=QJ-kKIdALRk

	CITA														
	CO-PO Mapping														
		Programme Outcomes (PO) PSC													
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
C01	2			2	2										
CO2	2	2			1				1	1					
CO3	2	2			1	1	1					1			
The streng	gth of n	napping	g is to t	be writt	en as 1	,2,3; W	/here, 1	:Low,	2:Med	ium, 3:	High				

	Electronics															
CO-PO Mapping																
	Programme Outcomes (PO)													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C01	2				2	2										
CO2	2	1			1	1	1					1				
CO3	2	2	2	2	1							1				
The streng	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Electrical																	
CO-PO Mapping																	
	Programme Outcomes (PO)													PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
C01	2			2								1					
CO2	2	2			2				1			1					
CO3	2	2		2	2							1					
The streng	gth of m	napping	g is to t	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High													

<u>-</u>																
CO-PO Mapping																
	Programme Outcomes (PO)													PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C01	2			1	1	1										
CO2	2	2	1		2							1				
CO3	2	1	2		2							1				
The streng	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High															

Computer Science

Flootropics

Civil
CO-PO Mapping																
	Programme Outcomes (PO)												PSO			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	
C01	2															
CO2	2	1			2				1							
CO3	1	2	2		2				1							
The streng	gth of n	napping	The strength of mapping is to be written as 1,2,3; Where, 1:Low, 2:Medium, 3:High													

Information Technology

Assessment (for Theory Course)

The assessment is based on MSE, ISE and ESE.

MSE shall be typically on modules 1 to 3.

ISE shall be taken throughout the semester in the form of teacher's assessment. Mode of assessment can be field visit, assignments etc. and is expected to map at least one higher order PO.

ESE shall be on all modules with around 40% weightage on modules 1 to 3 and 60% weightage on modules 4 to 6.

For passing a theory course, Min. 40% marks in (MSE+ISE+ESE) are needed and Min. 40% marks in ESE are needed. (ESE shall be a separate head of passing)