		W	alchand Colleg	e of Engineerin	ig, Sanş	gli		
			(Government Al	V 2022-23	ute)			
			Cours	se Information				
Progr	amme		B Tech (Mechanic	cal Engineering)				
Class.	Semes	ter	Second Year B Te	ech Sem III				
Cours	e Code		6MA202					
Course Name Probability and Statistics								
Desire	d Rea	isites:	Mathematics cours	se at Higher Seconda	rv Junior	College		
				8		8-		
T	eaching	Scheme		Examination Sc	heme (M	arks)		
Lectu	re	2Hrs/week	MSE	ISE	ES	SE	Т	'otal
Tutor	ial	-	30	20	5	0	1	100
				Credi	its: 2	I		
		1	1					
			Cou	rse Objectives				
1	Famil	iarize the stude	ents with techniques	in probability and st	atistics.			
2	Desig	n a statistical	hypothesis about t	he real world proble	em and c	onduct app	propriat	e test for
	drawi	ng valid inferen	nce about the popula	ation characteristics.				
		Соц	rse Outcomes (CO)	) with Bloom's Tax	onomy L	evel		
At the	end of	the course, the	students will be able	e to.				
СО	CO     Course Outcome Statement/s     Bloom's Taxonomy Level							Bloom's axonomy escription
CO1 Apply computational tools to solve Mathematical and Statistical III Apply							Apply	
<u>CO2</u>	Solve	problems in pr	obability statistics			III		Apply
	JUILE	problems in pr	obubility, statistics.					<u>rippiy</u>
Modu	le		Modu	le Contents				Hours
	R	andom Variab	le					
I	Di fu pr ra	screte random nction, Probabi obability distri ndom variable,	n variable, Continu ility density function bution, Joint distribu Examples	nous random varial n, Bivariate discrete ution function of two	ole, Prob random v o dimensi	ability ma ariable, Joi onal discre	ss nt te	4
п	Pr Pr	<b>obability Dist</b>	ribution oution Gaussian	Distribution Expo	nential	Distributio	n	4
	E	amples	dulon, Guussiun	Distribution, Expe	montial	Distributio	,	·
III	Sa Po sta di	mpling Distri opulation, Samp atistic, standard stribution of pr	<b>bution</b> ple, Random sample d error of Statistic, oportion, Examples	es, large sample, sma sampling distributio	all sample on of mea	e, Paramete an, samplir	er, 1g	5
IV	To Hy Ty sa fo	esting of Hypo ypothesis, null ypes of error, o mples, Hypothor r single popula	thesis I and alternative hype one tailed test, two esis testing for singl tion mean, Example	othesis, critical region tailed test, test of s e population proport s	n, level of significant ion, hypo	significanc ce for larg thesis testir	e, ge ng	5
Tor single population mean, Examples         Testing of Hypothesis II         Test of significance for small samples, degrees of freedom, student t         V       distribution: Definition and its properties, Test the significance of mean of random sample, Examples, Chi-square distribution: Definitions and its         properties, chi square test chi square test of goodness of fit Examples						5		
VI	St Co cu	atistics: prrelation, Line rve, Examples.	ear regression, Curv	ve fitting (a) straigh	t line (b)	logarithm	ic	5
		•	Т	ext Books				
1	Gupta	and Kapoor, "	Fundamental ofMa	thematical Statistics	,,			

2	Vijay Rohatgi ,"An I	ntroduction to	probability and	statistics"
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1 S.Ross, "Probability and Statistics for Engineers and Scientists"

	CO-PO Mapping													
				P	rograi	nme C	outcom	nes (PC	))				PS	0
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1												
CO2		1	2		1								1	
CO3	1			1	2	1							1	
The strong	oth of 1	nonnir	a is to	hawri	tton ac	123.	Whore	1.1.0		Indium	2.Hi	rh		

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.

### 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	Ichand College	e of Engineering	g, Sang	gli					
			(Government Ala	ea Autonomous Institu 7 <b>2022-23</b>	lle)						
				Information							
Drogror	nmo		B Tech (Mechani	cal Engineering)							
	omostor	•	Second Vear B T	ech Sem III							
Course			6MF201								
Course	Name		Thermodynamics								
Desired	Requis	ites•	Thermodynamics								
Desired	Itequis										
Те	aching	Scheme		Examination Sc	heme (N	(arks)					
Lecture		3Hrs/week	MSE	ISE	E	SE	Total				
Tutoria	1	_	30	20	5	50	100				
				Credi	ts: 3						
		1	<u> </u>								
			Cours	e Objectives							
	To lear	n about work	and heat interaction	s, and energy balanc	e betwee	en system and	l its				
1	surrou	ndings		.,		j					
2	To lear	n about applic	ation of I law to var	rious energy convers	ion devi	ces					
3	To eva	luate the chan	ges in properties of	substances in variou	s process	ses					
	To und	lerstand the dif	ference between hi	gh grade and low gra	de energ	vies and II lay	v limitations				
4	on ene	rgy conversion	l	Bri Brude und 10 11 Bre							
		6,									
		Cours	se Outcomes (CO)	with Bloom's Taxo	nomy L	evel					
At the e	end of the	he course, the	e students will be a	ible to,							
						Bloom's	Bloom's				
CO		Co	ourse Outcome Sta	tement/s	Taxonomy	Taxonomy					
						Level	Description				
CO1	Write energy balance to systems and control volumes in situations										
	write e	energy balance	to systems and cor	itrol volumes, in situ	D1 while energy balance to systems and control volumes, in situations III Apply						
COI	involvi	energy balance	to systems and conork interactions.	itrol volumes, in situ	utions	III	Apply				
CO1 CO2	involvi Evalua	energy balance ing heat and w te changes in t	to systems and cor ork interactions. hermodynamic prop	perties of substances	•	III IV	Apply Analyze				
CO1 CO2 CO3	write of involvi Evalua Evalua	energy balance ing heat and w te changes in t te the perform	to systems and cor ork interactions. hermodynamic prop ance of energy conv	perties of substances version devices and t		III IV V	Apply Analyze Evaluate				
CO2 CO3	write of involvi Evalua Evalua differe	energy balance ing heat and w te changes in t te the perform ntiate between	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low	perties of substances version devices and t grade energies.		III IV V	ApplyAnalyzeEvaluate				
CO1 CO2 CO3	write of involvi Evalua Evalua differe	energy balance ing heat and w te changes in t te the perform ntiate between	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low	perties of substances version devices and t grade energies.		III IV V	Apply Analyze Evaluate				
CO1 CO2 CO3 Module	Write of involvi Evalua differe	energy balance ing heat and w te changes in t te the perform ntiate between	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b>	perties of substances version devices and t grade energies.		III IV V	Apply Analyze Evaluate Hours				
CO1 CO2 CO3 Module	Write of involvi Evalua Evalua differe	energy balance ing heat and w te changes in t te the perform ntiate between damentals and	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> I First law of Ther	perties of substances version devices and t v grade energies. e Contents modynamics		III IV V	Apply Analyze Evaluate Hours				
CO2 CO3 Module	Write of involvi Evalua differe	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Syn	e to systems and cor ork interactions. hermodynamic pro- ance of energy con- high grade and low <b>Module</b> d First law of Ther stem & Control volu	perties of substances version devices and t grade energies. e Contents modynamics ume; Property, State	& Proce	III IV V ss; Exact &	Apply Analyze Evaluate Hours				
CO1 CO2 CO3 Module	Fund Fund Fund Fund Fund Fund Fund	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy- act differential	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> I First law of Ther stem & Control volu s; Work - Thermody	perties of substances version devices and t v grade energies. e Contents modynamics ume; Property, State ynamic definition of	& Proce work; ez	III IV V ss; Exact & xamples;	Apply Analyze Evaluate Hours				
CO1 CO2 CO3 Module	Fund Fund Disp	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work	e to systems and cor ork interactions. hermodynamic pro- ance of energy conv high grade and low <b>Module</b> d First law of Ther stem & Control volu s; Work - Thermody c; Path dependence of	perties of substances version devices and t v grade energies. e Contents modynamics ume; Property, State ynamic definition of of displacement work	& Proce work; ex	III IV V ss; Exact & kamples; istrations	Apply Analyze Evaluate Hours				
CO1 CO2 CO3 Module	Fund Fund Fund Fund Fund Fund Fund Tinexa Disp for s	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volt s; Work - Thermody c; Path dependence of es; electrical, magne	perties of substances version devices and t v grade energies. e Contents modynamics ume; Property, State ynamic definition of of displacement worl tic, gravitational, spu	& Proce work; ex k and illu	III IV V ss; Exact & kamples; ustrations shaft work.	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	Fund Fund Fund Fund Fund Fund Fund Fund	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe perature, Defin	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of ses; electrical, magne nition of thermal eque	perties of substances version devices and t v grade energies. e Contents modynamics ume; Property, State ynamic definition of of displacement worl of displacement worl stic, gravitational, spu uilibrium and Zeroth	& Proce work; ez k and illu ring and law; Te	III IV V ss; Exact & kamples; ustrations shaft work. mperature	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>Inexa</li> <li>Disp</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> </ul>	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe perature, Defines; Various The action in syste	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal eque ermometers- Definit	e Contents modynamics ume; Property, State ynamic definition of displacement worl dic, gravitational, spu uilibrium and Zeroth tion of heat; example	& Proce work; ex k and illu ring and law; Te es of hea	III IV V ss; Exact & kamples; ustrations shaft work. mperature t/work s: Concept	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> <li>of to</li> </ul>	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe perature, Defin es; Various The action in syste tal energy F. N	to systems and cor ork interactions. hermodynamic pro- ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of s; electrical, magne nition of thermal equermometers- Definit ms- First Law for Covarious modes of en	e Contents modynamics ume; Property, State ynamic definition of displacement worl uilibrium and Zeroth tion of heat; example yyclic & Non-cyclic p ergy, Internal energy	& Proce work; ex k and illu ring and law; Te es of hea processes y and En	III IV V ss; Exact & kamples; istrations shaft work. mperature t/work s; Concept thalpy	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write e</li> <li>involvi</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>Inexa</li> <li>Disp</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> <li>of to</li> </ul>	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe perature, Defin s; Various The action in syste tal energy E, V	e to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal eque ermometers- Definit ms- First Law for C various modes of en e substances	e Contents modynamics ame; Property, State ynamic definition of of displacement worl utic, gravitational, spu utilibrium and Zeroth tion of heat; example cyclic & Non-cyclic p ergy, Internal energy	& Proce work; ex k and illu ring and law; Te es of hea processes y and En	III IV V ss; Exact & kamples; ustrations shaft work. mperature t/work s; Concept thalpy	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defini</li> </ul>	energy balance ing heat and w te changes in t te the perform ntiate between damentals energy act differential lacement work imple processes perature, Defin es; Various The action in syste tal energy E, V perties of Pure nition of Pure	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal equermometers- Definit ms- First Law for Covarious modes of en e substances substance, Ideal Gas	e Contents modynamics ume; Property, State ynamic definition of displacement worl uilibrium and Zeroth tion of heat; example yyclic & Non-cyclic p ergy, Internal energy	& Proce work; ex k and illu ring and law; Te es of hea processes y and En ktures, R	III IV V ss; Exact & xamples; ustrations shaft work. mperature t/work s; Concept thalpy eal gases	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>for si</li> <li>for si</li> <li>for si</li> <li>scale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defin</li> <li>and to</li> </ul>	energy balance ing heat and w te changes in t te the perform ntiate between damentals and lamentals - Sy act differential lacement work imple processe perature, Defin s; Various The action in syste tal energy E, V perties of Pure real gas mixtur	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence es; electrical, magne nition of thermal eque mometers- Definit ms- First Law for C various modes of en e substances substance, Ideal Gaves	e Contents modynamics ame; Property, State ynamic definition of of displacement worl utic, gravitational, spu uilibrium and Zeroth tion of heat; example cyclic & Non-cyclic p ergy, Internal energy ses and ideal gas mix charts- Properties of	& Proce work; ex k and illu ring and law; Te es of hea processes y and En ctures, R f two pha	III IV V ss; Exact & kamples; ustrations shaft work. mperature t/work s; Concept thalpy eal gases ase systems	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defin</li> <li>and n</li> <li>- Con</li> </ul>	action in syste tal energy E, V perties of Pure real gas mixtur not construction of Pure real gas mixtur	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal eque ermometers- Definit ms- First Law for C Various modes of en e substances substance, Ideal Gar es, Compressibility re and Const. pressu	e Contents modynamics ume; Property, State ynamic definition of displacement worl dic, gravitational, spr uilibrium and Zeroth tion of heat; example yclic & Non-cyclic p ergy, Internal energy ses and ideal gas mix charts- Properties of the heating of water;	& Proce work; ex k and illu ring and law; Te es of hea processes y and En ktures, R f two pha Definitio	III IV V ss; Exact & kamples; istrations shaft work. mperature t/work s; Concept thalpy eal gases ase systems ons of	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>for si</li> <li>for si</li> <li>for si</li> <li>scale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defin</li> <li>and n</li> <li>- Con</li> <li>satur</li> </ul>	damentals and te changes in t te changes in t te the perform ntiate between damentals etween adamentals - Sy act differential lacement work imple processe perature, Defin es; Various The action in syste tal energy E, V perties of Pure nation of Pure real gas mixtur nst. temperatur ated states; P-	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence es; electrical, magne nition of thermal eque ention of thermal eque ermometers- Definit ms- First Law for C various modes of en e substances substance, Ideal Gar res, Compressibility re and Const. pressu v-T surface; Use of	error volumes, in situ perties of substances version devices and t grade energies. e Contents modynamics ume; Property, State ynamic definition of of displacement worl tic, gravitational, spr uilibrium and Zeroth tion of heat; example cyclic & Non-cyclic p ergy, Internal energy ses and ideal gas mix charts- Properties of the heating of water; steam tables ; Satura	& Proce & Proce work; ex k and illu ring and law; Te es of hea processes y and En ctures, R f two pha Definition ation tabl	III IV V ss; Exact & kamples; istrations shaft work. mperature t/work s; Concept thalpy eal gases ase systems ons of les;	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>for s</li> <li>Tem</li> <li>scale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defin</li> <li>and n</li> <li>- Con</li> <li>satur</li> <li>Supe</li> </ul>	damentals and w te changes in t te the perform ntiate between damentals even hamentals - Sy act differential lacement work imple processes perature, Defin es; Various The action in syste tal energy E, V perties of Pure real gas mixtur nst. temperatur ated states; P- rheated tables	to systems and cor ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>I First law of Ther</b> stem & Control volu s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal equermometers- Definit ms- First Law for C /arious modes of en e <b>substances</b> substance, Ideal Gas res, Compressibility re and Const. pressu y-T surface; Use of ; Identification of st	erries of substances version devices and t v grade energies. e Contents modynamics ume; Property, State ynamic definition of of displacement worl atic, gravitational, spu uilibrium and Zeroth tion of heat; example cyclic & Non-cyclic p ergy, Internal energy ses and ideal gas mix charts- Properties of the heating of water; steam tables ; Satura ates & determination	& Proce work; ez k and illu ring and law; Te es of hea processes y and En ctures, R f two pha Definition tabl n of prop	III IV V ss; Exact & kamples; istrations shaft work. mperature t/work s; Concept thalpy eal gases ase systems ons of les; erties,	Apply Analyze Evaluate Hours 8				
CO1 CO2 CO3 Module	<ul> <li>Write of involvi</li> <li>Evalua</li> <li>Evalua</li> <li>differe</li> <li>Fund</li> <li>Fund</li> <li>Fund</li> <li>for si</li> <li>for si</li> <li>for si</li> <li>cale</li> <li>inter</li> <li>of to</li> <li>Prog</li> <li>Defin</li> <li>and n</li> <li>- Con</li> <li>satur</li> <li>Supe</li> <li>Moll</li> </ul>	damentals and te changes in t te changes in t te the perform ntiate between damentals entry act differential lacement work imple processes perature, Defin es; Various The action in syste tal energy E, V perties of Pure real gas mixtur nst. temperatur rated states; P- rheated tables ier's chart.	to systems and corr ork interactions. hermodynamic prop ance of energy conv high grade and low <b>Module</b> <b>First law of Ther</b> stem & Control volues; Work - Thermody s; Work - Thermody c; Path dependence of es; electrical, magne nition of thermal eque ermometers- Definit ms- First Law for C Various modes of en e substances substance, Ideal Gas res, Compressibility re and Const. pressu v-T surface; Use of ; Identification of st	e Contents modynamics are; Property, State ynamic definition of of displacement work tic, gravitational, spu uilibrium and Zeroth tion of heat; example ycyclic & Non-cyclic p ergy, Internal energy ses and ideal gas mix charts- Properties of the heating of water; steam tables ; Satura ates & determination	& Proce & Proce work; ex k and illuring and a law; Te es of hear processer y and En ctures, R f two phar Definition ation table n of prop	III IV V ss; Exact & camples; istrations shaft work. mperature t/work s; Concept thalpy eal gases ase systems ons of les; erties,	Apply Analyze Evaluate Hours 8				

	First Law for Flow Processes - Derivation of general energy equation for a							
	control volume; Steady state steady flow processes including throttling;							
	Examples of steady flow devices; Unsteady processes; numericals on of steady							
	and unsteady flow processes,							
	Second Law of Thermodynamics							
	Second law - Definitions of direct and reverse heat engines; Definitions of							
IV	thermal efficiency and COP; Kelvin-Planck and Clausius statements;	6						
	Definition of reversible process; Internal and external irreversibility; Carnot							
	cycle; Absolute temperature scale.							
	Clausius inequality and Availability							
	Clausius inequality; Definition of entropy S; entropy S is a property;							
	Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures							
	undergoing various processes; Determination of entropy from steam tables-							
V	Principle of increase of entropy; Illustration of processes in T-s coordinates;	7						
	Definition of Isentropic efficiency for compressors, turbines and nozzles-							
	Irreversibility and Availability, Availability function for systems and Control							
	volumes undergoing different processes, concept of Lost work.							
	Second law analysis for a control volume and Thermodynamic cycles							
	Second law analysis for a control volume. Exergy balance equation and Exergy							
VI	analysis. Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression	6						
	cycle and comparison with Carnot cycle.							
	Text Books							
1	P. K. Nag "Thermodynamics", Tata McGraw Hill Publication, 3rd Edition, 2006							
2	V. P. Vasandani and D. S. Kumar, "Heat Engineering", Metropolitan Book Compar	ny, 2nd						
2	Edition, 1975							
2	R. Yadav, "Fundamentals of Thermodynamics", Central Publication house, Allahat	oad, Revised						
3	7th Edition, 2011.							
	References							
	Cengel and Boles, "Thermodynamics an Engineering Approach", Tata McGraw-Hi	ll publication,						
1	Revised 7th Edition 2016							
	Sonntag, R. E, Borgnakke, C. and Van Wylen, G. J. "Fundamentals of Thermodyna	mics", John						
2	Wiley and Sons, 6th Edition, 2003.							
-	Jones, J. B. and Duggan, R. E. "Engineering Thermodynamics", Prentice-Hall of In	idia, 2nd						
3	Edition, 1996	,						
4	Moran, M. J. and Shapiro, H. N. "Fundamentals of Engineering Thermodynamics".	John Wilev						
	and Sons. 3rd Edition 2003.	5						
<u> </u>								
	Useful Links							
1	https://nptel.ac.in/courses/112/105/112105123/							

	CO-PO Mapping													
	Programme Outcomes (PO) PSO					SO								
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2											1	
CO2	3	2	1										1	
CO3	3	2	3		2	1							1	
The stren	gth of 1	nappin	ig is to	be wri	tten as	1,2,3;	Where	e, 1:Lo	w, 2:M	edium	, 3:Hig	h		-

AssessmentThe 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 Al	<b>Y 2022-23</b>	uie)				
			Cours	se Information					
Progr	amme		B.Tech. (Mechani	cal Engineering)					
Class.	Seme	ster	Second Year B. To	ech., Sem III					
Cours	e Cod	e	6ME202						
Cours	e Nan	ie	Materials Enginee	ring					
Desire	d Req	uisites:		0					
T	eachin	g Scheme		Examination So	cheme (Ma	arks)			
Lectu	re	4Hrs/week	MSE	ISE	ESI	E	Total		
Tutor	ial	-	30	20	50		100		
				Cred	its: 4	I			
		1	•						
			Cou	rse Objectives					
1	Ton	ake the students	s familiarize with pr	operties of different	metals and	their micr	ostructural and		
	cryst	allographic rele	vance.						
$\frac{2}{2}$	Tod	escribe solidific	ation behavior of me	etals and its alloys ai	nd to predic	et their mic	rostructure.		
<u> </u>	Ton	ake students to	investigate various	NDT methods	etanui gy.				
	101	lake students to	investigate various	TOT methods.					
		Cou	rse Outcomes (CO	) with Bloom's Tax	onomy Le	vel			
At the	end of	the course, the	students will be abl	e to,					
GO					Bloom's	Bloom's			
CO		(	Course Outcome St	atement/s		I axonon v Level	1 I axonomy Description		
	Rela	te influence of in	mperfections in plas	tic deformation proc	ess,	III	Apply		
COI	stren	gthening mecha	nism and show its e	fiect over mechanica					
CO2	Expl	ain various phas	se transformations a	nd classify various h	eat	IV	Analyze		
	Appl	ment processes.	nowder metallurgy	process special grad	la	V	Evaluata		
CO3	mate	rials in engineer	ing applications.	process, special grad	10	v	Evaluate		
			<u> </u>						
Modu	le		Modu	le Contents			Hours		
	N	Iechanical Beha	viour of Metals, In	troduction to Science	e of metals	, Propertie	s		
I	0	f metals, Cryst	al defects, Deform	ation of metals, R	ole of disl	locations in	n 6		
	D T	eformation, Str	engthening Mechan	isms, Theory behind	creep.	and Non			
II		Destructive testir	ng methods). Introdu	iction to Fracture. fa	ilure case s	tudies	- 7		
	P	hase Diagram	and Phase Transfe	ormations, Objectiv	es and cla	assification	l,		
	S	ystem, phases	and structural cons	stituent of phase di	agram, Iro	on –Carbo	n		
	e	quilibrium diagr	am, Coring and den	dritic segregation, Gi	bb's phase	e rule, Leve	r		
	d	iagrams for nor	ions, Eulectic, Peri i -ferrous alloys Ex	sperimental methods	of determ	ining phas	e		
Ш	d	iagrams.		spermentar methods	of determ	ming phus	7		
	Phase transformations: - Concept of solidification of metals, Solidification of								
	p	ure metals, Nuc	cleation, Growth, G	rowth of the new p	hase, Solic	lification o	f		
	a L	lloys, Nucleatio	on, growth and ove	erall transformation	rates, TT	I and CC	Ľ		
		lagrains. Jeat Treatment	Processes Definit	ion Purpose and	classificati	on of her	t		
	1   1	eatment process	ses for various types	of steels. Bainite and	Martensit	e formation	  ,		
IV		Concept of Har	rdenability, Introdu	ction and applicat	ions of va	arious cas	e 6		
	h	ardening and su	urface hardening tre	atments, Precipitation	on Hardeni	ng, Therm	0		
	<u>n</u>	nechanical treat	nents. Heat treatmen	nt defects.	<u> </u>	1			
l V	P	owder Metallur	gy, Introduction, N	Anufacturing route	for – Too	ol materials	5,		

	bearings and bushes, electrical contacts, brake pads etc., failure of powder metallurgy components -case studies, Economic, Environmental and Social	7
	Issues in Materials Science and Engineering.	
VI	Application and properties of Stainless steel, Duplex stainless steels, Nickel alloys, HSLA, Maraging stainless steels, Precipitation hardenable stainless steels, Martensitic stainless steels, Carbon steels for General purpose and	6
	pressure containing parts.	
	Text Books	
1	V. Raghvan, "Solid State Phase Transformations", PHI Publication, 1st Edition, 198' Reprinted 2004.	7,
2	V. Raghvan, "Physical Metallurgy: Principles and Practice", PHI Publication, 3rd Ed	lition, 2015.
3	William D. Callister, "Fundamentals of Materials Science and Engineering", Wiley I 9th Edition, 2014.	ndia Pvt. Ltd,
	References	
1	Sidney H. Avener, "Physical Metallurgy", Tata McGraw Hill Education Private Edition, 2017	Limited, 2nd
2	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metri Revised edition, 2013.	c Edition, 3rd
3	Ashok Sharma, Rajan, "Heat Treatment: Principles & Techniques", PHI Learning Delhi, 2nd edition, 2011.	Pvt. Ltd-New
	Useful Links	
1	https://www.youtube.com/watch?v=KMcsjCXfLQw&list=PLyAZSyX8Qy5Am_2St 3VIcAenE	OOQ5vCUE
2	https://www.youtube.com/watch?v=5nBBUahtzc&list=PLyAZSyX8Qy5C8ciqBBlyyUbL	pbx91j4now
3	https://onlinecourses.nptel.ac.in/noc22_mm05/preview	

CO-PO Mapping														
	Programme Outcomes (PO)							PSO						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
C01			3										2	1
CO2			2						2			1		1
CO3			2									1	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 d	course	must r	nan to	at leas	t one P	0							

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 Al	$\mathbf{V}$ 2022-23	tute)			
				so Information				
Progr	amm		B Tech (Mechani	cal Engineering)				
Class	Sem	lester	Second Year B Te	ech Sem III				
Cours		do	6MF203					
Cours		me	Strength of Materi	iale				
Desire		nic misites	Basic Engineering	Mechanics				
Desire	u itt	quisites.	Dusie Engineering	, wreenames				
Т	eachi	ing Scheme		Examination So	heme (M	arks)		
Lectu	re	3 Hrs/week	MSE	ISE	ES	E	Total	
Tutor	ial	1 Hrs/week	30	20	5(	)	100	
1 4001				Credi	its: 4		100	
			Com	rse Objectives				
	То	make the students	s understand the nat	ure of stresses develo	oned in sir	nnle geome	ries such as	
1	bar	s, cantilevers, bea	ms, shafts, cylinder	s and spheres for var	rious types	of simple l	bads.	
2	То	enable the studen	ts to calculate the el	lastic deformation oc	curring in	various sim	ple geometries	
	for	different types of	loading.					
						-		
At the	and	Cou of the course, the	rse Outcomes (CO	) with Bloom's Tax	onomy Le	evel		
At the		of the course, the	students will be abi	e t0,		Bloom's	Bloom's	
СО	Co	urse Outcome St	atement/s			Taxonomy	Taxonomy	
						Level	Description	
CO1	Un	derstand the natur	e of internal stresse	s that will develop w	vithin	II	Understandi	
	the	components.					ng	
CO2	Cal	culate the stresses	s in various simple o	components due to d	ifferent	III	Applying	
	Fvs	uings. aluate the strains a	and deformation tha	t will result due to th	e	IV	Analyzing	
CO3	elas	stic stresses devel	oped within the mat	terials for simple typ	es of	1 4	7 maryzing	
	loa	ding.	1	1 71				
Modu	ıle		Modu	le Contents			Hours	
		Stresses and stra	ain					
I		Deformation in s	olids- Hooke's law,	stress and strain- ter	ision, com	pression and	6	
		shear stresses- ela	astic constants and t	their relations- volur	netric, line	ear and shear	ſ	
		Torsion and She	er force and bendi	ing moment diagram	m			
п		Torsion, stresses	and deformation in	circular and hollow	shafts, ste	epped shafts	, 7	
		deflection of shafe	fts fixed at both end	s, stresses and deflec	tion of he	lical springs		
		Stresses in beam	15	1 1 0				
		Beams and types	s transverse loading	; on beams- shear for	brce and b	end momen	t	
III		cantilevers Theo	ry of bending of be	ams bending stress of	listribution	iging beams	, 7	
		axis, shear stress	distribution, point a	7				
		used sections	, F	,		·~ · · · · · · · · · · ·		
		Deflection of bea	ams					
IV		Moment of inert	ia about an axis an	d polar moment of	inertia, de	flection of a	1 7	
		beam using doub	le integration metho	od, computation of si	lopes and	deflection ir		
		Principal Stress	s reciprocal theorem	115				
v		Normal and shea	r stress on oblique	planes, principal stre	esses and r	lanes. Moh		
		Circle. Combined	d effect of bending a	and shear in beams.	Theories of	f failure	6	
VI		Buckling of Colu	umns					
	VI Euler's formula for different end connections, concept of equivalent length, 6							

	eccentric loading, Rankine formula
	Text Books
1	Beer and Johnson, Mechanics of Materials, McGraw Hill, 6th Edition, 2013
2	Hibbeler, R.C., Statics and Mechanics of Materials, Prentice-Hall, SI Edition, 2004
3	Ramamurthum, Strength of materials, Dhanpat Rai and Sons New Delhi, 3rd edition, 2009
	References
1	Den Hartog, Jacob P., Strength of Materials. Dover Publications Inc., 3rd Edidtion 1961
2	Timoshenko S., Strength of Materials, Krieger Publishing Company, 3rd edition, 1976
3	Mott, Robert L., Applied Strength of Materials, Prentice-Hall, 4th edition, 2002
	Useful Links
1	https://nptel.ac.in/courses/112/107/112107146/
2	https://nptel.ac.in/courses/112/107/112107147/
3	https://www.coursera.org/learn/mechanics-1
4	https://ocw.mit.edu/courses/materials-science-and-engineering/3-11-mechanics-of-materials-fall- 1999/

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

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 Engineerin	ig, Sang	,li						
			(Government Al	<b>V 2022-23</b>	uie)							
				a Information								
Duogu	0 <b>mm</b> 0		R Tech (Mechan	ical Engineering)								
Class		-	B. Tech. (Mechan Second Veen D. T.	ach Sam III								
Class,	Semes	ler	Second Tear D. To									
Cours	e Code		6ME204	T								
Cours	e Name	•••	Manufacturing Pro	ocesses - I								
Desire	ed Requ	usites:										
		~ -										
T	eaching	Scheme		Examination Sc	heme (M	arks)		_				
Lectu	re	4 Hrs/week	MSE	ISE	ES	E	To	tal				
Tutor	ial	-	30	20	50	)	10	0				
				Credi	its: 4							
		Course Objectives										
1	To un	To understand classification of manufacturing processes and develop an interest in primary										
-	shapir	shaping processes.										
2	To <b>ex</b> extrus	To <b>explain</b> the basic fundamentals in metal forming processes such as casting, forging, rollin extrusion, wire drawing, sheet metal working etc.										
3	To gain an understanding and <b>interpret</b> the breadth and depth of the field of manufacturing processes (primary shaping processes)											
4	To learn and apply the basic terminology associated with primary shaping processes.											
5	To evaluate the number of passes / stages and forces required in forming processes.											
6 To study the recent developments in metal forming processes.												
• To study the recent developments in metal forming processes.												
		Cou	rse Outcomes (CO	) with Bloom's Tax	onomy Le	evel						
At the	end of	the course, the	students will be abl	e to,								
СО	Cours	se Outcome St	atement/s			Bloom's Taxonomy Level	Bl Tax Dese	oom's conomy cription				
CO1	To su	mmarize and cl	lassify different mar	nufacturing processes	5	II	Unc	lerstand				
CO2	To ske	etch and articul	late different primar	y shaping processes.		III	A	pply				
CO3	To illı	istrate and con	clude the selection of	of proper primary sha	aping	IV	A	nalyse				
	proces	ss for a particul	ar components.									
	•							TT				
Modu		• 6• 4• 6		dule Contents	a			Hours				
I	Classification of Manufacturing Processes and Metal Casting Classification of manufacturing processes and Metal Casting Classification of manufacturing processes, their advantages, applications, limitations etc.Metal Casting – I: Importance of casting, advantages, disadvantages and limitations of casting processes. Status of foundry industry at national and international level. Pattern materials, types of patterns, pattern allowances and colour codes used. Types of sand, their properties. Moulding and core making processes, Green sand Moulding, shell Moulding, CO2 Moulding. Components of gating system, functions and importance											
П	M Pe pro foa M / g sel the	etal Casting – rmanent mould essure die-casti am casting inve- elting, pouring as fired furnac- lection criteria, eir causes and r	II: I casting processes s ing, Centrifugal cast estment casting. g in Metal Casting: es, crucible furnaces their applications. ( remedies. Processes:	such as Continuous c ting, Vacuum die cas Types of melting F s, Electrical furnaces Cleaning-fettling of c	asting, Gr ting, Sque urnaces-C , Rotary fi castings. C	avity die cast eze casting. I upola furnace urnaces. Furr Casting defect	ing, Lost e, oil ace s,	9				
III		ot. cold and y	vorm working. Re	covery and Recryst	allization.	Formability	and	8				

	parameters affecting the yield strength of materials.	
	Classification of various metal Forming processes, their special features with respect	
	to other manufacturing processes. Friction and lubrication in Metal Forming	
	processes. Stresses in Metal Forming process.	
	Forging:	
	Basic operations, types of forging, forging hammers/ presses, forging stages and	
	force calculations, die design considerations, forging applications, Defects and	
	remedies in forging process.	
	Rolling	
	Classification of rolling processes, rolling mill types, condition for natural entry in	
	rolling operation, number of passes in rolling, roll bite, elongation, reduction, rolling	
	of sheets, plates, bars, sections and tubes, Ring Rolling and Thread Rolling	
IV	operation, Case studies of products such as crank-shafts, different types of sections	9
	etc. Applications, defects and remedies in rolling process.	-
	Extrusion:	
	Equipment and principles, types of extrusion, direct, indirect, impact, continuous,	
	hydrostatic, tube extrusion, metal flow in extrusion, Die design considerations,	
	factors affecting extrusion load, defects and remedies in extrusion.	
	Drawing:	
	Types of Drawing, Rod/wire drawing, Die Design considerations, equipment and	
	principles of process, Tube drawing, Seamless pipe manufacturing. defects and	
V	remedies in drawing.	10
	Introduction process operations types of diag. Nexting (strip layout) of sheet. Foreas in	10
	hanking Drawability of sheet metal. Doop drawing Redrawing Tractrix dias	
	Forming limit diagrams (FLD). Dialoss forming of sheet metal	
	Pornning minit diagrams (FLD). Dieless forming of sheet metal.      Decent Developments in Foundry and Motel Forming: Electrose moulding in	
	foundry. High energy rate forming processes such as Explosive forming. Electro-	
	hydraulic forming, Electromagnetic forming, Magnetic pulse forming, Metal forming	
VI	in mashy state, forming by Laser beam / plasma arc etc	7
	Modernization mechanization and use of computers in foundries and forming	,
	industries.	
		1
	Text Books	
1	P.N. Rao, "Manufacturing Technology- Foundry, Forming and Welding", Vol. I Tata M	IcGraw-
1	Hill, 4 <sup>th</sup> edition, 2013, ISBN: 9781259062575	
2	P.C. Sharma, "A Textbook of Production Technology (Manufacturing Processes)", S. C	hand &
	Co., 8 <sup>th</sup> Edition, 1999, ISBN: 978-8121901116	
3	P. L. Jain, "Principles of Foundry Technology", Tata McGraw-Hill, New Delhi, 5th Edition	on,2009,
	ISBN: 0070151296, 9780070151291	
4	B. L. Juneja, "Fundamentals of Metal Forming Processes", New Age International (P)	Limited,
	1 <sup>st</sup> Edition, 2007	
5	R. K. Rajput, " A Textbook of Manufacturing Technology", Laxmi Publications	, 2016,
	ISBN:9788131802441	
	References	
1	E. Paul DeGarmo, J.T. Black, Ronald A. Kosher, "Materials and Processes in Manufac	turing",
	John Wiley and Sons Ltd, 9th revised edition, 2004.ISBN:,9780471656777	
2	Schuler GmbH, "Metal Forming Handbook", Springer, 5th Edition, 1998	
3	Kalpakjian and Schmid, "Manufacturing processes for engineering materials", Pearso	on India
	Limited, /" Edition-2008,ISBN: 9/80132272/11	
4	Heinz Ischaetsch, "Metal Forming Practise, Processes, Machines, Tools", Springer, 7 <sup>th</sup>	Edition,
	2005 V. N. Danahanka, "Matal Famina", Ministry of Education and Science of Ultraine, Natio	
5	V. IN. Danchenko, Wietai Forning, Winnstry of Education and Science of Ukraine, Nation Metallymer, A so domes of Ukraine, Eist Edition, 2007	lial
	Metallurgy Academy of Ukraine, First Edition, 2007	
1	Useful Links	
	nttps://www.vlab.co.in/broad-area-mechanical-engineering	
$\frac{2}{2}$	nttp://viabs.iitb.ac.in/viab/labsme.html	
5	nups://youtu.be/IXIK2XYFWQU	
4	nttps://youtu.be/EcebuzUNVyE	

5	https://www.youtube.com/watch?v=zvc5OoYPL7M
6	https://youtu.be/2CIcvB72dmk
7	https://youtu.be/748_ME0p0Ag
8	https://www.youtube.com/watch?v=y6G2eiy6X04
9	https://onlinecourses.nptel.ac.in/noc21_me30/preview
10	https://youtu.be/o3kaIwbOq1E
11	https://www.youtube.com/watch?v=PB49vko0II0
12	https://www.youtube.com/watch?v=yGKym19qxiM&t=16s
13	https://youtu.be/XNG3ewS39Lw
14	https://www.youtube.com/watch?v=Ic8Uc41IK1I

	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			2						3				2		
CO3			2						1					2	
The stren	The strength of mapping is to be written as 1.2.3: Where, 1:Low, 2:Medium, 3:High														

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 (Government A	ge of Engineerin	<b>ig, San</b> g	gli				
			A	Y 2022-23	/					
			Cour	se Information						
Progra	amme		B.Tech. (Mechan	ical Engineering)						
Class.	Semest	ter	Second Year B.T.	ech., Sem III						
Cours	e Code		6ME251	· · · · · · · ·						
Cours	e Name	<u>د</u>	Thermodynamics	Lab						
Desire	d Rear	isites:								
Т	eaching	g Scheme		Examination Sector	cheme (N	larks)				
Practi	cal	2Hrs/Week	LA1	LA2	E	SE	Total			
Intera	ction		30	30	4	0	100			
				Cred	its: 1	·				
			Cou	rse Objectives						
1	To im	part the techniq	ues to find physica	l properties of the oil	ls, greases	s, and solid f	uels used in			
1	steam	generators.								
2	To pro	epare the studer	ts for applying law	s of thermodynamics	s to variou	us thermodyn	amics devices.			
3	To de	velop the skills	of students for eval	luating performance	of thermo	odynamics sy	stems.			
		Com	so Autoomos (CA	) with Plaam's Tax	onomy I	aval				
At the	end of	the course the	students will be abl	e to	ununny L	evel				
At the child of the course, the students will be able to, Rhom's Rhom's Rhom's										
СО		C	ourse Outcome Sta	atement/s		Taxonomy	Taxonomy			
						Level	Description			
CO1	Deter	mine the proper	ties of fluids used	in various industrial	systems	III	Apply			
	Such a	is Mechanical F	fic value of a g	ystems. iven fuel by using	Romh	IV	Apalyza			
CO2	calori	meter.	ne value of a g	rven nuel by using	, Donio	1 V	Anaryze			
CO3	Apply	first law of the	rmodynamics to va	arious cyclic systems	•	V	Evaluate			
			·	· ·			·			
			List of Exper	iments / Lab Activi	ties					
List of	f Exper	iments:								
Fuel t	testing	<b>C</b> 1	· · , ,							
	Test of Test	on Grease dropp	oing point apparatus	S.						
2.	Test	on Aniline point	annaratus							
4.	Deter	mination of flas	h and fire point of	a lubricating oil.						
5.	A test	on Bomb calor	rimeter.	C						
Theri	modyna	amics Laws ap	plication							
1.	Vapo	r compression to	utor.							
2.	Alf CO Mini d	steam power pl	Dr. ant							
4.	Cooli	ng Tower.								
5.	Meas	urement of ther	mal conductivity of	f metal rod under stea	ady state of	conditions.				
6.	Recip	rocating compr	essor unit.							
7.	Intern	al combustion	engine setup.							
			<del>_</del> <del>_</del>							
1	PK	Nag "Thermody	mamics" Tata Mat	Graw Hill Publication	n 3rd Edi	ition 2012				
2	V. P.	Vasandani and I	D. S. Kumar, "Heat	Engineering", Metro	politan B	Book Compan	y, 2nd Edition.			
3	R. Ya	dav, "Fundamer n 2011	ntals of Thermodyn	amics", Central Publ	ication ho	ouse, Allahab	ad, Revised 7th			
	Lanio									

References

1	Cengel and Boles, "Thermodynamics an engineering Approach", Tata McGraw-Hill publication, Revised 7th Edition, 2011,
2	R. Yadav, "Thermodynamics and heat engine", Central Publication house Allahabad, Revised 7th Edition. 2016
3	R. Yadav, "Steam and Gas Turbine", Central Publication house, Allahabad, Revised 7th edition,2010
	Useful Links
1	https://www.youtube.com/watch?v=g8LrAsL4oH0&list=PLRoYs08qHtE7HDTE3KerpAWPyqf
1	QiEq8x
2	https://www.youtube.com/watch?v=h9LeZs0N8qQ
3	http://htv-au.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	3	2											1		
CO2	3	2	1		3			3	3		3		1		
CO3	<b>3</b> 3 2 3 2 1 3 1 1														
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.														

		Asses	sment								
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%											
Assessmen         Based on         Conducted by         Typical Schedule         M											
t				s							
та1	Lab activities,	Lab Course	During Week 1 to Week 8	20							
LAI	attendance, journal	Faculty	Marks Submission at the end of Week 8	50							
Ι Δ 2	Lab activities,	Lab Course	During Week 9 to Week 16	20							
	attendance, journal	Faculty	Marks Submission at the end of Week 16	50							
		Lab Course									
	Lab activities,	Faculty and	During Week 18 to Week 19								
Lab ESE	journal/	External	Marke Submission at the and of Week 10	40							
	performance	Examiner as	Warks Submission at the end of week 19								
		applicable									

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	g, Sang	gli						
			(Government All	Y 2022-23	uie)							
			Cours	se Information								
Progr	amme		B.Tech. (Mechani	cal Engineering)								
Class,	Semest	er	Second Year B.Te	ech., Sem III								
Cours	e Code		6ME252									
Cours	e Name	;	Materials Enginee	ring Laboratory								
Desire	ed Requ	isites:										
			1									
Т	eaching	Scheme		Examination So	cheme (M	larks)						
Practi	cal	2Hrs/Week	LA1	LA2	ES	SE	Total					
Intera	ction	-	30	30	4	0	100					
	Credits: 1											
	,		Cour	se Objectives								
1	To der	nonstrate destr	uctive and non-dest	ructive test methods.								
2	To des	scribe solidifica	tion behaviour of n	netals and its alloys a	and to pre	dict their mici	ostructure,					
3	To dei	nonstrate meth	odology for metallo	oranhic sample pren	aration							
	10 401	inoniburate intern	ouology for metano	Stupine sumple prep	urution							
		Cour	se Outcomes (CO)	with Bloom's Taxe	onomy L	evel						
At the	end of t	he course, the	students will be able	e to,								
CO	D Course Outcome Statement/s Bloom's Bloom's Townsony											
	Course Outcome Statement/s         Taxonomy         Taxonomy           Level         Description											
CO1	Exami	ne various dest	ructive and non des	structive testing meth	ods	III	Apply					
CO2	Estima	ate effect of ph	ases present in the 1	microstructure over j	physical	IV	Analyze					
	proper	ties of material	S.			<b>X</b> 7						
003	Perfor	m metallograpi	nic sample preparati	ion process.		V	Evaluate					
			List of Experi	ments / Lab Activit	ies							
List of	f Experi	iments:										
1. T	ensile te	st as per ASTN	I/IS standards.									
2. H	lardness	test										
3. C 4. D	emonsti	ation tests- Ult	rasonic testing. Ma	gnetic particle test. I	Ove penet	rant test. Spar	k Test.					
S	pectro c	hemical analys	is, Thickness measu	rement test, Electric	al conduc	tivity measure	ement test.					
5. D	etermin	ation of volume	e fraction of phases.									
6. D	etermin	ation of grain s	ize of metals and al	loys.	~							
7. D 8 D	etermin	ation of harden	ability of a given st	eel component	8.							
9. M	letallog	aphy/Microstru	actural examination	test on ferrous and r	non ferrou	is metals and	alloys as per					
10. H	leat treat	ment of steels.										
11. C	reep tes	t .										
12. I	nermal a	anarysis										
			Т	ext Books								
1	V. Ra 2004.	ghvan, "Solid S	State Phase Transfo	rmations", PHI Pub	lication, 1	st Edition, 19	987, Reprinted					
2	V. Rag	ghvan, "Physica	al Metallurgy: Princ	iples and Practice",	PHI Publ	ication, 3rd E	dition, 2015.					
3	Willia 9th Ed	m D. Callister, lition, 2014.	"Fundamentals of M	Materials Science and	d Enginee	ering", Wiley	India Pvt. Ltd,					
1	0:1	, II A 4		References	<b>IIIIIIIIIIIII</b>	nation Dringe	Limited 2nd					
	Sidney	H. Avener,	Physical Metallurg	gy', Tata McGraw	HIII Educ	cation Private	Limited, 2nd					

	Edition, 2017
2	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metric Edition, 3rd
2	Ashok Sharma, Rajan, "Heat Treatment: Principles & Techniques", PHI Learning Pvt. Ltd-New
5	Delhi, 2nd edition, 2011.
	Useful Links
1	https://sm-nitk.vlabs.ac.in/#
2	https://www.youtube.com/watch?v=D8U4G5kcpcM

	CO-PO Mapping													
		Programme Outcomes (PO) PSO												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	1	1	3										2	1
CO2														
CO3	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	Each CO of the course must map to at least one PO, and preferably to only one PO.													

		Assessment		
There are thre	e components of lab a	assessment, LA1, LA2 and	Lab ESE.	
IMP: Lab ESH	E 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 indica	ites starting week of a	semester. Lab activities/L	ab performance shall include performance shall include performance shall include performance shall be able to	rming

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 College	of Engineering,	Sang	li	
			(Government Aut	2022-23	/		
			Course	Information			
Progr	amme		B Tech (Mechanica	al Engineering)			
Close	Somost	0 <b>r</b>	Second Veer B. Tee	b Som III			
Class,	Semest	CI	6ME254				
Cours	e Coue		Manufacturing Proc	and Llab			
Doging			Manufacturing Froe				
Desire	a kequ	isites:					
Т	ooching	Sahama		Examination Sala	mo (M	orka)	
Drooti	catining	2Hrs/Wook	TA1				Total
Intono	cal	21115/ W CCK	20	20			100
Intera		-		JU	4		100
				Creans:	1		
			Course	o Obioativos			
	To day	monstrata diffa	ront wood working r	rocossos typos of pat	torn d	amonstration	and hands on
1	experi	ence of pattern	making	nocesses, types of par	uern, u	emonstration	and namus on
2	To exp	plain various ty	nes and properties of	molding sand			
3	To cla	ssify and study	different metal form	ing processes and proc	cess par	rameters.	
	To acc	uire knowledg	e of number of passes	s, die angle in wire dra	awing a	and stages red	uired in metal
4	formir	ig operations.	I	, U	U	0	1
5	To ac	quire the know	wledge of press too	ls, strip layout, deep	draw	ing and nun	ber of draws
5	require	ed.				-	
		Cou	rse Outcomes (CO) v	with Bloom's Taxono	my Le	evel	
At the	end of t	he course, the	students will be able t	to,			
CO	Cours	e Outcome St	atement/s			Bloom's Taxonomy	Bloom's Taxonomy
	Cours	e outcome ba				Level	Description
CO1	Show	the types of pa	tterns, demonstrate a	and hands on experien	ce of	III	Apply
<u> </u>	Comp	are different ty	nes of metal forming	Process		IV	Analyze
	Recon	mend the prop	perties of sand numb	er of passes in rolling	r die	V	Evaluate
CO3	angle	in wire drawi	ng, number of draws	s and strip layout in	sheet	·	Livalaute
	metal	working	6,	I			
CO4	Comp	ose reports bas	ed on industrial visits			VI	Create
			List of Experin	nents / Lab Activities			·
List of	f Experi	ments:					
A. Der	monstra	tion of types o	of patterns and hand	ls on experience of Pa	attern	making	
[Locat	ion: Car	pentry shop]	[4 Hrs] – Brief re	port submission			
B. Sar	nd Testi	ng (Any four)	[Location: Foundry S	Shop] [8 Hrs]		11	
	Prepai	ation of sand f	or mould and core ma	aking with demonstrat	ion of s	small compoi	nents
2.	I ensil	e, Compressive	e and shear strength o	f molding sand			
<b>3</b> .	Moist	adding test for	for molding sand				
	Hardn	ess test (mould	/core) [Green and Di	rvl			
6.	Sand s	rain Size analy	vsis (Grain Fineness N	No. on Sieve Shake an	paratus	s)	
C. Me	tal forn	ing (Anv four	·) [8 Hrs]	in sieve shake up	<u>r m mun</u>	~/	
1.	Demo	nstration of ope	en, closed and precisi	on die forging using n	nodels	charts.	
2.	Study	of rolling proc	ess by using model or	r chart and evaluation	of num	ber of passes	in rolling
	operat	ion.					
3.	Study	of metal extrus	sion process using mo	odel or chart.			

- 4. Study of wire drawing process and evaluate optimum die angle for wire drawing.
- 5. Study of various types of press tools and analysis of strip layout in sheet metal working.
- 6. Study of deep drawing process and evaluate number of draw and force required for deep drawing.

3. Report on industry visits related to Foundry and metal forming industries - [4 Hrs].

	Text Books
1	P. N. Rao, "Manufacturing Technology- Foundry, Forming and welding", Vol. I Tata McGraw- Hill, 4 <sup>th</sup> edition, 2013, ISBN: 9781259062575
2	P.C.Sharma, "A Textbook of Production Technology(Manufacturing processes)", S. Chand & co.,8 <sup>th</sup> revised edition 2014. ISBN:8 I -219- 1 114-1
3	R. K. Rajput, "A Textbook of Manufacturing Technology", Laxmi Publications, 2016, ISBN:9788131802441
4	B.L.Juneja," Fundamentals of Metal forming processes", New Age International (P) Ltd., Publishers, 2018, 978-8122430899
5	R. K. Jain ,"Production technology", Khanna Publishers, Delhi, 17 <sup>th</sup> Edition,2001, ISBN: 9788174090997
	References
1	George E. Dieter, "Mechanical Metallurgy", McGraw Hill Book Company, Revised 3rd Indian edition, ISBN : 9780070168930, 2013
2	W.A.J. Chapman, "Workshop Technology", CBS Publishing & Distributors, New Delhi, Vol. I [ISBN13:9788123904016]2001, Vol. II [ISBN:9788123904115] 2007 and Vol. III [ISBN:9788123904122] 1995
3	P. H. Joshi, "Press Tools-Design and Construction", S. Chand & Company Ltd., 2010, ISBN:81-219-2938-5
	Useful Links
1	https://www.vlab.co.in/ba-nptel-labs-mechanical-engineering
2	https://www.vlab.co.in/broad-area-mechanical-engineering
3	https://www.youtube.com/watch?v=gOms0cwsK3Y
4	https://www.youtube.com/channel/UC7MhW1yD_wun48LBtBojtzw
5	https://www.youtube.com/watch?v=yGKym19qxiM
6	https://www.youtube.com/watch?v=AiBnWJD0HIc
7	https://www.youtube.com/watch?v=wtj_GhWb_jQ
8	https://youtu.be/HSn3G3r69QE

						CO-I	PO Ma	apping						
				P	rograi	nme O	utcon	nes (PC	))				PS	50
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1			1	2									2	
CO2	2												2	
CO3	2			2										2
CO4			2			2							1	
The stren	gth of	mappir	ıg is to	be wr	itten as	1,2,3;	Wher	e, 1:Lo	w, 2:M	ledium	, 3:Hig	gh		
Each CO	of the	course	must r	nap to	at leas	t one P	O, and	d prefer	ably to	o only o	one PC	).		
						As	ssessm	nent						
There are	three	compoi	nents o	of lab a	issessm	ent, LA	41, LA	A2 and	Lab ES	SE.				
IMP: Lab	ESE	is a sepa	arate h	ead of	passin	g.(min	40 %)	), LA1+	LA2 s	hould l	oe min	40%		
Assessme	ent	Ba	sed on	l	Cond	ucted	by		Ту	pical S	Schedu	ıle		Marks
		Lab a	ctiviti	es,	Lah	Cours	еТ	During	Week 1	to We	ek 8			
LA1		atte	ndance	e,	Fa	aculty		Marks S	Submis	sion at	the en	d of W	eek 8	30
		JC	urnal			J							-	

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	ates starting week of	a semester. Lab	activities/Lab performance shall include per	forming

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.

		Walc	hand College ( (Government Aided	of Engineering, Sar Autonomous Institute)	ngli	
			AY	2022-23		
			Course I	nformation		
Progra	amme		B.Tech. (Mechan	ical Engineering)		
Class,	Semester		Second Year B. T	ech., Sem IV		
Cours	e Code		6MA221			
Cours	e Name		Applied Mathema	atics for Mechanical Engi	neering.	
Desire	d Requisit	tes:				
	Teaching	Scheme		Examination Scheme	(Marks)	
Lectu	re	3Hrs/week	MSE	ISE	ESE	Total
Tutor	ial		30	20	50	100
				Credits: 3		
		I	1			
			Course	Objectives		
1	To devel	op mathematica	l skills and enhanc	e thinking power of stude	nts.	
2	To introd	uce fundamenta	l concepts of mathe	ematics and their applicat	ions in engine	ering fields
		Course	Outcomes (CO) w	ith Bloom's Taxonomy ]	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	Understa	nding mathemat	ical concepts in en	gineering field	III	Applying
CO2	Use math	nematical and co	omputational metho	ds to solve the problems	IV	Analysing
	in science	e and engineerin	ig field		1.	7 marysnig
	•			<b>N</b> ( )		
Modu			Module (	Contents		Hours
I	Deter even a half ra	mination of Fou and odd function ange Fourier sin	rier coefficients(Eu s, change of interva e and cosine series	ler's formulae), expansion al and functions having ar	, Definition, n of functions, bitrary period,	6
II	<b>Parti</b> equat	al Differential ions and applica	<b>Equations.</b> Four to one dimension	Standard forms of Parti ional Heat equation	al differential	5
III	Matr deterr Trans	<b>ices and its A</b> ninant, Jacobia lation, mirror sc	<b>pplication.</b> Transp in ,Banded Matri caling, concept of te	ose Adjoint, General pr x Transformation Matr ensor.	operties, rank ices Rotation	7
IV	Lapla functi Trans equati	ace Transform ons, Properties, form, Convolutions, Laplace tra	and Its Application , Transform of der tion Theorem, App ansform of periodic	<b>ons.</b> Definition, Transform rivative and Integral, In- plications to solve linear functions.	n of Standard verse Laplace ar differential	8
V	Vector vector of vec	<b>or Differential.</b> r field, tangent l ctor field, conser	Concept of vector f ine to the curve. Ve rvative vector field.	ield, directional derivativ elocity, acceleration, dive	es, gradient of rgent and curl	6
VI	Vector in pla	or Integral. Lin ne, Gauss Diver	e integrals, Surface gence theorem, Sto	e and volume integral, G okes's Theorem.	eens theorem	7
	(( ) *	1.5.	Tex	tbooks	<b>D</b> . <b>T</b>	
1	"Adva   1978,	anced Engineer 1st Edition.	ing Mathematics",	Erwin Kreyszig, Wiley	Eastern Limit	ed Publication,

	"A Text Book o[Applied Mathematics, Vol I and II", P. N. and J. N. Wartikar, Vidyarthi Griha
2	Prakashan, Higher Engineering Maths", B.S. Grewal, Khanna Publication, 2005, 39th Edition
	Pune, 2006.
	References
1	Advanced Engineering Mathematics ", Wylie C.R., Tata McGraw Hill Publication, 1999, 8th
1	Edition.
2	Advanced Engineering Mathematics ", H. K. Dass, S. Chand & Company Ltd., 1988, I " Edition
	Useful Links
1	https://www.youtube.com/watch?v=Na6N2DwdL_k&list=PLp6ek2hDcoNB3jiva0_CRJ-
1	1wmTOo98E0
2	https://www.youtube.com/watch?v=W3HXK1Xe4nc

						CO-PC	) Mapp	oing						
		Programme Outcomes (PO)										PSO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	2													
CO2	2													
The stren	gth of r	nappin	g is to ł	be writt	en as 1	: Low,	2: Med	ium, 3:	High					
Each CO	of the o	course 1	must m	ap to a	t least o	one PO.								

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 Engineeri	ng, Sang	gli	
			A	Y 2022-23			
			Cour	se Information			
Progr	amme		B Tech (Mechani	cal Engineering)			
Class.	Semes	ter	Second Year B Te	ch Sem IV			
Cours	e Code		6MF222				
Cours	o Nom	<u> </u>	Fluid Mechanics a	and Fluid Machines			
Dociro	d Dogi	usitos:	Thurd Wiechames a				
Desire	u neqi	iisites:					
Т	achine	Sahama		Examination	ahama (N	(onlyg)	
Loctu		2Urg/wook	MCE		Eneme (IV)	TALKS)	Total
Tectu		SHIS/WEEK		15E	E		100
Tutor		-		20	) 	0	100
				Crec	lits: 3		
			9				
	<b>m</b> 1		Cou	rse Objectives	<u> </u>		
	To lea	arn about the ap	oplication of mass a	nd momentum cons	ervation la	ws tor fluid fl	ows
2	To un	uersiand the in	portance of dimens	ations in various typ	es of simp	le flows	
<u> </u>	To an	alvze the flow	in water pumps and	turbines		ie nows	
	10 all	aryze the now	in water pumps and	turomes.			
		Cou	rse Outcomes (CO	) with Bloom's Tay	konomy L	evel	
At the	end of	the course, the	students will be abl	e to,	<b>v</b>		
						Bloom's	Bloom's
CO		С	ourse Outcome Sta	atement/s		Taxonomy	Taxonomy
	<b>F</b> 1	• .1 1 •			Cl · 1	Level	Description
CO1	Expla	in the basics of kinematics d	fluid properties, pr	essure measurement	, fluid	111	Apply
	Sumn	haries the basic	expressions and the	ory related to: fluid	1 statics	IV	Analyze
CO2	kinem	atics, dynamic	s. dimensional analy	vsis, boundary laver	theory	1,	T mary 20
	and it	s applications.			J		
CO3	Analy	ze roto dynami	ic machines for thei	r performance.		V	Evaluate
Modu	le		Modu	le Contents			Hours
	Pr	operties of Flu	uids				
I	Fl	uid Properties:	viscosity, vapour	pressure, compress	ibility, sur	face tension,	4
	M	ach number. Pr	essure at a point, va	riation in pressure, F	ascal law,	and Pressure	
	FI	uid Kinematic		ometers.			
	Di	ifferent approa	ches to study fluid	mechanics, Reyno	lds transp	ort Theorem.	
п	Fl	ow visualizatio	n, types of flow, str	ain rate, stream line	, streak lir	e, path lines,	7
11	sti	ream tubes, cor	ntinuity equation in	Cartesian coordinat	es in three	dimensional	/
	fo	rms, velocity a	ind acceleration of	fluid particles. Velo	ocity poter	ntial function	
	an	a stream functi	On.	Flows			
	M	omentum equa	tion. Nervier Stoke	equation. Developm	ent of Eule	er's equation	
	In	tegration of H	Euler's equation i.	e. Bernoulli's equ	ation, Ar	oplication of	
	Be	ernoulli's equat	tion, Steady and un	steady flow through	orifice. C	Drifice placed	
	in	pipe, Venturin	neter, flow over trian	ngular and rectangu	lar notches	s, pitot tube.	
III	Vi	scous/Lamina	r flow:				7
	Pl	ane poissullie f	low and coutte flow	, Laminar flow thro	ugh circula	ar pipes, Loss	
	Of   L)	nead due to fri	cuon in viscous flo	w, Power absorbed i	III VISCOUS	110W.	
	U)	ess in furbulen	t flow, major and m	inor losses (Darcy's	and Chezy	v's equation)	
	H	GL, TEL, Flow	through siphon pip	es, Branching pipes	and equiv	alent pipe.	
<b>T 1 1 1</b>	Di	imensional ana	alysis and Boundar	y layers	1	<b>I</b> I ···	7
	<b>a</b> )	Dimension	al analysis: Di	imensionally hon	nogeneous	equations,	

	Buckingham's $\pi$ Theorem, calculation of dimensionless parameters. Similitude	
	complete similarity, model scales	
	b) Introduction to boundary layer theory and analysis.	
V	Rotodynamic machines Euler's equation – theory of Rotodynamic machines – various efficiencies – velocity components at entry and exit of the rotor, velocity triangles – Centrifugal pumps, working principle, work done by the impeller, performance curves – Cavitation in pumps- Reciprocating pump – working principle	7
	Classification and Performance of hydro turbines.	
VI	Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working	7
	principles –draft tube- Specific speed, unit quantities, performance curves for	
	turbines – governing of turbines.	
	Text Books	
1	S K Som, Gautam Biswas, SumanChakraborty, "Introduction to Fluid Mechani Machines" Tata McGraw – Hill Publication. 3rd Edition 2012.	ics and Fluid
2	M. Potter, D.Wiggert "Fluid Mechanics" Schaum's Outline Series Mcgraw-Hill New edition 2008.	York Second
3	R.K.Bansal, "A Text book of Fluid Mechanics and Hydraulic Machines", Laxmi Pub Ltd. New Delhi 9th edition, 2005.	olications Pvt.
	References	
1	Streeter, Wylie and Bedford, "Fluid Mechanics", Tata McGraw – Hill Publication 2000.	. 9th Edition
2	Franke and White, "Fluid Mechanics", Tata Mcgraw-Hill New Delhi. 5th Edition 200	03
3	CengelYunus A. And Cimbala John M. "Fluid Mechanics and Fundamental and appli Mcgraw-Hill New Delhi. 1st Edition 2006.	cations", Tata
	Useful Links	
1	https://www.youtube.com/results?search_query=fluid+mechanics+nptel	
2	https://www.youtube.com/watch?v=HGbbdXNcIQA&list=PLbMVogVj5nJQEgL1sl OqXInnt	HuY24d6om
3	https://nptel.ac.in/courses/112/103/112103290/	

						CO-I	PO Ma	pping						
		Programme Outcomes (PO) PSO										SO		
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2											1	
CO2	3	2	1										1	
CO3	3	2	3		2	1						3	1	3
The stren	gth of 1	nappir	ng is to	be wri	itten as	1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	, 3:Hig	gh	-	

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)								
			(Government A	ided Autonomous Instit V 2022-23	tute)			
				se Information				
Progr	amme		B Tech (Mechan	ical Engineering)				
Class		ter	Second Year B T	ech Sem IV				
Cours	e Code		6MF223					
Cours	e Nam	<u>م</u>	Manufacturing Pro	ocesses - II				
Desire	d Rea	uisites:						
Desire	uncq							
Т	eaching	Scheme		Examination So	heme (M	arks)		
Lectu	re	3 Hrs/week	MSE	ISE	ES	E	Т	otal
Tutor	ial	-	30	20	5	)		100
				Credi	its: 3			
			Cou	rse Obiectives				
1	To fa	miliarize studer	nts in various metal	cutting, joining and	finishing r	processes.		
	To in	troduce student	s with various plast	ic processing, additiv	ve manufa	cturing and	variou	is non-
2	conve	entional machin	ing processes.	1 0,		U		
	To tra	in the students	to identify various	process and response	variables	in cutting,	joining	g and
3	finish	ing processes.	•			U.	5	
4	To fa	miliarize studer	nts about CNC, VM	C and various micro	machining	processes.		
5	To m	ake aware of va	rious non-conventi	onal machining proc	esses.			
	1							
		Cou	rse Outcomes (CO	) with Bloom's Tax	onomy Le	evel		
At the	end of	the course, the	students will be abl	e to,				
						D1 4		
со		С	ourse Outcome Sta	atement/s		Bloom's Taxonomy	y Ta	Bloom's axonomy
со		С	ourse Outcome Sta	atement/s		Bloom's Taxonomy Level	y Ta De	Bloom's axonomy escription
СО	To su	C mmarize and c	ourse Outcome Sta	<b>atement/s</b> ing, joining, finishin	g,	Bloom's Taxonomy Level II	y Ta De	Bloom's axonomy escription nderstand
<b>CO</b>	To su plasti	C mmarize and co c working and a	ourse Outcome Sta ompare various cutt additive manufactur	<b>atement/s</b> ing, joining, finishin <sup>r</sup> ing, non-convention	g, al	Bloom's Taxonomy Level II	y Ta De U	Bloom's axonomy escription nderstand
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	Introduction to Additive manufacturing: Rapid prototyping(3D Printing) Types of	
	Finishing Processes:	
	Overview and elegatification of finishing processes. Crinding processes abreative	
IV	Overview and classification of finishing processes, Grinding process- abrasive	6
	materials, grinding wheel specification and types, grinding machine classification	
	and grinding operations. Lapping, Honing, and other super finishing processes.	
	Non-conventional Machining Processes – I:	
	Importance and scope of various non-conventional machining processes like	
V	Abrasive Jet Machining, Water Jet Machining, Abrasive Water Jet Machining,	7
	Ultrasonic Machining, micro machining, their working Principle, Process	
	Parameters, comparison and application of these processes	
	Non-conventional Machining Processes – II:	
	Flectrical Discharge Machining wire EDM Electro-chemical machining (ECM)	
VI	Laser Beam Machining (LBM) Plasma Arc Machining (PAM) and Electron Beam	6
	Machining (EBM) their working Principles Process Parameters comparison and	-
	application of these processes	
	1 II	
	Text Books	
1	P.C. Sharma, "A Textbook of Production Technology (Manufacturing processes)", S. Ch	and &
1	co.,8 <sup>th</sup> revised edition 2014. ISBN:8121911141.	
	P.N. Rao, "Manufacturing Technology- Foundry, Forming and Welding", Vol. I Tata Me	cGraw-
2	Hill, 4 <sup>th</sup> edition, 2013, ISBN: 9781259062575.	
	George E. Dieter, "Mechanical Metallurgy", Tata McGraw Hill Publication, Si Metric E	dition. 3 <sup>rd</sup>
3	Revised edition 2013 ISBN : 9780070168930	, .
	Lagadeesha T "Unconventional Machining Processes" Dreamtech Press Edition 2020	ISBN
4	$J_{action}$ $J_{$	ISDIN
	N0.778-75-87770-03-2	
	Kelerences E. Daul DaCarma, I.T. Plack Danald A. Kashar, "Matarials and Dracesses in Manufactu	nina"
1	L. Faul Debalillo, J. I. Black, Rolland A. Rosher, Waterials and Flocesses in Manufactu	ning,
	John whey and Sons Ltd, 9 revised edition, 2004.15BN:,9780471050777	
2	Jagadeesha T, "Non-traditional Machining Processes", Dreamtech Press, Edition 2020,	ISBN
	No:978-93-85920-72-9	
3	Serope Kalpakjian, Steven R. Schmid, Manufacturing Engineering and Technology', Pea	arson
5	(Prentice Hall), Fifth Edition, 2005	
4	V. K. Jain, Introduction to Micromachining, Alpha Science, 2010, ISBN 184265485	3,
4	9781842654859	
	Useful Links	
1	https://youtu.be/Qx-Kx4GapgI	
2	https://youtu.be/ljveGnQw2G0?list=PLSGws_74K018JY-1RyIj0cm4yppa1h54r	
3	https://youtu.be/ZLlwfXSXEVc?list=PLSGws_74K01_zyzpQkNtm-6ickGhCwi-4	
4	https://youtu.be/TlhGTSDfQxc	
5	https://youtu.be/Vy4nlWoPPmo	
6	https://youtu.be/mmKy5PbndQl?list=PLyqSpQzTE6M-KwjFQByBvRx464XpCgOEC	
7	https://www.youtube.com/watch?v=sPhTjrvpGyE&t=1838s	
8	https://www.youtube.com/watch?v=WJtF1wEOeAw	
9	https://www.youtube.com/watch?v=ICjQ0UzE2Ao	
10	https://www.youtube.com/playlist?list=PLzCSUZGIUJkaSyCzPiQMWynGyxmC8hrpl	
11	https://www.youtube.com/watch?v=Hc6mfNWT8oQ&t=7s	
12	https://www.youtube.com/watch?v=cxU1zUOpGLk&t=3016s	
13	https://youtu.be/xf6TbK68hHY	
14	https://www.youtube.com/watch?v=06QxjEAMrKc&list=PLwFw6Nkm8oWqFJUxiUuu	15c0uHK
1 14 1		

CO-PO Mapping	
Programme Outcomes (PO)	PSO

	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3					1									
CO2	2				1									1	
CO3		1											2		
The strength	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.															

# 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.

Course Information           Programme         B. Tech. (Mechanical Engineering)           Course Code         GME224           Course Name         Kinematics and Theory of Machines           Desired Requisites:           Teaching Scheme         Examination Scheme (Marks)           Lecture         Standard Scheme (Marks)           Lecture         Standard Scheme (Marks)           Course Objectives           Total           Totake the students understand the kinematics and ri			W	alchand Colleg	ge of Engineerin	g, Sang	gli								
Course Information           Programme         B. Tech. (Mechanical Engineering)				(Government Al	Y 2022-23	uie)									
Programme         B. Tech. (Mechanical Engineering)           Class, Semester         Second Year B. Tech., Sem IV           Course Code         6ME224           Course Name         Kinematics and Theory of Machines           Desired Requisites:         Image: Control of Machines           Teaching Scheme         Examination Scheme (Marks)           Lecture         3Hrs/week         MSE         ISE         Total           Tutorial         -         30         20         50         100           To make the students understand the kinematics and rigid- body dynamics of kinematically driven machine components         To make the students understand the kinematics and rigid- body dynamics of kinematically driven machine components         To make the students understand the kinematics of gear trains           To make the students understand the kinematics of gear trains         To make the students understand the kinematics of gear trains           Course Outcomes (CO) with Bloon's Taxonomy Level         At the end of the course, the students will be able to,           CO         Course Outcome Statement/s         Bloom's Taxonomy Level           At the end of the course, the students will be able to,         Understand           CO3         Develop various linkage mechanisms for optimal functioning         IV         Analyse           CO3         Develop various linkage mechanisms for optimal functioning				Cour	se Information										
Class. Semester       Second Year B. Tech., Sem IV         Course Code       6ME224         Course Name       Kinematics and Theory of Machines         Desired Requisites:       Examination Scheme (Marks)         Lecture       3Hrs/weck       MSE       ISE       ESE       Total         Tutorial       -       30       20       50       100         Course Objectives         To make the students understand the kinematics and rigid- body dynamics of kinematically driven machine components         Course Objectives         To make the students understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link         3       To make the students to design linkage mechanisms and cam systems to generate specified output motion       Bloom's Taxonomy Level         At the end of the course, the students will be able to.       Bloom's Taxonomy Level       Bloom's Taxonomy Level         At the end of the course, the students might be used according to application and find degrees of freedom of different mechanisms.       V       Evaluate         CO2       Analyze various linkage mechanisms for optimal functioning       IV       Analyze         CO3       Develop various linkage mechanisms.       Module contents       Hours         Addee to tudents will be able	Progra	amme     B.Tech. (Mechanical Engineering)       Semester     Second Year B. Tech., Sem IV													
Course Code         6ME224           Course Name         Kinematics and Theory of Machines           Desired Requisites:         Examination Scheme (Marks)           Lecture         3Hrs/week         MSE         ISE         ESE         Total           Tutorial         -         30         20         50         100           Course Objectives           To make the students understand the kinematics and rigid-body dynamics of kinematically driven machine components           1         To make the students understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link         To enable the students understand the kinematics of gear trains           2         To make the students understand the kinematics of gear trains         To make the students will be able to.           Course Outcomes (CO) with Bloom's Taxonomy Level           At the end of the course, the students will be able to.         If on dayse various linkage mechanisms for optimal function and find degrees of freedom of different mechanisms.         If veraluate         Module         Veraluate           Module         Module Contents         Hours         Hours         7         Taxonomy correlation and positions. Mecker mechanisms.         7           1         Identify mechanism. Inhal should be used according to application and find degrees of freedom of different mechani	Class,	Semes	ter	Second Year B. T	ech., Sem IV										
Kinematics and Theory of Machines         Desired Requisites:         Teaching Scheme       Examination Scheme (Marks)         Teaching Scheme       Examination Scheme (Marks)         Lecture       3/1         Total         Total         Course Objectives         To make the students understand the kinematics and rigid-body dynamics of kinematically driven machine components       To make the students understand the motion of linked mechanisms in terms of the displacement, velocity and acceleration at any point in a rigid link       To enake the students to design linkage mechanisms and cam systems to generate specified output motion         Course Outcomes (CO) with Bloon's Taxonomy Level       Bloom's Taxonomy Level         At the end of the course, the students will be able to,         Course Outcome Statement/s       Bloom's Taxonomy Level         Go Course Outcome Statement/s       Bloom's Taxonomy Course Course Outcome Statement/s       Bloom's Taxonomy Course Course Outcome Statement/s       Bloom's Taxonomy Coursectified Course Outcome Statement/s       Bloom's Taxono	Cours	e Code		6ME224											
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IVClassification of cams and followers- Terminology and definitions- Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers7		m	echanism dyna	mics											
IV Displacement diagrams- Uniform velocity, parabolic, simple harmonic and cycloidal motions- derivatives of follower motions- specified contour cams- circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers			assification o	of cams and fol	lowers- Terminolo	gy and	definitions	-							
IV circular and tangent cams- pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers			splacement di	agrams- Uniform	velocity, parabolic,	simple h	armonic and	1							
graphical and analytical disc cam profile synthesis for roller and flat face followers	IV		cular and tan	vent cams- pressure	e angle and undercu	tting sizi	ing of came	- 7							
followers		gr	aphical and ar	nalytical disc cam	profile synthesis for	r roller a	and flat fac	e l							
		fo	llowers												
Involute and cycloidal gear profiles, gear parameters, fundamental law of		In	volute and cy	cloidal gear profile	es, gear parameters,	fundame	ental law o	f							
V gearing and conjugate action, spur gear contact ratio and	v	ge	aring and	conjugate action	n, spur gear o	contact	ratio an								
and regular gear train kinematics		111   an	d regular gear	reauing- nelical, be	evel, worm, rack & p	mion gea	ars, epicycli	0							

VI	Surface contacts- sliding and rolling friction- friction drives, belt and rope drives	
• •	bearings and lubrication, friction clutches and brakes	5
	Text Books	
1	Ratan S.S, "Theory of Machines", Tata McGraw Hill, New Delhi, 3rd Edition, 2011.	
2	Sadhu Singh,"Theory of Machines", Pearson Education, 2nd Edition, 2009	
3	H. G. Phakatkar,"Theory of Machines I", Nirali Publication, 5th Edition 2009.	
	References	
1	Thomas Bevan, "Theory of Machines", CBS Publishers, New Delhi, 1st Edition, 201	0.
2	J. E. Shigley,"Theory of Machines and Mechanism", , McGraw Hill, New York. 4th	Edition, 2011
2	G.S. Rao and R.V. Dukipatti, "Theory of Machines and Mechanism", New Age	International
3	Publications Ltd. New Delhi. 2011	
	Useful Links	
1	Kinematics of Mechanisms and Machines - YouTube	
2	Module 1 Lecture 1 Kinematics Of Machines - YouTube	
3	Lecture 01   Introduction to Kinematics of Machines   KOM - YouTube	
4	https://onlinecourses.pptel.ac.in/noc22_me25/preview	

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

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 (Government A	ge of Engineerin	<b>g, San</b> g	gli						
			Α	Y 2022-23								
			Cour	se Information								
Progr	amme		B. Tech. (Mechan	ical Engineering)								
Class,	Seme	ster	Second Year B. To	ech., Sem. IV								
Cours	Course Code 6ME225											
Cours	Course Name Design of Machine Elements											
Desire	Desired Requisites:											
Т	eachin	g Scheme		Examination Sc	heme (M	larks)						
Lectu	Lecture3Hrs/weekMSEISEESE											
Tutor	<b>Tutorial</b> - 30 20 50											
	Credits: 3											
		1	1									
			Cou	rse Objectives								
1	To ta	ke overview of	codes, standards an	d design guidelines f	or differe	ent machine	elements.					
2	Toe	xplain the effect	of combined loadir	ng on machine eleme	nts and sa	afety critical	design.					
2	To a	ppraise the relat	ionships between co	omponent level desig	n and ov	erall machin	e system design					
3	and p	performance.	-									
		Cou	rse Outcomes (CO	) with Bloom's Tax	onomy L	evel						
At the	end of	the course, the	students will be abl	e to,								
						Bloom's	Bloom's					
CO	Cou	rse Outcome Si	tatement/s			Taxonomy	Taxonomy					
<u>C01</u>	onnl	theories of fail	ure in decign of yer	ious mashina alamar	to		Description					
$\frac{001}{002}$	estin	y theories of fail	meters of machine e	lous machine elemen	118.	IV	Appry Analyze					
	evalı	late the perform	ance of machine ele	ements subjected to a	lifferent	V	Evaluate					
CO3	loadi	ng conditions.			initer ent		L'viluité					
		0				1	I					
Modu	le		Modu	le Contents			Hours					
	B	asics of engine	ering design									
T	C	eneral Design	process and procee	dure, types of loads	, factor o	of safety- it	5 5					
	S	election and sign	nificance, theories of	failure and their app	lications,	aesthetic and	1					
	e	rgonomic consid	derations in design									
		esign of shafts	and accessories	. <b></b>		0 0 11						
т		esign of solid	and hollow shaf	ts based on elastic	theories	s of failure	,					
	ti	ansmission and	flowible buched nin	shafts, types of coup	olings, de	sign of mutt	, 6					
		giù fiange and	nexible busiled pill	type mange coupling	gs, design	f of keys and						
	з Г	esign of screw										
	F	orms of threads	s, design of power s	screws and nuts, type	es of indu	iced stresses	_					
Ш	e	fficiency of pow	ver screw, self-locki	ng and overhauling p	roperties.	, introduction	' 7					
	to	re -circulating	ball screw.	0 01	L ·							
	E	esign of joints										
IV	T	ypes of welded,	, bolted and riveted	joints, design of weld	led, bolte	d and riveted	l   7					
	j	oints subjected t	o transverse and ecc	centric loads								
V		esign against :	fluctuating load				7					

	<ul> <li>Stress concentration - causes and remedies, fluctuating stresses, S-N. diagram under fatigue load, endurance limit, notch sensitivity, endurance strength- modifying factors, design for finite and infinite life under reversed stresses, cumulative damage in fatigue failure, Soderberg and Goodman diagrams, modified Goodman diagram, fatigue design for components under combined stresses such as shafts, and springs.</li> </ul>	
VI	Helical springs, design against static load, design against fluctuating load, optimum design of springs, types of springs and its design.	7
	Text Books	
1	V. B. Bhandari, "Design of Machine Elements", Tata McGraw Hill Publication, 3 <sup>rd</sup>	Edition, 2008
2	J.F. Shigley, "Mechanical Engineering Design", McGraw Hill Publication, 8th Edition	on, 2008
3	R. L. Norton, "Design of Machinery", McGraw Hill Publication, 3 <sup>rd</sup> Edition, 2003	
	References	
1	Timothy Wentzell, "Machine Design", Cengage Learning, 1st Edition, 2009	
2	M. F. Spotts, T.E Shoup, Hornberger, Jayaram, Venkatesh, "Design of Machine Eleme	ents", Pearson
	Education, 8 <sup>th</sup> edition, 2011	
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 manning is to be written as 1.2.3: Where 1.1 ow 2. Medium 3. High														

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	e of Engineerin	g, Sang	gli								
	(Government Aided Autonomous Institute) AY 2022-23 Course Information													
			Cours	e Information										
Progra	amme		B.Tech. (Mechani	cal Engineering)										
Programme     B. Fech. (Mechanical Engineering)       Class, Semester     Second Year B. Tech., Sem IV       Course Code     6ME272       Course Number 100 Number 10														
Course Code6ME272Course NameFluid Mechanics and Fluid Machines Lab														
Course Name     Fluid Mechanics and Fluid Machines Lab       Desired Requisites:     Image: Course Name														
Desired Requisites:														
T	Teaching Scheme     Examination Scheme (Marks)       Prostical     2 Urs/Wook													
Practical2 Hrs/WeekLA1LA2ESETotalInteraction303040100														
Interaction         -         30         30         40         100														
Credits: 1														
			1											
			Cour	se Objectives										
1	To int	roduce the stud	ents about basic pri	nciples and laws thro	ough cond	lucting experi	ments in							
1	labora	tory.		•										
2	To ena	able the student	s to analyze the flui	d turbo machines.										
3	To dev	velop skills in t	he evaluation of flui	id turbo machines.										
		Com	ra Autoomos (CA)	with Ploom's Tax	nomyI	wol								
At the	end of t	the course the s	students will be able	e to										
		ne course, me				Bloom's	Bloom's							
СО	CO Course Outcome Statement/s Bloom's Taxonomy Taxonomy													
						Level	Description							
CO1	Under	stand basic prir	nciples and laws and	conduct the experim	ents for	III	Apply							
COl	valida	tion.	monoo nonomotono	of fluid turks mashin	20	IV/	Analyza							
C02	Intern	ret the perform	mance of fluid turbo	machines	es.	V IV	Analyze       Evaluate							
	merp	tet the periori		indefinites.		•	L'valuate							
			List of Experi	iments / Lab Activit	ies									
List of	Experi	iments:												
a) S	Study a	nd demonstrat	ion.											
b) I	I. St Typerin	uay of similarit	y principles.											
	1. Ez	xperiment on Ir	npact of Jet.											
	2. Ez	xperiment on P	randtl type pitot typ	e apparatus.										
	3. V	erification of B	ernoulli's Equation.											
	4. Ca	alibration of Ve	enturi meter and Ori	fice meter.										
	5. C	alibration of $V$	-Notch ifice and Mouthnie	ce enneratus										
	0. Ca 7 Ea	speriment on R	evnolds apparatus	ce apparatus.										
	8. D	etermination of	Minor losses in pip	e fittings.										
	9. D	etermination of	loss in pipes (series	s/parallel/different m	aterial)									
	10. Ti	rial on Pelton T	urbine.											
	11. Ti	ial on Kaplan	Furbine.											
	12. 11 13 Tr	rial on Francis	al Pump											
	13. Ti 14 Ti	ial on Gear Pu	gai i unip. mn											
	15. Ti	ail on Cavitatio	on apparatus.											
In case	e of min	i-projects, draw	ving, presentations e	etc, write the relevant	t details o	f the same.								
			Т	ext Books										
1	Modia	and Seth," Fluid	d mechanics and hyd	traulic machines", St	andard bo	ook house, thir	d edition 2012							
2	N.S. (	ovindrao, "Flu	and flow machines",	, 1 ata Mc Hill, Secor	nd edition	1983.								
<u> </u>	j Jaguis	н Lai, Гiuiu a	ind r ur ut ut machines	, new Age publishe	1, Second	1 cuitioli 1982								

4	S K Som, Gautam Biswas, Suman Chakraborty, "Introduction to Fluid Mechanics and Fluid
	Machines" Tata McGraw – Hill Publication. 3rd Edition, 2012.
	References
1	P.L. Balleny, "Thermal Engg.", Khanna pub. New delhi, third edition, 2002.
2	Cohen and Rogers, "Gas turbines and Compressor", Pearson Ed, second edition, 1996.
2	3. R. Yadav, "Thermodynamics and Heat Engines – Vol-II", CPH Allahabad, third edition
3	1999.
	Useful Links
1	https://www.youtube.com/watch?v=HGQM913rI10&list=PLkUEX3IbW7lclZ9jK-thjumHM2-
1	meHGjF
2	https://nptel.ac.in/courses/112/103/112103290/

						00.1		•						
CO-PO Mapping														
		Programme Outcomes (PO)												
	1	2	3	4	5	6	7	8	9	10	11	12	1	2
CO1	3	2								3			1	
CO2	3	2	1				3		3				1	3
CO3	3	2	3		2	1				3		3	1	3
The stren	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 Marks											
	Lab activities,		During Week 1 to Week 8								
LA1	attendance,	Lab Course Faculty	Marks Submission at the end	30							
	journal		of Week 8								
	Lab activities,		During Week 9 to Week 16								
LA2	attendance,	Lab Course Faculty	Marks Submission at the end	30							
	journal		of 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	40							
	performance	applicable	of Week 19								

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)											
			(Government All	Y 2022-23	ule)						
			Cours	e Information							
Progra	amme		B.Tech. (Mechani	cal Engineering)							
Class,	Semest	ter	Second Year B. To	ech., Sem. IV							
Cours	e Code		6ME273								
Cours	e Name	9	Manufacturing Pro	ocesses Lab – II Lab							
Desire	ed Requ	isites:									
			1								
Т	eaching	g Scheme		<b>Examination Sc</b>	heme (M	arks)					
Practi	cal	2Hrs/Week	LA1	LA2	ES	E	Total				
Intera	ction	-	30	30	40	0	100				
				Credi	ts: 1	I					
			Cour	se Objectives							
1	To pe	rform simple jo	b having turning an	d milling operations.							
2	To un	derstand and de	emonstrate CNC, VI	MC machines.							
3	To de	monstrate and f	amiliarize with diffe	erent types of grindin	ng machin	es and operat	ions.				
4	To su	mmarize and de	emonstrate different	types of non-conven	tional ma	chining proce	esses.				
5	To ma	ake aware of M	icromachining proce	esses.							
		Cou	rse Outcomes (CO)	with Bloom's Taxo	onomy Le	evel					
At the	end of	the course, the	students will be able	e to,							
GO		G				Bloom's	Bloom's				
CO		C	ourse Outcome Sta	tement/s		I axonomy	Taxonomy Decerintion				
	Tilucte	ata tha Imanula	las of the motel out	ing Joining finishin			Apply				
CO1	advan	$ced$ and $non_{-}cc$	nge of the filetal cut	ng processes	ig,	111	Apply				
	Differ	entiate between	conventional non-	conventional		IV	Apalyze				
CO2	manut	facturing proces		conventional		1 V	Anaryze				
CO3	Comp	are the perform	ance of various mai	nufacturing processe	\$	V	Evaluate				
C04	Produ	ce simple com	onent by machining	operations.		VI	Create				
	11000			, op on anomon							
			List of Experi	ments / Lab Activit	ies						
List of	f Exper	iments:									
1.	Simpl	e job having La	athe, Milling machir	ne operation [6 Hrs].							
2.	Demo	nstration on Cl	NC / VMC machine	[2Hrs].	_						
3.	Demo	onstration on gr	inding processes suc	ch as cylindrical, sur	face, cent	reless grindin	g machines [2				
4	Hrsj. Study	and demonstra	tion of 3-D Printing	[2Hrs]							
5.	Study	and demonstr	ration of Non-Con	ventional Machining	g Process	ses: EDM, V	VEDM, Laser				
	machi	ining [ 6 Hrs].			0		,				
6.	Study	and demonstra	tion on Micromachi	ning centre setup [4	Hrs].	1 50.00	,				
7.	Repor				II ourrio	$\mu h m = 12 Hr s$	5.				
		t on industry v	isits related to Manu	facturing Processes			_				
	P. N.	t on industry vi Rao, "Manufac	isits related to Manu T Turing Technology-	facturing Processes ext Books Foundry, Forming an	nd Weldir	ng", Vol. 1 Ta	ata McGraw-				
1	P. N. 1 Hill, 5	rt on industry vi Rao, "Manufac 5 <sup>th</sup> edition, 2018	isits related to Manu T turing Technology-	facturing Processes ext Books Foundry, Forming an	nd Weldir	ng", Vol. 1 Ta	ita McGraw-				
1	P. N. Hill, 5 P.N. I	t on industry vi Rao, "Manufac <sup>i<sup>th</sup> edition, 2018 Rao, "Manufact</sup>	isits related to Manu T turing Technology- uring Technology- 1	facturing Processes ext Books Foundry, Forming an Metal cutting and Ma	nd Weldir	ng", Vol. 1 Ta	tta McGraw-				
1 2	P. N. Hill, 5 P.N. I Hill, 4	Rao, "Manufac <sup>3th</sup> edition, 2018 Rao, "Manufact <sup>th</sup> edition, 2018	isits related to Manu T turing Technology- uring Technology- 1 3	ext Books Foundry, Forming an Metal cutting and Ma	nd Weldir	ng", Vol. 1 Ta	ata McGraw-				
1 2	P. N. Hill, 5 P.N. I Hill, 4 P.C. S	t on industry vi Rao, "Manufac i <sup>th</sup> edition, 2018 Rao, "Manufact i <sup>th</sup> edition, 2018 Sharma, "A Tex	isits related to Manu T turing Technology- uring Technology- 1 tbook of Production	facturing Processes <b>ext Books</b> Foundry, Forming an Metal cutting and Ma engineering", S. Ch	nd Weldir achine too	ng", Vol. 1 Ta ls", Vol. 2 Ta , 2006. ISBN	tta McGraw- tta McGraw-				

4	P.H. Joshi, "Press Tools-Design and Construction", S. Chand & Company Ltd., 2010, ISBN:81-										
4	219-2938-5										
_	R. K. Rajput, "A Textbook of Manufacturing Technology", Laxmi Publications, 2016,										
5	ISBN:9788131802441										
	References										
	W.A.J. Chapman, "Workshop Technology", CBS Publishing & Distributors, New Delhi, Vol.I										
1	[ISBN13:9788123904016]2001, Vol.II [ISBN:9788123904115] 2007 andVol.III										
	[ISBN:9788123904122] 1995										
2	HMT, "Production Technology", Tata McGraw-Hill Publications. Ltd., 2017										
2	ISBN: 978-0070964433 ,New Delhi										
2	Serope Kalpakjian, Steven R. Schmid, "Manufacturing Engineering and Technology", Pearson										
3	(Prentice Hall), Fifth Edition, 2005										
	Useful Links										
1	http://msvs-dei.vlabs.ac.in/msvs-dei/ [http://vlabs.iitb.ac.in/vlab/labsme.html]										
2	https://www.vlab.co.in/broad-area-mechanical-engineering										
3	https://www.youtube.com/watch?v=gOms0cwsK3Y										
4	https://www.youtube.com/watch?v=on_juMwWrc4										
5	https://www.youtube.com/watch?v=dwftwb-J1E4										
6	https://www.youtube.com/watch?v=68LWCNGDvls										
7	https://www.youtube.com/watch?v=EALXTht-stg										
8	https://www.youtube.com/watch?v=tJ7bhA4EgO4										
9	https://www.youtube.com/watch?v=kyeDtbmCSgw										

	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			2											1	
CO3					3					1					
CO4													2		
The stren	gth of 1	nappir	ng is to	be wr	itten as	\$ 1,2,3;	Where	e, 1:Lo	w, 2:N	ledium	n, 3:Hig	gh			

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

		Asses	sment									
There are three IMP: Lab ESE	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								
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 of	a semester. Lab	activities/Lab performance shall include performance shall include performance solutions and other suitable activities	rforming								

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	i <b>g, San</b> g	gli		
			(Government All	Y 2022-23	uie)			
			Cours	e Information				
Progra	amme		B.Tech. (Mechani	cal Engineering)				
Class,	Semest	er	Second Year B. To	ech., Sem IV				
Cours	e Code		6ME274					
Cours	e Name		Kinematics and Tl	heory of Machines L	ab			
Desire	d Requ	isites:						
			1					
T	eaching	Scheme		Examination So	cheme (N	larks)		
Practi	cal	2 Hrs/Week	LA1	LA2	E	SE		Total
Intera	ction	-	30	30	4	0		100
				Credi	its: 1			
			Cour	se Objectives				
1	To dev	velop skills of g	generation of gear to	both and cam profiles	<u>8.</u>	1 .		
2	To pre	pare the studer	its to perform the an	alysis of gear drives	and mec	hanisms.		
		Сош	rse Outcomes (CO)	with Bloom's Tax	onomy L	evel		
At the	end of t	he course, the	students will be able	e to,	<u> </u>			
						Bloom	's	Bloom's
CO		C	ourse Outcome Sta	tement/s		Taxono	my	Taxonomy
	Apply	principles of	kinematics to pla	t velocity and acce	leration			Apply
CO1	diagra	ms of mechanis	sms.	i verberty and acce	loration			rippiy
CO2	Invest	igate gear train	s for various power	transmission system	s.	IV		Analyze
CO3	Evalua	ate various type	es of gears and belt	drives.		V		Evaluate
			List of Experi	ments / Lab Activit	ties			
List of	í Experi Work o	ments:	ing					
1.	To plo	t displacement	. velocity and accele	eration curves for tw	o types o	f cam follo	ower	svstems.
2.	To ver	rify angular dis	placement ratio of s	hafts connected by I	Hooke's j	oint		5
3.	To fin	d out Coriolis o	component of accele	eration.				
4.	To dev	velop computer	program for veloci	ty and acceleration a	inalysis o	f four bar	chai	n and single
5	Toger	erate involute	siii. gear tooth profile					
6.	To sol	ve problems or	n epicyclic gear train	n by tabular method.				
7.	To det	ermine momen	t of inertia by Bi-fil	ller suspension, Tri-f	filler susp	ension or	com	pound
	pendu	lum method.				· ·		C
8.	To stu fraada	dy different me	echanisms and analy	se them with respec	t to links,	joints, De	egree	es of
9.	To ana	alvse gear train	s in lathe, drilling, r	nilling machine etc				
10	. To stu	dy any one aut	omobile gearbox.					
In case	of min	i-projects, draw	ving, presentations e	etc, write the relevan	t details o	of the same	э.	
1	Datan	C C	$\frac{T}{CM}$	ext Books	N-11-1 2 - 1	F 11/1	011	
1	Katan	S.S. I neory 0 Rhandari "Dec	i machines", 1 ata N	ments" Tata McGra	$\frac{1}{W}$ Hill 2	Edition, 2	011. 201	1
3	Sadhu	Singh."Theory	of Machines" Pear	rson Education 2nd	Edition	2009	201	. 1
	~	, incory	, <b>, , , u</b>	2nd		/		
			R	leferences				
1	Thoma	as Bevan, "The	ory of Machines", C	CBS Publishers, New	v Delhi, 1	st Edition,	, 201	0.
2	J. F. S	higley,"Mecha	nical Engineering D	esign", , McGraw H	ill, New	York. 4th	Edit	ion, 2011

	Useful Links										
1	Virtual Labs (vlabs.ac.in)										
2	Kinematics and Dynamics of Mechanisms (iitkgp.ac.in)										

	CO-PO Mapping														
		Programme Outcomes (PO)												PSO	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	
C01	1		3										1		
CO2		1		3	1								1		
CO3			3		1				1				1		
The streng	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	o only	one PC	).			

	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%												
Assessmen	Based on	Conducted by	Typical Schedule	Marks								
t												
	I als activities		During Week 1 to Week 8									
LA1	Lab activities,	Lab Course Faculty	Marks Submission at the end	30								
	attendance, journal		of Week 8									
	I als activities		During Week 9 to Week 16									
LA2	Lab activities,	Lab Course Faculty	Marks Submission at the end	30								
	attendance, journal		of 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	40								
	performance	applicable	of Week 19									
Week 1 indica	ates starting week of a	semester. Lab activities/La	b performance shall include perfo	rming								
experiments,	mini-project, presenta	tions, drawings, programmi	ng, and other suitable activities, a	s per the								

nature and requirement of the lab course. The experimental lab shall have typically 8-10 experiments and related activities if any.

		Wal	<b>chand Colleg</b>	e of Engineeri	ng, Sar	ngli	
			A	Y 2022-23			
			Cours	e Information			
Progra	amme		B.Tech. (Mechan	ical Engineering)			
Class,	Semester		Second Year B. 7	Fech., Sem IV			
Cours	e Code		6ME275				
Cours	e Name		Machine Drawing	g and CAD Lab			
Desire	d Requisi	ites:	Basics of Engine	ering Drawing			
7	Teaching	Scheme		Examination	Scheme	(Marks)	
Practi	cal	2 Hrs/ Week	LA1	LA2	Lab	ESE	Total
Intera	ction		30	30	4	0	100
				Cr	edits: 1		
		•					
			Cour	se Objectives			
1	To make	the student far	niliar with Indian S	Standards for draw	ing.		
2	To make	the student ac	quainted with stan	idard machine part	s and sub	o-assemblies r	eadily available
	in marke	et.		f different line in f			oo o wa hali i
3	drawing	op students to a	apply knowledge c	or different limits, f	its, and to	pierances on a	ssembly
Δ		s. de sound knowl	edge of detail and	assembly procedu	Ire		
5	To highli	ght the importa	ince of auxiliary vie	ews and interpene	tration.		
6	To learn	to use suitable	drafting software.				
	1	Cours	e Outcomes (CO)	with Bloom's Tax	xonomy l	Level	
At the	end of the	course, the stud	dents will be able t	.0,			
СО		Cou	rse Outcome State	ement/s		Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Use Bur and draf	eau of Indian S ting software to	Standards drawing draw assembly a	g conventions in c nd detail drawings.	lrawings	II	Understanding
CO2	Produce	proportionate	sketches of stand	lard machine com	ponents	Ш	Annlying
~~~	with use	limits, fits and	tolerances on asse	mbly drawings.			, , , , , , , , , , , , , , , , , , , ,
CO3	Produce	detail drawing	s from given ass	embly drawings a	nd vice-	III	Applying
	versa.						
			list of Exporimor	nts / I ab Activition	Topics		
List of	I oh Acti	vitios.	List of Experimer	its / Lab Activities	s ropics		
PART /	A. Followi	ng sheets are to	be completed on	A2 size drawing pa	per.		
Sheet	No 2. Base	ed on free hand	sketching				
Sheet	No 3. Dray	wing details and	l assembly contain	ning maximum twe	lve parts	by taking actu	al measurement
on par	ts.		containing contain		ive pures	by taking acta	
Sheet	No 4. Drav	wing details and	assembly from give	ven drawing of det	ails and e	ntering limits	fits and
tolerar	nces, surfa	ice finish symbo	ols, geometrical tol	erances etc.			
PART I	<b>B.</b> Followi	ng drawings to k	e completed using	g suitable drafting	software	on A4 size pap	bers
Sheet	No.5 Simp	le 2D figures					
Sheet	No.6 One	detail and asser	nbly drawing cont	aining not more th	an ten pa	irts	
Sheet	No.7 One	3D object.					
			Τ	extbooks			
1	P.S.G	iill, "Machine Dr	rawing", S.K. Katar	ia and Sons,2002.			
2		<b>NI II ((A.A  .!.</b>	Dunuitan // Chanat	an Dudaltaattan Han			
-	N.D.I	Bhatt, "Machine	Drawing , Charot	or Publication Hou	.2001, ise		

	References										
1	I.S.:SP46 Engineering drawing practice for schools and colleges BIS Publication.										
2	I.S.:696 Code of practice for general engineering drawings. BIS Publication.										
3	I.S.:2709 Guide for selection of fits. BIS Publication.										
	Useful Links										
1	https://nptel.ac.in/courses/112102101										
2	https://www.youtube.com/watch?v=5xQdrWly11s&list=PLbkIghvjQ7P8qhyX-L2HYBbDzzF4ntW7w										
3	https://www.youtube.com/watch?v=ptJfomL1I7o&list=PLLvBXFAV- DeIsmVkmcNv2RzwCuT1XvhTV										

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

Aggaggenent								
Assessment								
There are three	components of la	b assessment, LA1, LA2 an	nd 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								
	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 ESE	Lab activities,	Lab Course Faculty and	During Week 18 to Week 19					
	journal/	External Examiner as	Marks Submission at the end of	40				
	performance	applicable	Week 19					
Week 1 indicates starting week of a semester. Lab activities/Lab performance shall include performing								
experiments, m	ini-project, presei	ntations, drawings, program	ming, and other suitable activities, a	s per the				
nature and requ	irement of the lab	o course. The experimental l	ab shall have typically 8-10 experim	ents and				

related activities if any.

Walchand College of Engineering, Sangli (Government Aided Autonomous Institute)								
AY 2022-23								
Course Information								
Programme B.Tech. (Mechanical Engineering)								
Class, Semester Second Year B. Tech., Sem IV								
Cours	e Code		6ME276					
Cours	e Name	e	Presentation and F	Report Writing				
Desired Requisites:								
T	eaching	g Scheme		Examination S	cheme (M	(arks)		
Practi	cal	2Hrs/Week	LA1	LA2	ES	SE	Total	
Intera	ction		30	30	4	0	100	
				Cred	its: 1			
			Cour	se Objectives				
1	To rev	view and increase	se student's underst	anding of the specif	ic topics.			
2	2 To read, summarise and review research articles and gain an understanding of a new field, in the absence of text book							
3	To juc	lge the value of	different contributi	ons and identify pro	mising ne	w directions.		
A 1	1 0		se Outcomes (CO)	) with Bloom's Tax	onomy Le	evel		
At the	end of	the course, the s	students will be able	e to,		Bloom's		
CO		Co	ourse Outcome Sta	tement/s		Taxonomy	Bloom's Texonomy	
co				itemente 5		Level	Description	
<b>CO1</b>	Revie	w and increase	their understanding	of the specific topic	s	III	Apply	
CO2	Read	research papers	critically and effici	ently		IV	Analyze	
CO3	Summ	narize and revie	w the topics in abse	ence of textbooks.		V	Evaluate	
			List of Experi	iments / Lab Activi	ties			
List of Experiments:								
Read on any report subject student should shoose the tonic for report writing and presentation								
(Subcomponents: Introduction Literature review modeling (if any) case study applications								
advantages, disadvantages, future scope and conclusions etc.)								
Text Books								
1 As per topic chosen by student.								
References								
1	As per	r topic chosen b	y student.					
Useful Links								
	⊢ ∆s ne	بممامه منعبمه ممامه						

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

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%								
Assessmen	Based onConducted byTypical ScheduleMa							
t				s				
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								

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.