# **GOVERNMENT COLLEGE OF ENGINEERING**

(An Autonomous Institution Affiliated to Anna University) BARGUR - 635 104

# Curriculum For MECHANICAL ENGINEERING

(Full Time)

I TO VIII SEMESTERS

# 2017

# Regulations

OFFICE OF CONTROLLER OF EXAMINATIONS GOVERNMENT COLLEGE OF ENGINEERING BARGUR - 635 104

Website: www.gcebargur.ac.in

# GOVERNMENT COLLEGE OF ENGINEERING, BARGUR

# **Regulation – 2017**

### (AUTONOMOUS)

#### Academic Year 2017-2018 onwards

## **Curriculum for Full Time- B.E. – MECHANICAL ENGINEERING**

#### **I SEMESTER**

#### Mandatory Induction Programme as prescribed by AICTE - 21 Days

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17ZHS101	Communicative English I	HS	4	0	0	4
2.	17ZBS102	BS	3	2	0	4	
3.	17ZBS103	Engineering Physics I	3	0	0	3	
4.	17MBS104	Applied Chemistry	3	0	0	3	
5.	17ZES105	ES	3	0	0	3	
6.	17ZES106	Engineering Graphics	ES	2	0	4	4
PRACT	ICALS						
7.	17ZES107	Programming in C Laboratory	ES	0	0	4	2
8.	8. 17ZBS108 Physics Laboratory BS						2
9.	17ZBS109	Chemistry Laboratory	BS	0	0	4	2
			TOTAL	18	2	16	27

#### **II SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17ZHS201	Communicative English II	HS	4	0	0	4
2.	17ZBS202	Engineering Mathematics II	BS	3	2	0	4
3.	17ZBS203	Engineering Physics II	BS	3	0	0	3
4.	17MES204	Basic Electrical, Electronics	ES	3	0	0	3
		and Instrumentation					
		Engineering					
5.	17ZBS205	Environmental Science and	BS	3	0	0	3
		Engineering	00	5	0	0	5
6.	17MES206	Engineering Mechanics	ES	3	2	0	4
PRACT	ICALS						
7.	17ZES207	Engineering Practices Lab	ES	0	0	4	2
8.	17MES208	Basic Electrical, Electronics and	FS	0	0	Λ	2
		Instrumentation Engineering Lab	LO	0	0	+	2
			TOTAL	19	4	8	25

# **III SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17ZBS301	Transforms and Partial Differential Equations	BS	3	2	0	4
2.	17MES302	Strength of Materials	ES	3	2	0	4
3.	17MPC303	Machine Drawing	1	0	4	3	
4.	17MPC304	Manufacturing Technology I	PC	3	0	0	3
5.	17MPC305	Engineering Metallurgy	PC	3	0	0	3
6.	17MPC306	Engineering Thermodynamics	PC	3	0	0	3
PRACT	ICALS						
7.	17MPC307	Manufacturing Technology Laboratory I	РС	0	0	4	2
8.	17MES308	Strength of Materials Laboratory	ES	0	0	4	2
			TOTAL	16	4	12	24

# **IV SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17MBS401	Statistics and Numerical Methods	BS	3	2	0	4
2.	17MES402	Applied Electronics and	ES	3	0	0	3
		Microprocessors					
3	17MES403	Fluid Mechanics and Machinery	ES	3	0	0	3
4.	17MPC404	Kinematics of Machines	3	2	0	4	
5.	17MPC405	Manufacturing Technology II	PC	3	0	0	3
6.	17MPC406	Thermal Engineering	PC	3	0	0	3
PRACT	ICALS						
7.	17MPC407	Manufacturing Technology Laboratory II	PC	0	0	4	2
8. 17MES408 Fluid Mechanics and Machinery Laboratory ES					0	4	2
9.	17MPC409	Thermal Engineering Laboratory	PC	0	0	4	2
			TOTAL	18	4	12	26

# **V SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17MPC501	Design of Machine Elements	PC	4	0	0	4
2.	17MPC502	PC	3	0	0	3	
3	17MPC503	Dynamics of Machines	PC	3	2	0	4
4.	17MPC504	Operations Research	PC	3	0	0	3
5.	17MPC505	Energy Engineering	PC	3	0	0	3
6.	E - 1	Elective I	PE	3	0	0	3
PRACT	ICALS						
7.	17MPC507	Heat and Mass Transfer Laboratory	PC	0	0	4	2
8.	17MPC508	PC508 Dynamics Laboratory		0	0	4	2
9.	17ZEE509	Communication and Soft Skills Laboratory	EEC	0	0	4	2
			TOTAL	19	2	12	26

# **VI SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17MPC601	Computer Aided Design and Manufacturing	PC	3	0	0	3
2.	17MPC602	Gas dynamics and Jet Propulsion	PC	3	0	0	3
3	17MPC603	Design of Transmission systems	PC	2	2	0	3
4.	17MPC604	Metrology and Measurements	PC	3	0	0	3
5.	17MPC605	Finite Element Analysis	PC	3	2	0	4
6.	E - II	Elective II	PE	3	0	0	3
PRACT	ICALS						
7.	17MPC607	Metrology and Measurements Laboratory	РС	0	0	4	2
8.	17MPC608	CAD / CAM Laboratory	PC	0	0	4	2
9	17MEE609	Professional Skills development Laboratory	EEC	0	0	2	1
			TOTAL	17	4	10	24

# **VII SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	Y						
1.	17MES701	ES	3	0	0	3	
		Management					
2.	17MPC702	PC	3	0	0	3	
3	OE	Open Elective	OE	3	0	0	3
4.	E - III	Elective III	PE	3	0	0	3
5.	E - IV	Elective IV	PE	3	0	0	3
PRACT	ICALS						
6.	17MPC706	Automation Laboratory	PC	0	0	4	2
7.	7. 17MEE707 Simulation Laboratory EEC				0	4	2
8.	8. 17MEE708 Technical Seminar EEC				0	2	1
			TOTAL	15	0	10	20

# **VIII SEMESTER**

Sl.No.	COURSE CODE	COURSE TITLE	CATEGORY	L	Т	Р	С
THEOR	THEORY						
1.	E - V	Elective V	PE	3	0	0	3
2.	E - VI	PE	3	0	0	3	
PRACT	ICALS						
3.	17MEE803	Project Work	EEC	0	0	12	6
		TOTAL	6	0	12	12	
		TOTAL CREDITS					184

# CBCS

# MECHANICAL ENGINEERING (UG) CURRICULUM DESIGN

# CREDIT SUMMARY

# Name of the UG Programme: B.E - MECHANICAL ENGINEERING

SI.	Subject Area			Cre	dits p	er Se	mesto	er		Credits Total	% of Total Credits	Total no. of subjects	AI Recom Range Cro	CTE mended of % of edits
No.		Ι	II	ш	IV	v	VI	VII	VIII				MIN.	MAX.
1	HS	4	4							8	5	2	5	10
2	BS	14	10	4	4					32	17	10	15	20
3	ES	9	11	6	8			3		37	19	13	15	20
4	PC			14	14	21	20	5		74	40	26	30	40
5	PE					3	3	6	6	18	10	6	10	15
6	OE							3		3	2	1	5	10
7	EEC					2	1	3	6	12	7	5	10	15
	Total	27	25	24	26	26	24	20	12	184	100	63		

SL No	Subject	Course Title	САТ		Cre	dits	
	Code			L	Τ	P	C
1	17MPE001	Refrigeration and Air Conditioning	PE	3	0	0	3
2	17MPE002	Manufacturing planning and Control	PE	3	0	0	3
3	17MPE003	Design of Jigs, Fixtures and Press Tools	PE	3	0	0	3
4	17MPE004	Design for Manufacture	PE	3	0	0	3
5	17MPE005	Computational Fluid Dynamics	PE	3	0	0	3
6	17MPE006	Industrial Robotics	PE	3	0	0	3
7	17MPE007	Plant Layout and Material Handling	PE	3	0	0	3
8	17MPE008	Mechanical Vibrations	PE	3	0	0	3
9	17MPE009	Newer Production Processes	PE	3	0	0	3
10	17MPE010	Lean Manufacturing	PE	3	0	0	3
11	17MPE011	Welding Technology	PE	3	0	0	3
12	17MPE012	Theory of Metal cutting	Theory of Metal cutting PE				3
13	17MPE013	Professional Ethics in Engineering	PE	3	0	0	3
14	17MPE014	Additive Manufacturing	PE	3	0	0	3
15	17MPE015	Entrepreneurship Development	PE	3	0	0	3
16	17MPE016	Non Destructive Testing and Materials	PE	3	0	0	3
17	17MPE017	Engineering Tribology	PE	3	0	0	3
18	17MPE018	Advanced Internal Combustion Engines	PE	3	0	0	3
19	17MPE019	Total Quality Management	PE	3	0	0	3
20	17MPE020	Nano Materials and Technology	PE	3	0	0	3
21	17MPE021	Micro Electro Mechanical Systems	PE	3	0	0	3
22	17MPE022	Industrial Safety and Regulations	PE	3	0	0	3
23	17MPE023	Energy Auditing and Management	PE	3	0	0	3
24	17MPE024	Automobile Engineering	PE	3	0	0	3
25	17MPE025	Composite and Smart Materials PE 3				0	3
26	17MPE026	Hydraulic and Pneumatic controls	PE	3	0	0	3
27	17MPE027	Material Characterizations	PE	3	0	0	3

# LIST OF PROFESSIONAL ELECTIVES

# **OPEN ELECTIVES** [Students should select open electives offered by other Departments]

# COMPUTER SCIENCE AND ENGINEERING

S.NO	COURSE CODE	COURSE TITLE	L	Τ	Р	C
1.	17SOE001	Programming in C++	3	0	0	3
2.	17SOE002	Java Programming	3	0	0	3
3.	17SOE003	Python Programming	3	0	0	3
4.	17SOE004	Web Designing	3	0	0	3
5.	17SOE005	Android Application Development	3	0	0	3

# ELECTRONICS AND COMMUNICATION ENGINEERING

S.NO	COURSE CODE	COURSE TITLE	L	Т	Р	C
1	17LOE001	Real Time Systems	3	0	0	3
2	17LOE002	Wireless Sensor Networks	3	0	0	3
3	17LOE003	Industrial Automation and Robotics	3	0	0	3
4	17LOE004	Principles of VLSI design	3	0	0	3
5	17LOE005	Applied Electronics	3	0	0	3
6	17LOE006	Wireless Networks	3	0	0	3

# ELECTRICAL AND ELECTRONICS ENGINEERING

S.NO	COURSE CODE	COURSE TITLE	L	Т	Р	C
1.	17EOE001	Matlab Programming	3	0	0	3
2.	17EOE002	Renewable Energy Sources	3	0	0	3
3.	17EOE003	Energy Management and Auditing	3	0	0	3
4.	17EOE004	Smart Grid	3	0	0	3

# **MECHANICAL ENGINEERING**

S.NO	COURSE	COURSE TITLE	L	Τ	Р	С
	CODE					
1	17MOE001	Disaster Management and Mitigation	3	0	0	3
2	17MOE002	Environmental Management	3	0	0	3
3	17MOE003	Composite materials	3	0	0	3
4	17MOE004	<b>Renewable Energy Sources and</b>	3	0	0	3
		Technology				
5	17MOE005	Intellectual Property Rights	3	0	0	3
6	17MOE006	Engineering Economics and Financial	3	0	0	3
		Accounting.				
7	17MOE007	Industrial Safety Acts and Standards	3	0	0	3
8	17MOE008	Global Warming and Climate Change	3	0	0	3

<b>ONE CREDIT</b>	<b>COURSES</b>
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SI No	Subject CodeCourse Title		САТ	Credits						
51. NO			CAI	L	Т	P	С			
1	17MOC001	Human Values	OC	1	0	0	1			
2	17MOC002	Yoga for youth empowerment	OC	1	0	0	1			
3	17MOC003	Metallography	OC	1	0	0	1			
4	17MOC004	Design of Experiments using Taguchi Techniques	OC	1	0	0	1			
5	17MOC005	Wind Energy Management	OC	1	0	0	1			
6	17MOC006	Solar Energy Management	OC	1	0	0	1			
7	17MOC007	Project Management	OC	1	0	0	1			
8	17MOC008	Personality Development	OC	1	0	0	1			
9	17MOC009	Six Sigma	OC	1	0	0	1			
10	17MOC010	Bio fuels Technology	OC	1	0	0	1			
11	17MOC011	German Language	OC	1	0	0	1			

17ZHS101		<b>COMMUNICATIVE ENGLISH – I</b>	L	Т	Р	С			
Comm	non to ]	MECH, EEE, ECE and CSE Branches	4	0	0	4			
UNIT I						12			
<b>Listening</b> - Short texts- Short formal and informal conversations- listening to TV and Telephonic interviews. <b>Speaking-</b> Introducing one self- exchanging personal information. <b>Reading</b> -Skimming and Scanning. <b>Writing</b> -Letter writing - E-mail writing. <b>Grammar</b> - introducing Tenses (Simple Present, Present Continuous, Present Perfect) Articles, <b>Vocabulary:</b> <b>Prefix</b> & Suffix and Compounds									
UNIT II						12			
Listening- Lis congratulating a Short narrative Simple Past)- W Word-formation	Listening- Listening to announcements- listening to news. Speaking – Greetings and congratulating and taking leave. Reading – Finding key information in a given text. Writing-Short narrative descriptions- dialogue writing. Grammar- Tenses (Present Perfect Continuous, Simple Past)- WH questions, Yes-No questions, Prepositions Vocabulary: Word-formation, Synonym & Antonym.								
UNIT III						12			
Listening- List opinions. Readi informal letter comparison, dire	tening t ing- Re- writing ect-indin	to dialogue <b>Speaking</b> – describing a person, exp ading longer text, reading science articles. <b>Writing</b> - g. <b>Grammar</b> - Tenses (Past continuous, Past Per rect speech. <b>Vocabulary</b> : One- word substitution.	erier Para erfec	nce, agraj t),	exp ph W degre	ressing /riting- ees of			
UNIT IV		* · · · ·				12			
Listening- Liste Reading comprise inventions. Graverbs.	ening to ehension ammar-	product descriptions. <b>Speaking</b> - describing an object- n. <b>Writing</b> - completing sentences- writing about sc Tenses (Past Perfect Continuous, Simple Future) <b>V</b>	pro ienti <b>oca</b>	cess fic o bula	. Rea objec ry: ]	ading - cts and Phrasal			
Listoning List	oning t	o talks & conversations <b>Sneeking</b> participating	in o	00110	raati				
responding. Re Grammar- Ten Vocabulary- co	eading- ading- ses (Fut ollocatio	Reading longer text & close reading. Writing ture Continuous, Future Perfect, Future Perfect Continuous, idioms.	–Cr nuou	eativ is), c	ve W condi	Vriting. tionals			
		TOTAL : 60 PEI	RIO	DS					
OUTCOMES	S:	On completion of this course, students will be able to							
1. Read	d articles	s of a general kind in magazines and newspapers.							
2. Parti	icipate e	ffectively in informal conversations; introduce themse	lves	and	their	[			
frien	friends and express opinions in English.								
3. Com	Comprehend conversations and short talks delivered in English								
4. Writ	te short o	essays of a general kind and personal letters and emails	s in 1	Engl	ish.				
TEXT BOOI	KS:								
1. Boar Tech	rd of Ed hnologis	itors. Using English " <b>A Course book for undergradu</b> sts". Orient Black Swan Limited, Hyderabad:2015	late	Eng	ginee	rs and			
REFERENC	ES:								

1.	Richards, C. Jack. "Interchange Students" Book-2 New Delhi: CUP, 2015.
2.	Bailey, Stephen. Academic Writing: "A Practical guide for students", New York:
	Rutledge, 2011.
3.	Seely, John. "The Oxford guide to writing & Speaking", New York. 1998.

17ZBS	102	<b>ENGINEERING MATHEMATICS – I</b>	L	Т	Р	С		
	Common to MECH, EEE, ECE and CSE Branches 3 2				0	4		
UNIT I	[	MATRICES			9	9+6		
Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of eigenvalues and eigenvectors – Statement and applications of Cayley-Hamilton Theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.								
UNIT I	Ι	SEQUENCES AND SERIES			ļ	9+6		
Sequence – Tests o series – I converge	Sequences: Definition and examples – Series: Types and Convergence – Series of positive terms – Tests of convergence: Comparison test, Integral test and D'Alembert's ratio test – Alternating series – Leibnitz's test – Series of positive and negative terms – Absolute and conditional convergence.							
UNIT I	II	APPLICATIONS OF DIFFERENTIAL CALCUL	<u>JS</u>		9	<del>)+6</del>		
Curvatur Evolutes	e in Ca – Env	artesian co-ordinates – Centre and radius of curvature – Circle o elopes - Evolute as envelope of normals.	f curva	ature	_			
UNIT I	V	FUNCTIONS OF SEVERAL VARIABLES			ļ	<del>)</del> +6		
Limits ar functions minima o	nd Cor s – Jac of func	tinuity – Partial derivatives – Total derivative – Differentiation obian and properties – Taylor's series for functions of two varia tions of two variables – Lagrange's method of undetermined m	of imp oles – ıltiplie	olicit Max ers.	ima	and		
UNIT V	V	MULTIPLE INTEGRALS			9	9+6		
Double in enclosed Triple int	ntegra by pla tegrals	s in cartesian and polar coordinates – Change of order of integr ne curves – Change of variables in double integrals – Area of a – Volume of Solids.	ation – curveo	- Are 1 sur	a face	-		
		LECTURE: 45 TUTORIAL: 30 TOTAL :	75 I	PER	IOI	DS		
OUTC	<u>OME</u>	<b>S:</b> On completion of this course, students will be able to						
5.	Solv appl	e problems on matrices and to apply concepts of matrix cable in the field of engineering.	theor	ry w	hene	ever		
6.	Solv engi	e problems using convergence tests on sequences and series ar neering field appropriately.	d to a	pply	ther	n in		
7.	Solv	e problems on differential and integral calculus and will b cations in engineering.	e expo	osed	to t	heir		
TEXT	BOO	KS:						
1.	Bali Editi	N. P and Manish Goyal, "A Text book of Engineering Mather on, Laxmi Publications Pvt Ltd., 2011.	natics'	', Eig	ghth			
2.	Grev Publi	val. B.S, " <b>Higher Engineering Mathematics</b> ", 41 st Edition, K cations, Delhi, 2011.	hanna					
REFER	RENO	CES:						
4.	Dass Prive	, H.K., and Er. RajnishVerma <b>," Higher Engineering Mathema</b> tte Ltd., 2011.	ics", 1	S. Ch	and			
5.	Glyn Educ	James, "Advanced Modern Engineering Mathematics", 3rd E ation, 2012.	dition,	Pea	rson	ļ		
6.	Peter learn	V. O'Neil <b>," Advanced Engineering Mathematics</b> ", 7th Edition ing, 2012.	ı, Cenz	gage				
7.	Rama Com	ana B.V, " <b>Higher Engineering Mathematics</b> ", Tata McGraw H pany, New Delhi, 2008.	ill Pu	blish	ing			
8.	Sivar Volu	ama Krishna Das P. and Rukmangadachari E., " <b>Engineering</b> l ne I, Second Edition, PEARSON Publishing, 2011.	<i>lathe</i>	natio	cs ",			

17ZBS103	ZBS103 ENGINEERING PHYSICS I							
Co	mmon	to MECH, EEE, ECE and CSE Branches	3	0	0	3		
UNIT I	PR	OPERTIES OF MATTER				9		
Elasticity – Hooke's law – Stress – Types of Stresses – Strain- Types of Strain -Young's Modulus – Rigidity Modulus – Bulk Modulus –Poisson's ratio – Relationship between three elastic constants and Poisson's ration – Torsional Pendulum – Factors affecting elasticity of materials - Bending moment of a Beam – Depression of cantilever (Theory and Experiment) – Determination of Young's modulus – Uniform and non-uniform bending (Theory and Experiment).								
UNIT II	LAS	SERS				9		
Introduction to LASER – Interaction of light radiation with materials – Stimulated absorption – Spontaneous emission – Stimulated emission –Einstein's A and B co-efficient derivation – Concept of LASER – Population inversion –Pumping action – Methods for pumping action – Characteristics of LASER - Types of Lasers (Nd-YAG, He-Ne) – Industrial and medical applications of lasers.								
UNIT II	[ <b>FIB</b>	RE OPTICS				9		
Introduction – Structure of Optical Fibre – Guiding mechanism – Total internal reflection – Critical Angle – Conditions for total internal reflection – Principle and Propagation of light in Optical Fibres – Numerical aperture and acceptance angle – Types of optical fibres (Material, refractive index and mode) – their characteristics and applications – Losses associated in optical fibres.								
UNIT IV	TH	ERMAL PHYSICS			9			
Introduction Thermal co Linear heat disk method exchangers,	to Heat nductivit flow – I for dete refrigera	flow – Modes of heat transfer (Conduction, Convection a ty – Expression for thermal conductivity – Newton's la Heat conduction through a compound media(Series and p ermination of thermal conductivity of bad conductors – A ators.	and H wo oaral pplio	Radia f co lel) - catio	ation oling – Le n: H	) – g – e's eat		
UNIT V	QU	ANTUM PHYSICS				9		
Concept of Blackbody radiation – Wien's displacement law – Rayleigh-Jean's law - Planck's theory (derivation) – Deduction of Wien's displacement law and Rayleigh-Jean's law from Planck's law – Compton effect – Matter waves – De-Broglie's Hypothesis – Properties of matter waves - Wave-particle duality – Schrodinger wave equation – Time dependent and time independent.								
		TOTAL : 4	45 P	PER	IOI	<b>DS</b>		
OUTCOM	/IES:	On completion of this course, students will be able to						
1.	Learn a conduct	bout three types of elastic modulus, related laws and ba ivity of different solid materials with relevant Newton's la	asics aw o	of t f coo	thern	nal		

1.	Apply the functional knowledge of different types of lasers in their engineering						
	applications.						
2.	Attain the basic knowledge of fiber optics and apply in their engineering&						
	medical applications.						
3.	Apply the fundamental principles of quantum physics in engineering field.						
TEXT B	OOKS:						
1.	P. Mani, "Engineering physics", Dhanam Publications, 2017.						
2.	G. Senthikumar, "Engineering physics", VRB Publishers						
3.	A.Marikani, "Engineering Physics", PHI Learning Pvt., India 2009						
REFERE	ENCES:						
1.	R. K. Gaur and S.C. Gupta, "Engineering physics", DhanpatRai publications,						
	New Delhi 2003.						
2.	M. N. Avadhanulu and P. G. Kshirsagar, "A text book of engineering physics",						
	S. Chand and Company Ltd, New Delhi, 2005.						
3.	K. Rajagopal, "Engineering Physics", PHI, New Delhi, 2011.						
4.	P. K. Palanisamy, "Engineering Physics", SCITECH Publication, 2011						
5.	M. Arumugam, "Engineering physics", Anuradha publishers						

UNIT I	WATER TECHNOLOGY AND ANALYTICAL TECHNIQUES	9						
Water Technology: Characteristics – alkalinity and its significance – hardness (problems) -								
types and estimation by EDTA method - potable water treatment - boiler feed water -								
requirements -	requirements - disadvantages of using hard water in boilers (Scales & Sludge, Boiler							
corrosion, Prin	ning & Foaming, Caustic embrittlement) – water treatment – Internal treatmen	ıt						
- external treat	ment – Demineralization process – desalination – reverse osmosis.							
Analytical Te	chniques: Electromagnetic spectrum – Beer-Lambert's law - Fundamentals o	of						
spectroscopy -	(Instrumentation) of UV-Visible, AAS, Flame photometry.							
UNIT II	ELECTROCHEMISTRY, CORROSION AND ALLOYS	9						
Electrochemis	stry: Electrochemical cells - reversible and irreversible cells - EMF -	_						
measurement of	of EMF - single electrode potential - Nernst equation (Problems) - reference	e						
electrode - sta	ndard hydrogen electrode and calomel electrode - electrochemical series and	d						
its applications	).							
Corrosion: Co	prrosion - Pilling Bedworth rule - dry corrosion - electrochemical corrosion -	_						
types (galvanie	c, pitting, differential aeration) - factors influencing corrosion - corrosion	n						
control method	ls - sacrificial anode method - impressed current cathodic method - protective	e						
coatings - pai	nts - constituents - functions - metallic coatings - electroplating (Cu) and	d						
electro less pla	ating (Ni). Alloys - importance of alloys - heat treatment of alloys - Ferrou	S						
alloys (nichron	ne and stainless steel) – non-ferrous alloys (Brass and bronze).							
UNIT III	POLYMERS AND COMPOSITES	9						
Polymers: De	efinition – classification – functionality – polymerization – degree o	of						
polymerization	n - types (addition, condensation, copolymerization) - mechanism (free	e						
radical) - plas	tics - thermoplastics and thermosetting plastics - preparation, properties and	d						
uses of indivi-	dual polymers (PVC, TEFLON, Nylon-6,6, Nylon-6, PET, epoxy resin) -	_						
rubber - vulcar	nization of rubber – applications - Advanced polymeric materials and electronic	с						
devices - cond	lucting and semiconducting polymers - liquid crystal properties - dendrimer	S						
and their differ	rence from polymers.							
<b>Composites:</b> d	lefinition - types polymer matrix composites - Fibre Reinforced Polymers -	_						
applications -	- advanced composite materials - physical and chemical properties -	_						
applications.								
UNIT IV	NON-CONVENTIONAL ENERGY SOURCES AND STORAGE							
	DEVICES - LUBRICANTS	9						
Renewable and	non renewable energy resources and their importance - Nuclear energy - fission	n						
fusion reaction	as – light water nuclear reactor for power generation – breeder reactor – sola	r						
energy conversion – solar cells – wind energy – batteries: alkaline batteries – lead-acid								
accumulator, 1	$M-Cu$ and $LI-IOI Datternes - Tuel Cells - H_2-O_2 Tuel Cell - principles and advantages and disadvantages$	u						
Lubricants:	Lubricants - mechanism of lubrication. classification and properties of	of						
lubricants (viso	cosity index, flash and fire points, cloud and pour points, oilyness), Additive	s						
for lubricants,	synthetic lubricants, Greases - Preparation & properties (consistency, drop	р						

point) and uses. **FUELS AND COMBUSTION** UNIT V

Classification - Calorific value – coal – analysis of coal (Proximate and Ultimate) – metallurgical coke – manufacture by Otto-Hoffmann method – petroleum – manufacture of synthetic petrol (Bergius method) – Knocking –octane number – diesel oil – cetane number – natural gas - compressed natural gas (CNG) – Liquefied petroleum gas (LPG) – Producer gas – water gas. Power alcohol – biodiesel and its synthesis (transesterification) – chromatographic analysis of biodiesel.

Combustion of fuels: theoretical calculation of calorific value – calculation of stoichiometry of fuel and air ratio – ignition temperature – explosive range – flue gas analysis (ORSAT apparatus)

			TOTAL : 45 PERIODS				
OUT	COMES:	On completion of this course, student	s will be able to				
1.	Apply the know	wledge of basic science in identifying	, to formulate and to solve the				
	engineering p	roblems.					
2.	Analyze water borne problems faced in boilers, water treatment methods and						
	analytical tech	nniques and its applications.					
3.	Understand pol	ymerization reactions and its applications	in engineering field.				
4.	Understand th	e mechanism behind various types of e	electrochemical reactions which				
	in turn helps i	n understanding the causes for corrosic	on and prevention methods.				
5.	Acquire in-de	pth knowledge in fuels and combustion	n.				
ТЕХТ	BOOKS:						
1.	Vairam S, K	alyani P and SubaRamesh.,"Enginee	ering Chemistry", Wiley India				
	PvtLtd.,New	Delhi., 2011					
2.	Dara S.S,Um	areS.S."Engineering Chemistry", S.	Chand & Company Ltd., New				
	Delhi , 2010						
REFE	<b>RENCES:</b>						
1.	Pahari A and	Chauhan B., "Engineering Chemistry	<b>y",</b> Firewall Media., New Delhi.,				
	2010.						
2.	Jain and jain	, 16 <sup>th</sup> editin, <b>"Engineering Chemistry</b> "	, DhanpatRqai Publishing Co.				
3.	Foster R., Gh	assemi M., Cota A., <b>"Solar Energy",</b> C	CRC Press, 2010.				
4.	"Physical Ch	emistry", P.W. Atkin (ELBS, Oxford P.	ress).				

17ZES	5105		PROGRAMMING IN C	L	Т	Р	C		
	С	ommo	n to MECH, EEE and ECE Branches	3	0	0	3		
UNIT	Ι	INT	RODUCTION				9		
Generation and Classification of Computers- Basic Organization of a Computer –Number System – Binary – Decimal – Conversion – Problems. Need for logical analysis and thinking – Algorithm –Pseudo code – Flow Chart.									
UNIT	II	C PI	ROGRAMMING BASICS				9		
Problem formulation – Problem Solving - Introduction to "C" programming –fundamentals – structure of a "C" program – compilation and linking processes – Constants, Variables – Data Types – Expressions using operators in "C" – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problems.									
UNIT	III	ARR	AYS AND STRINGS				9		
Arrays String- operatio	Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String operations – String Arrays. Simple programs- sorting- searching – matrix operations.								
UNIT	IV	FUN	CTIONS AND POINTERS				9		
Functio reference and arra	n – de ce –Rec ays- Ex	finition cursion ample	n of function – Declaration of function – Pass by va – Pointers - Definition – Initialization – Pointers arithm Problems.	ilue netic	– Pa – Po	iss b ointei	y :s		
UNIT	V	STR	UCTURES AND UNIONS				9		
Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure - Union - Programs using structures and Unions – Storage classes, Pre-processor directives.									
			TOTAL : 45 PER	IOI	DS				
OUTO	COME	ES:	On completion of this course, students will be able to						
1.	Devel	op sim	ple applications in C using basic constructs.						
2.	Design and implement applications using arrays and strings.								
3.	Develop and implement applications in C using functions and pointers.								
4.	4. Develop applications in C using structures.								
TEXT	BOO	KS:							
1.	1.Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.								

2.	PradipDey, Manas Ghosh, <b>"Fundamentals of Computing and Programming in</b> <b>C"</b> , First Edition, Oxford University Press, 2009.						
	-,	,					
3.	Yashavant P. K	Yashavant P. Kanetkar. "Let Us C", BPB Publications, 2011.					
4.	E.Balagurusamy, "Computing fundamentals and C Programming", TMH publishing Company, 2008.						
REFE	RENCES:						
1.	Byron S Gottfri	ied, " <b>Programming with C</b> ", Schaum"s Outlines, Second Edition,					
	Tata McGraw-	Hill,2006.					
2.	Dromey R.G.,	"How to Solve it by Computer", Pearson Education, Fourth Reprint,					
	2007.						
3.	Kernighan,B.W	and Ritchie, D.M, "The C Programming language", Second Edition,					
	PearsonEducat	tion, 2006.					

17ZES106ENGINEERING GRAPHICSLTP										
(	Common to MECH, EEE, ECE and CSE Branches 2 0 4									
OBJECTIV	VES									
• Thi	• This course aims to introduce the concept of graphic communication, develop the drawin skills for communicating concepts, ideas and designs of engineering products.									
• To	expose them to existing national standards related to technical d	rawi	ngs.							
• To	draw the projection of simple solids like prisms, pyramids, cylin	der	etc.							
• To pre	draw the development of surfaces to estimate the sheet metal pare sectional views of solids.	requ	uirer	nent	and to					
• To dra	develop skills in three-dimensional visualization of engineering w isometric and perspective views of simple solids.	; con	npor	nents	and to					
CONCEPT	S AND CONVENTIONS (Not for Examination)									
Importance BISconventio dimensioning	of graphics in engineering applications – use of draft ns and specifications – size, layout and folding of drawing sh	ing eets	inst – le	rume etterii	ents – ng and					
UNIT I	PLANE CURVES AND FREE-HAND SKETCHIN	G			6+9					
Basic geometr parabola and curves. Visua three dimensi views of object	crical constructions, curves used in engineering. Conics – con hyperbola by eccentricity method – drawing of tangents and r lization concepts and free hand sketching: visualization principle onal objects – layout of views- freehand sketching of multiple v cts.	nstru norm es –re view	al to epress fro	n of o the senta om pi	ellipse, above tion of ictorial					
UNIT II	PROJECTION OF POINTS, LINES AND PLANE SURFACES				6+9					
Orthographic Projection of true inclinatio surfaces) incli	projection –principles-principal planes-first angle projection-pro straight lines inclined to both the principal planes - determination ons by rotating line method - traces. Projection of planes (pol aned to both the principal planes by rotating object method.	jecti 1 of 1 ygor	on c true nal a	of poi lengt and c	nts. hs and ircular					
UNIT III	PROJECTION OF SOLIDS				6+9					
Projection of axis is incline	simple solids like prisms, pyramids, cylinder, cone and truncat d to both the principal planes by rotating object method.	ed s	olid	s, wł	ien the					
UNIT IV	UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES									
Sectioning of plane is inclir shape of sect pyramids cyli	prisms, pyramids, cylinders and cones in simple vertical positioned to the one of the principal planes and perpendicular to the ottion. Development of lateral surfaces of simple and sectioned and cones.	on w her - ed se	/hen – ob olids	the taining 5 – 1	cutting ng true prisms,					
UNIT V	ISOMETRIC AND PERSPECTIVE PROJECTIO	NS			6+9					

Principles of isometric projection – isometric scale –isometric projections of simple solids and truncated solids - prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions - perspective projection of simple solids- prisms, pyramids and cylinders by visual ray method .

		LECTURE: 30 TUTORIAL: 45 TOTAL : 75 PERIODS			
OUTCO	OMES:	On completion of this course, students will be able to			
1.	Familiari freehand	ze with the fundamentals, standards of Engineering graphics and Perform sketching of multiple views of basic geometrical constructions.			
2.	Draw orth	nographic projections of points, lines and plane surfaces.			
3.	Draw pro	jections of solids.			
4.	Draw pro	jection of sectioned solids and development of surfaces.			
5.	Visualize	and draw isometric and perspective views of simple solids.			
TEXT I	BOOKS:				
1.	Natrajan Chennai,	K. V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, 2012.			
2.	Venugopal K. and Prabhu Raja V., " <b>Engineering Graphics</b> ", New Age Internationa (P) Limited, 2016.				
3.	Bhatt N. D. and Panchal V. M., <b>"Engineering Drawing</b> ", Charotar Publishing Hous 53 <sup>rd</sup> Edition, 2014.				
REFER	ENCES:				
1.	N S Part Press, Ne	hasarathy and Vela Murali, " <b>Engineering Graphics</b> ", Oxford University, w Delhi, 2015.			
2.	Gopalakrishna K. R., "Engineering Drawing" (Vol. I&II combined), Subhas publications, Bangalore, 2014.				
3.	Basant A Publishin	garwal and Agarwal C. M., " <b>Engineering Drawing</b> ", Tata McGraw Hill g Company Limited, New Delhi, 2013.			
4.	Luzzader <b>an introd</b> Eastern E	Warren J. and Duff John M., " <b>Fundamentals of Engineering Drawing with</b> <b>Juction to Interactive Computer Graphics for Design and Production</b> ", Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005			
5.	Shah M. I	B., and Rana B. C., "Engineering Drawing", Pearson, 2 <sup>nd</sup> Edition, 2009.			

17ZES1(	)7	PROGRAMMING IN C LABORAT	FORY	L	Т	Р	C				
	Common to MECH, EEE and ECE Branches										
LIST OF	LIST OF EXPERIMENTS:										
1. Search,	1. Search, generate, and manipulate data using MS office / Open Office.										
2. Presenta	tion and V	visualization – graphs, charts, 2D, 3D.									
3. Problem	formulat	ion, Problem Solving and Flowcharts.									
4. C Progra	amming u	sing Simple statements and expressions.									
5. Scientifi	c problen	n solving using decision making and looping.									
6. Simple	programm	ing for one dimensional and two dimensiona	l arrays.								
7. Solving	problems	using String functions.									
8. Program	s with use	er defined functions – Includes Parameter Pa	ssing.								
9. Program	9. Program using Recursive Function and conversion from given program to flow chart.										
10.Program	n using st	ructures and unions.									
TOTAL:						JRS	5				
OUTCO	MES:	On completion of this course, students will	be able to								
1. Do str	1. Develop C programs for simple applications making use of basic constructs, arrays, strings.										
2. D	<ol> <li>Develop C programs involving functions, recursion, pointers and structures.</li> </ol>										

17ZB	ZBS108		PHYSICS LABORATORY		L	Т	Р	C		
	Common to MECH, EEE, ECE and CSE Branches0042									
LIST	LIST OF EXPERIMENTS : (ANY 5 EXPERIMENTS)									
1.	1. Determination of rigidity modulus : Torsion Pendulum									
2.	2. Determination of Young's modulus by non-uniform bending method									
3.	<ul><li>(a) Determination of wave length and particle size using LASER</li><li>(b) Determination of acceptance angle in an optical fibre</li></ul>									
4.	Determination of thermal conductivity of a bad conductor – Lee's Disc method									
5.	5. Determination of velocity of sound and compressibility of fluid – Ultrasonic interferometer									
6.	6. Determination of wavelength of mercury spectrum – Spectrometer grating									
7.	7. Determination of band gap of a semiconductor									
				TOTAL	.: 6(	) H(	DUI	RS		
OUT	COM	ES:	On completion of this course, students will	be able to						
1.	1. Apply principles of elasticity, optical and thermal properties for engineering applications.									

17ZI	BS109	CHE	MISTRY LABORAT	ORY	L	Т	P	C	
	Common to MECH, EEE, ECE and CSE Branches <b>0</b>								
LIST	Γ OF EXPERIN	IENTS :							
1.	Determination of total hardness of given water sample by EDTA method.								
2.	Determination of a	lkalinity in giv	en water sample.						
3.	Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.								
4.	Conduct metric titration using mixture of acids and strong base.								
5.	Determination of strength of in given hydrochloric acid using pH meter.								
6.	Estimation of sodium present in water using flame photometer.								
7.	Estimation of Zn present in effluent using Atomic Absorption Spectroscopy(AAS)								
8.	Corrosion experiment – weight loss method								
9.	Estimation of iron content of the given solution using potentiometer meter.								
10.	Estimation of iron content of the given sample using Spectro photometer (thiocyanate method).								
				TOTAL	<b>: 6</b> (	) H(	OUI	RS	
OUI	COMES: On a	completion of	this course, students will	be able to					
1.	Outfitted with hands-on knowledge in the qualitative and quantitative chemical analysis of water quality related parameters, corrosion studies, heavy metal analysis, etc.								

17ZH	S201		COMMUNICATIVE ENGLISH-II	L	Т	Р	С	
	Commo	on to	MECH, EEE, ECE and CSE Branches	4	0	0	4	
UNIT I							12	
Listenin announce Turn taki – Extens instructio adjective	<b>Listening</b> – Listening to different types of conversation and answering questions. Listening to announcements at railway station, airports, etc. <b>Speaking</b> – Comments on topics like weather. Turn taking – Closing a conversation (excuses, general wish, positive comment, thanks); <b>Reading</b> – Extensive reading; <b>Writing</b> – purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-; <b>Grammar</b> - impersonal passive voice, numerical adjectives ; Vocabulary – Homonyms, Homophones.							
UNIT I	Ι						12	
Listening situations Welcome story or Gramma	<b>Listening</b> – Listening to situation based dialogues; <b>Speaking</b> – Conversation practice in real life situations, asking for directions, giving directions, Discussing various aspects of a film, or a book. Welcome address, Vote of Thanks, special address on special topics. <b>Reading</b> –reading a short story or an article from newspaper. <b>Writing</b> –writing a review/ summary of a story / article. <b>Grammar</b> – concord compound words							
UNIT I	II						12	
Speaking seeking i limit - sk journals; verbs wit	g – Conv nformati timming Gramn hout any	versati on – e ; Writ nar- C z chang	on skills with a sense of stress, intonation, pronuncia expressing feelings, <b>Reading</b> – speed reading – reading ting – Minutes of meeting – writing summary after re Cause and effect expressions; <b>Vocabulary</b> – Words ge in spelling.	tion g pas eadin useo	and sage ng a d as	mea es wi rticle nou	ning – th time s from ns and	
UNII I			madel interviews (fore to fore talenhouse and w	. d		- <b>f</b> - m -		
Speaking note taki Reading job – cov reported	<b>Listening</b> – Viewing model interviews (face-to- face, telephonic and video conferencing); <b>Speaking</b> – role play practice in telephone skills – listening and responding, asking questions – note taking – passing on messages, Role play and mock interview for grasping interview skills; <b>Reading</b> – Reading the profile of the company concerned – scanning; <b>Writing</b> – Applying for a job – cover letter – resume preparation – vision, mission and goals of the candidate; <b>Grammar</b> - reported speech <b>Vocabulary</b> – Idioms and their meanings							
UNIT V	V						12	
Listening – Viewing a model group discussion ; Speaking – Group discussion skills – initiating the discussion – exchanging suggestions and proposals – expressing dissent/ agreement – assertiveness in expressing opinions- mind mapping technique; Reading – Note making skills – making notes from books, or any form of written materials – Intensive reading; Writing – Types of reports / Project report – report format – recommendations/ suggestions Grammar – Use of Clauses ; Vocabulary – Collocation; fixed and semi-fixed expressions.								
	OMEG		On completion of this course, students will be able to			~~~		
0010	Read te	chnica	al texts and write area specific texts effortlessly.					
<u>o.</u>	Listen a	and co	mprehend lectures and talks in their area of specialization	ion s	ucce	essfu	lly.	

10.	Speak appropriately and effectively in varied formal and informal contexts.						
11.	Write reports and winning job applications.						
TEXT	BOOKS:						
1.	Board of ed Technology"	itors. "Fluency in English A Course book for Engineering and , OrientBlackswan, Hyderabad: 2016					
REFERENCES:							
6.	6. Comfort, Jeremy, et al. "Speaking Effectively : Developing speaking skills for Business English". Cambridge University Press . Cambridge : Reprint 2011.						
7.	Dutt P. Kiranmai and RajeevanGeetha . "Basic Communication Skills", Foundation Books:2013.						
8.	8. Means, L. Thomas and Elaine Langlois. "English & Communication For Colleges".						
CengageLearning, USA : 2007							
9.	Redston, Chr & Workbook)	is &Gillies Cunningham "Face2Face" (Pre-intermediate student's Book Cambridge University Press, New Delhi: 2005.					

17ZBS202	ENGINEERING MATHEMATICS – II L T I								Р	С					
Common to MECH, EEE, ECE and CSE Branches									3	2	0	4			
UNIT I	VECT	OR CA	ALCUI	LUS											9+6
Gradie fields – Vecto theorem (exclu	nt, diverg or integrat iding proc	gence an tion – C ofs) – Si	nd curl – Green's t mple app	- Direct theorem plication	tiona n in a ons in	ıl der a pla volvi	rivati ine, v ing c	ve – Gaus ubes	- Irro ss div and	tation rergen rectan	al and nce th ngular	d sol eore para	enoi m an illelo	dal v id St pipe	vector okes' ds.
UNIT II ORDINARY DIFFERENTIAL EQUATIONS										9+6					
Higher parameters – ( with constant of	order line Cauchy's coefficien	ear diffe and Leg ts.	erential e gendre's	equation linear	ns wi equa	ith co tions	onsta – S	nt co imul	beffic tanec	ients ous fii	– Me rst ord	thod ler li	of va near	ariati equa	on of ations
UNIT III LAPLACE TRANSFORMS										9+6					
Basic propertie transforms - ' functions. Inve theorems – S transformation	e transform erse Transform erse Lapla olution o technique	sforms of ns of un ace tran of linear es.	of derivation nit step asform -S	tives an function Stateme of seco	nd int on ar ent of ond of	tegra nd in of Co order	ls of npul nvol	fund se f ution	tions function theo theo theo theo	orin ( ons – orem nt co	rivati - Trai – Init	ves a nsfor ial a ents	ind ir m of and f using	ntegr f per inal g La	als of riodic value place
UNIT IV	ANAL	YTIC	FUNC	TION	IS										9+6
Functions of a equations and analytic functions $w = z+k, kz, 1$	complex sufficient on – Harn /z, $z^2$ , $e^z$ a	variable condition nonic co nd bilin	e – Analy ons (excl onjugate ear trans	vtic fund luding p – Const oformati	ction proof tructi ion.	is: Ne Es) – l ion o	ecess Harn f ana	ary on nonio alytic	condi c and c func	tions ortho tions	– Cau gonal – Coi	chy- prop form	Riem pertie nal m	nann es of nappi	ng:
UNIT V	COMF	PLEX	INTEG	GRATI	ION	I									9+6
Complex integral formuresidue theore (example)	gration – la – Taylc m – Eval ccluding p	Statem or's and luation of poles on	ent and Laurent of real d the real a	applica 's series lefinite axis).	ation s exp integ	ns of pansio grals	Cau ons - as c	uchy - Sin conto	's in gular our in	tegral poin tegral	theo ts – R ls aro	rem esidu und	and ues – unit	Cau Cau circl	chy's chy's e and
		LE(	CTURE	E: 45 T	ГUТ	OR	IAL	.: 30	) TO	TAI	. 7	5 Pl	ERI	OD	5
OUTCOME	ES:	On con	npletion	of this c	cours	se, sti	uden	ts w	ill be	able (	0				
1. Solv	ve probler	ms on v	vector ca	alculus	and	to ap	oply	ther	n in	any c	other 1	field	theo	ry re	elated
2. Solv	ve differen	ntial equ	uations a	und will	l be e	expo	sed t	to th	eir ap	plica	tions	in va	riou	s fiel	lds of
3. Solv	e problentions of d	ns on La ifferenti	aplace tra	ansform	ns and equat	d wil	ll be and	able othe	to us	e Lap neeri	blace t	ranst plica	form tions	in fi	nding
4. Solv anal	ytic funct	ex integritions and	gration p conforr	problem nal map	ns an pping	nd w	vill k	be e	xpose 1g.	d to	vario	ous a	pplic	catio	ns of
TEXT BOO	OKS:					g in e	ngin								
1 Bali	NT D 1					g in e	ngin								
I. Edit	N. P and ion, Laxm	Manish 11 Public	Goyal, " cations P	<b>'A Text</b> vt Ltd	<b>t boo</b> ,2011	g in e	Engin	inee	ring	Math	emat	ics",	Eigh	ith	

REFER	ENCES:							
1.	Dass, H.K., and Er. RajnishVerma," Higher Engineering Mathematics", S. Chand							
	Private Ltd., 2011							
2.	Glyn James, "Advanced Modern Engineering Mathematics", 3rd Edition, Pearso	son						
	Education, 2012.							
3.	Peter V. O'Neil," Advanced Engineering Mathematics", 7th Edition, Cengage learning,	,						
	2012.							
4.	Ramana B.V, " <b>Higher Engineering Mathematics</b> ", Tata McGraw Hill Publishin	ing						
	Company, New Delhi, 2008.							
5.	Sivarama Krishna Das P. and Rukmangadachari E., " <b>Engineering Mathematics</b> " Volur	те						
	I, Second Edition, PEARSON Publishing, 2011.							

#### **ENGINEERING PHYSICS II**

Common to MECH, EEE, ECE & CSE

L T P C 3 0 0 3 9

#### UNIT I ELECTRICAL PROPERTIES OF MATERIALS

Conductors – Classification of conducting materials – Ohm's Law – Electrical conductivity – Relation between current density, drift velocity and mobility – Classical free electron theoryof metals – Expression for electrical conductivity of a metal – Thermal conductivity – Expression for thermal conductivity of a metal – Wiedemann – Franz law – success and failuresof classical free electron theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states.

# UNIT II SEMICONDUCTOR PHYSICS

Introduction – Intrinsic semiconductor – Energy band diagram – Direct and indirect semiconductors –Carrier concentration in an intrinsic semiconductors (derivation) – Extrinsic semiconductors – Carier concentration in n-type & p-type semiconductors –Hall effect – Determination of Hall coefficient (Theory) – Application of Hall effect.

# UNIT III MAGNETIC PROPERTIES OF MATERIALS

Magnetization – Magnetic flux – Magnetic flux density – Intensity of Magnetisation – Magnetic field intensity – magnetic permeability – magnetic susceptibility – Magnetic field and induction – Types of magnetic materials – Microscopic classification of magnetic materials – Ferromagnetism : origin and exchange interaction – Domain theory- Hard and soft magnetic materials – Magnetic storage devices – Hard disk.

# UNIT IV DIELECTRIC PROPERTIES OF MATERIALS

General properties of Dielectric materials – Electrical susceptibility – Dielectric constant – Electronic, ionic, orientational and space-charge polarization – Frequency and Temperature dependence of Polarisation– Internal field – Claussius – Mosotti relation (derivation) – Dielectric breakdown – Dielectric loses – Use of dielectric materials (capacitor and transformer) - Ferroelectricity and its applications.

# UNIT V

# MODERN ENGINEERING MATERIALS

Metallic glasses – Properties of metallic glasses – Shape memory alloys (SMA) – Preparation, properties and applications of Shape memory alloys (SMA) – Characteristics of Shape memory alloys – Characteristics, properties of Ni-Ti alloy, application, advantages and disadvantages of shape memory alloys (SMA) – Nanomaterials – Different forms of nanomaterials – Preparations –Pulsed Laser Deposition, Chemical Vapour Deposition and Applications.

OUTCO	MES:	On completion of this course, students will be able to			
1.	To explore knowledge about free electron theory and density of states of				
	conducting materials with related laws.				
2.	2. Students are able to compare intrinsic and extrinsic semiconductor, density of				

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**TOTAL : 45 PERIODS** 

	electrons and holes calculation, Hall effect with applications and basic
	semiconductor devices.
3.	To learnt comparatively about different type of magnetic materials,
	superconducting materials and apply in their engineering field.
4.	To attain the functional knowledge of different types of dielectric materials,
	polarization mechanism and their qualitative engineering applications.
5.	To know more aboutpreparation of modern engineering materials and materials
	suitability for their own engineering field.
TEXT B	BOOKS
1.	P. Mani, "Engineering physics", Dhanam Publications, 2011.
2.	G. Senthilkumar, "Engineering physics", VRB Publishers.
3.	A.Marikani, "Engineering Physics" PHI Learning Pvt., India 2009.
4.	Wahen M. A. " <b>Solid state physics: Structure and properties of materials</b> ", Narosa publishing house, 2009
REFER	ENCES
1.	R.K. Gaur and S.C. Gupta, "Engineering physics", DhanpatRai publications,
	New Delhi 2003.
2.	M.N.Avadhanulu and P. G. Kshirsagar, "A text book of engineering
	physics "S.Chand and Company, Ltd, New Delhi 2005.
3.	K. Rajagopal, "Engineering Physics", PHI, New Delhi, 201.
4.	M. Arumugam, "Engineering physics", Anuradha publishers

171/00	0.4	BASIC ELECTRICAL, ELECTRONICS A	ND	L	Τ	Р	С
17MES	204	INSTRUMENTATION ENGINEERING	r I				
				3	0	0	3
UNIT I	F	LECTRICAL CIRCUITS		_	-		9
Basic elem	nents of	Electric circuits including sources. Resistor. Inductor	and (	Capa	citor	· - N	- Iesh
and Nodal	analy	sis of simple circuits - Basics of AC circuits - Power	er and	i Po	wer	fact	or -
Introductio	on to th	ree phase circuits and its connections (Star and Delta).					-
UNIT II	E	LECTRICAL MACHINES					9
Principle,	classi	ication, characteristics and Applications of DC	Gene	erato	rs,	Mot	ors,
Transform	ers, Th	ree phase induction machines, Alternators, Synchronou	is Mot	tors.			
UNIT II	I E	LECTRONIC DEVICES AND CIRCUITS					9
Introductio	on- PN	Junction diode and its characteristics - Zener diode - B	JT Co	onfig	urat	ions	and
characteris	tics - F	ET Configuration and characteristics - Introduction to	Op Ai	mps	-An	plif	iers,
Oscillators	. Diff	erentiators - Integrators - Multivibrator using 555	j Tin	ner	IC.	Vol	tage
Regulator	, IC usin	g LM 723 and LM 317.			,		
UNIT IV	7 D	IGITAL ELECTRONICS AND COMMUN	ICA	ТІС	DN		9
	S	YSTEMS					
Binary Nu	mber S	ystem - Logic Gates - Boolean Algebra - Half and F	ull A	dder	s – 1	A/D	and
D/A Conv	version	(single concepts) - Types of Signals: Analog and	nd D	igita	l Si	gnal	s –
Modulatio	n and	Demodulation: Principles of Amplitude and Fre	quenc	y N	Aodu	ılati	ons.
Communio	cation	Systems: Radio, TV, Fax, Microwave, Satellite and	Optic	cal F	Fibre	(B)	ock
Diagram A	pproac	h only).					
UNIT V	I	NSTRUMENTATION					9
Characteri	stics of	measurement-Errors in measurement - Moving coil and	id mo	ving	iron	me	ters,
Energy me	eter, W	att meter and Multimeter - Three phase Power meas	surem	ent	- Ins	strun	nent
Transform	ers (C	and PT) - Introduction to Digital Measurements - O	scillos	scop	es(C	RO	and
DSO) -	Transc	ucers: Resistive, Inductive, Capacitive, Thermoe	lectric	c, p	iezo	elec	tric,
photoelect	ric, Ha	l effect, RTD, Strain gauge, LVDT and LDR.					
			<b>L:4</b>	5 PI	ERIC	ODS	1
OUTCO	MES	On completion of this course, students will be able	to				
1. l	Discuss	the essentials of electric circuits and analysis.					
2. 1	Discuss	the basic operation of electric machines and transform	ers				
3. 1	Unders	and the concepts of various analog and digital electron	ic dev	vices	•		
4. I	4. Understand the concepts of various communication devices.						
5. 1	5. Introduction to measurement and metering for electric circuits.						
TEXT B	OOK	S:					
1. l	R.Muth	ukrishnan, S.Salivahanan, "Basic Electrical	and	d	Ele	ctro	nics
]	Engine	ering",Tata McGraw Hill, 2015.					
2. 1	3.L. Th	eraja and A.K.Theraja, "A Text Book of Electrical Te	echno	logy	" <b>,</b> V	ol-I	and
]	I, S. C	nand & Co. 2014.					
REFER	ENCE	S:					
1. Allan S Moris, , "Measurement and Instrumentation Principles", Elseveir, 2006							
2. Rajendra Prasad, " <b>Fundamentals of Electrical engineering</b> ", Prentice Hall of India 2006							
3.	3. S.K.Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson India,					'ia,	
1770624							
1/20520	13	EINVIKUINIVIEINIAL SUIEINUE AIND EINU	<b>I</b> G.		I	r	
Common to MECH_EFE_ECE and CSE Branches 3 0 0 3							
	E	VIRONMENT ECOSVSTEMS AND DIODIVEDSITY	r				
UNIT	<b>E</b> 1	A A TVOLATATICUTT, FOOD I DI CIVID ATAD DIODIA EKSIT I					14

Definition, scope and importance of Risk and hazards; Chemical hazards, Physical hazards, Biological hazards in the environment – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers-Oxygen cycle and Nitrogen cycle – energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds. **Field study of simple ecosystems – pond, river, hill slopes, etc.** 

UNIT II ENVIRONMENTAL POLLUTION& HEALTH RISK

Definition – causes, effects and control measures of: (a) Air pollution: Causes, effects and prevention (b) Water pollution: Causes, effects and prevention (c) Soil pollution: Causes, effects and prevention -(d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards–role of an individual in prevention of pollution – soil waste management: causes, effects and control measures of municipal solid wastes – pollution case studies

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

#### UNIT III NATURAL RESOURCES

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Energy Conversion processes – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets - river / forest / grassland / hill

#### **UNIT IV** SOCIAL ISSUES AND THE ENVIRONMENT

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air act – Water act – Wildlife protection act – Forest conservation act – The Biomedical Waste (Management and Handling) Rules; 1998 and amendments- scheme of labeling of environmentally friendly products (Ecomark) - central and state pollution control boards-disaster management: floods, earthquake, cyclone and landslides. Public awareness.

#### **UNIT V** HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- -GIS-remote sensing-role of information technology in environment and human health – Case studies.

			<b>TOTAL : 45 PERIODS</b>
OUI	COMES:	On completion of this course, students will	be able to
1.	. Apply the knowledge of environmental science in identifying, to formulate and t		
	solve the envir	onmental problems.	
2.	Create awarenes	s about structure and function of various ecosys	tems and natural resources.

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Understand that the ignorance and incomplete knowledge will lead to misconceptions.
Analyse the reason behind serious environmental disasters.
Acquire Knowledge about important environmental laws.
Acquire in-depth knowledge on population explosion and role of IT in environmental
management.
T BOOKS:
Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd
edition, Pearson Education, 2004.
Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi,
2006.
'ERENCES:
R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and
Standards", Vol. I and II, Enviro Media.
Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ.,
House, Mumbai, 2001.
Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New
Delhi,2007.
Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University
Press 2005.

17MES	5206	ENGINEERING MECHANICS	L	Τ	Р	С
			3	2	0	4
• •	• To make the students to apply static equilibrium of rigid bodies both in two dimensions and also in three dimensions.					
•	To co	mprehend the effect of friction on equilibrium.				
•	To un	derstand the geometrical properties of surfaces and solids				
•	To un	derstandvarious terms involved inProjectiles.				
•	To ap	ply dynamic equilibrium of particles in solving basic problems	•			
UNIT I	UNIT I INTRODUCTION TO MECHANICS AND FORCECONCEPTS		9	+6		
Principles resolution of momen addition or	and Co and con t –Vari f concu	oncepts – Laws of mechanics – system of forces – resultant of mposition of forces –Lami's theorem – moment of a force – pl gnon's theorem – resolution of a force into force and couple rrent force in space – equilibrium of a particle in space.	of a fo hysica - for	orce Il sig rce ir	systen nific n spa	em – cance ace –
UNIT II	F	RICTION				9+6
Friction re friction - body on a wedge fric	esistanc angle o rough etion.	e – classification of friction – laws of friction – coefficient of of repose – cone of friction –free body diagram – advantages inclined plane – non- concurrent force system – ladder friction	f fricti – equ on – r	on – uilibi ope 1	ang rium fricti	te of of a ion –
UNIT II	IG	EOMETRICAL PROPERTIES OF SECTION				9+6
Centroids product of	– deter inertia	mination by integration – moment of inertia – theorems of n – principal moment of inertia of plane areas – radius of gyratic	nomer on.	nt of	ine	tia –
UNIT IN	/ <b>B</b>	BASICS OF DYNAMICS - KINEMATICS				9+6
Kinematics and kinetics – displacements, velocity and acceleration – equations of motion – rectilinear motion of a particle with uniform velocity, uniform acceleration, varying acceleration – motion curves – motion under gravity –relative motion – curvilinear motion of particles – projectiles – angle of projection – range – time of flight and maximum height-kinematics of rigid bodies.						
UNIT V B		T V BASICS OF DYNAMICS - KINETICS				9+6
Newton's second law of motion – linear momentum – D'Alembert's principle, dynamics equilibrium – work energy equation of particles – law of conservation of energy – principle of work and energy.Principles of impulse and momentum – equations of momentum – laws of conservation of momentum. impact – time of compression, restitution, collision – co-efficient of restitution – types of impact – collision of elastic bodies by direct central impact and oblique impact – collision of small body with a massive body – kinetic energy of a particle. <b>LECTURE: 45 TUTORIAL: 30 TOTAL : 75 PERIODS</b>						
OUTCO	<b>OUTCOMES:</b> On completion of this course, students will be able to					
1. E	xplain 1	the different principles of mechanics and to solve engineerin	g prol	olem	s de	aling

	with forces.				
2.	Apply the concepts of friction to solve various problems dealing with friction				
3.	Explain the dif	Explain the different geometrical properties of various sections.			
4.	Solve problems	s in rigid body dynamics (kinematic systems).			
5.	Solve problems	s in rigid body dynamics (kinetic systems).			
ТЕХТ	BOOKS:				
1.	Beer F.P and Jo and Dynamics	ohnston Jr. E.R., " <b>Vector Mechanics for Engineers (In SI Units): Statics</b> ", 10 <sup>th</sup> Edition, Tata McGraw-Hill Publishing company, New Delhi (2013).			
2.	BhavikattiS.S. International (F	and Rajashekarappa, K.G., <b>"Engineering Mechanics</b> ", New Age P) Limited Publishers, 2008.			
3.	Natesan, S.C. Naisarak, Delh	, " <b>Engineering Mechanics</b> ",Umesh publications, 5-B north market, i, 2002			
REFE	RENCES:				
1.	Hibbeller, R.C Edition,Pearso	and Ashok Gupta, <b>"Engineering Mechanics:</b> Statics and Dynamics", 11th n Education 2010.			
2.	Irving H. Sham	nes and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and			
	<b>Dynamics</b> ", 4th	h Edition, Pearson Education 2006.			
3.	Meriam J.L. ar Volume 2", 4 <sup>th</sup>	nd Kraige L.G., <b>"Engineering Mechanics- Statics - Volume 1, Dynamics-</b> Edition, John Wiley & Sons, 1996.			
4.	Rajasekaran <b>Dynamics",</b> 3 <sup>rd</sup>	S. and SankarasubramanianG., <b>"Engineering Mechanics Statics and</b> Edition, Vikas Publishing House Pvt. Ltd., 2009.			
5.	Kumar, K.L., Publishing con	<b>"Engineering Mechanics",</b> 3 <sup>rd</sup> Revised Edition, Tata McGraw-Hill apany, New Delhi 2008.			

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## ENGINEERING PRACTICES LABORATORY

#### Common to MECH, EEE, ECE and CSE Branches

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# **OBJECTIVES**

- To train the students in safety handling of tools, equipment and machineries, plumbing operation and basic carpentry exercises.
- To impart skill in fabricating simple components using basic machining processes, sheet metal and metal joining process like welding, soldering, etc.
- To expose them in house wiring, basic electrical circuits and Electronic components and equipments.

# **GROUP A (CIVIL & MECHANICAL)**

# **CIVIL ENGINEERING PRACTICES**

#### A) PLUMBING WORKS:

- 1. Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers and elbows in household fittings.
- 2. Study of pipe connections requirements for pumps and turbines.
- 3. Preparation of plumbing line sketches for water supply and sewage works.
- 4. Hands-on-exercise:Basic pipe connections Mixed pipe material connection Pipe connections with different joining components.
- 5. Demonstration of plumbing requirements of high-rise buildings.

#### **B) CARPENTRY USING POWER TOOLS ONLY:**

- 1. Study of the joints in roofs, doors, windows and furniture.
- 2. Hands-on-exercise: To make basic carpentry joints by sawing, planing and cutting.

# MECHANICAL ENGINEERING PRACTICES

#### A) WELDING:

- 1. Preparation of arc welding of butt joints, lap joints and tee joints.
- 2. Gas welding practice

#### **B) BASIC MACHINING:**

- 1. Simple Turning and Facing
- 2. Drilling Practice

#### **C) SHEET METAL WORK:**

- 1. Forming & Bending:
- 2. Model making Trays, funnels, etc.
- **3.** Different type of joints.

#### **D) MACHINE ASSEMBLY PRACTICE:**

- 1. Study of centrifugal pump
- 2. (b) Study of air conditioner

# **GROUP B (ELECTRICAL & ELECTRONICS)**

#### **ELECTRICAL ENGINEERING PRACTICES**

1. Resi 2. Fluo 3. Stair	Residential house wiring using switches, fuse, indicator, lamp and energy meter. Fluorescent lamp wiring. Stair case wiring				
4. Mea RLC	4. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.				
5. Mea	surement of energy using single phase energy meter.				
6. Mea	surement of resistance to earth of electrical equipment.				
ELECTR	ONICS ENGINEERING PRACTICES 15				
1. Stud measusing 2. Stud 3. Gene 4. Sold purp	<ol> <li>Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (Peak-Peak, RMS, Time period, frequency) using CRO.</li> <li>Study of logic gates AND, OR, EOR and NOT.</li> <li>Generation of Clock Signal.</li> <li>Soldering practice – Components, Devices and Circuits – Using general purpose PCB.</li> </ol>				
5. Mea	surement of ripple factor of Half-wave and Full wave rectifiers.				
	TOTAL : 60 PERIODS				
OUTCOM	<b>MES:</b> On completion of this course, students will be able to				
1. H	Fabricate components by carpentry and pipe connections including plumbin works.				
2. U	Use welding equipment to fabricate permanent joints by welding and also can perform basic machining operations.				
3. I	Fabricate electrical and electronics circuits.				
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#### BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION LABORATORY

# LISTOFEXPERIMENTS:

- 1.Load test on separately excited DC generator
- 2.Load test on Single phase Transformer
- 3.Load test on Induction motor
- 4.Verification of Circuit Laws
- 5.Verification of Circuit Theorems
- 6.Measurement of three phase power
- 7. Load test on DC shunt motor.
- 8. Transistor based application circuits
- 9. Characteristics of PN and Zener diode.
- 10. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
- 11. Characteristics of LVDT.
- 12. RTD and Thermistor.

			TOTAL:60 PERIODS
<b>OUTCOMES:</b>		On completion of this course, students will be	e able to
1.	Ability to determine the speed characteristic of different electrical machines.		nt electrical machines.
2.	Ability	to design simple circuits involving diodes and	transistors.
3.	Ability	to use operational amplifiers.	

17ZBS301	T	RANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	Т	Р	С
			3	1	0	4
UNIT I	PARTI	AL DIFFERENTIAL EQUATIONS				12
Formation of order partial of second a types.	of partial di differentia nd higher o	fferential equations – Singular integrals Solutions of a l equations - Lagrange's linear equation Linear partial order with constant coefficients of both homogeneous a	standard differer nd non-	types tial eq homog	of fi uatic geneo	rst ons ous
UNIT II	FOUR	ER SERIES				12
Dirichlet's c	conditions –	General Fourier series – Odd and even functions – Half	range s	ne ser	ies –	Half
UNIT III	APPLI	CATIONS OF PARTIAL DIFFERENTIAL EQUATI	ONS	<u>ary 515.</u>		12
Classification - One dimen heat conduct	on of PDE – nsional equation (exclud	- Method of separation of variables - Solutions of one dim ation of heat conduction – Steady state solution of two ling insulated edges).	nensiona dimensi	l wave onal ee	e equ quati	ation on of
UNIT IV	FOUR	ER TRANSFORMS				12
Statement o Properties –	f Fourier in Transforms	tegral theorem – Fourier transform pair – Fourier sine s of simple functions – Convolution theorem – Parseval's	and cosi identity	ne tra	nsfor	ms –
UNIT V	Z - TRA	ANSFORMS AND DIFFERENCE EQUATIONS 12				12
Z- transform Convolution transform.	ns - Elemen 1 theorem -	ntary properties – Inverse Z - transform (using partial Formation of difference equations – Solution of difference	fraction nce equ	and re ations	esidu usin	es) – g Z -
TOTAL: 60 PER				RIC	DS	
OUTCOM	ES:					
• T ec pi	• The understanding of the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.					
TEXT BOO	OKS:					
1.	Veerarajan. Education I	T.," <b>Transforms and Partial Differential Equations</b> ", Ta Pyt Ltd., NewDelhi, Second Reprint, 2012	ata McG	raw H	i11	
2.	Grewal.B.s	""Higher Engineering Mathematics" 42 <sup>nd</sup> edition, Khann	a Publis	ners D	elhi,2	2012.
3.	Narayanan.S.,Manicavachagampillai.,T.K and Ramanaiah.G"Advanced Mathematics f Engineering Students" Vol II and III,S.Viswanathan Publishers Pvt.Ltd1998.			for		
REFEREN	CES:					
1. I I	Bali.N.P and publications	d Manish Goyal, <b>"A Text book of Engineering Mathemat</b> Pvt.Ltd.2007.	<b>ics</b> ",7 <sup>th</sup>	Edition	ı Lax	cmi

2.	Ramana B.V., "Higher Engineering Mathematics" Tata McGraw Hill Education Pvt
	Ltd.,NewDelhi. ,2008
3.	Glyn James, "Advanced Modern Engineering Mathematics", 3 <sup>rd</sup> edition Pearson
	Education,2007.
4.	Erwin Kreyszig, "Advanced Engineering Mathematics",8 <sup>th</sup> edition,Wiley India, 2007
5.	Ray Wylie .C and Barrett L.C, "Advanced Engineering Mathematics", Tata McGraw Hill
	Education Pvt Ltd., NewDelhi., Sixth edition, 2012.
6.	Datta.K.B., "Mathematical Methods of Science nad Engineering", Cengagae Learning India
	PvtLtd.Delhi.2013.

17MES302	17MES302	
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#### **STRENGTH OF MATERIALS**

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3	2	0	4
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OBJECT	IVE	ES		
•	To make the students to understand the concepts of stress and strain.			
•	То	draw shear force and bending moment diagrams for different types of beams	\$ <b>.</b>	
•	To apply theory of simple bending in beams and to understand the concept of principle stress.			
•	To evaluate slope and deflection different types of beams and to understand various theories of long columns.			
•	To evaluate stresses induced in the shaft due to torsion.			
UNIT I	UNIT I STRESS AND STRAIN 9-			

Stress and strain at a point-tension, compression, shear stresses - Hooke's law - compound bars – lateral strain - Poisson's ratio -volumetric strain - bulk modulus - relationship among elastic constants – stress strain diagrams for mild steel, cast iron-ultimate stress - yield stress-factor of safety - thermal stresses - thin cylinders - strain energy due to axial force - resilience- stress due to gradual load, suddenly applied load and impact load.

#### UNIT II SHEAR FORCE AND BENDING MOMENT

9+6

Beams – types of beams - types of loads, supports - shear force – bending moment – shear forces and bending moment diagrams for cantilever, simply supported and over hanging beams with concentrated , uniformly distributed and uniformly varying load-relationship between rate of loading, shear force, bending moment- point of contra flexure.

## UNIT III THEORY OF BENDING AND COMPLEX STRESSES

9+6

Theory of bending-bending equation-section modulus-stress distribution at a cross section due to bending moment and shear force for cantilever, simply supported beams with point, UDL loads (rectangular, circular, I & T sections only) -combined direct and bending stresses, kernel of section (rectangular, circular sections only). 2D state of stress – 2D normal and shear stresses on any plane-principal stresses and principal planes-principal strains and direction-Mohr's circle of stress.

## UNIT IV

# DEFLECTION OF BEAMS AND THEORY OF LONG COLUMNS

9+6

Determinations of deflection curve – relation between slope, deflection and radius of curvature – slope and deflection of beam at any section by Macaulay's method - concept of conjugate beam method (theory only)- Euler's theory of long columns- expression of crippling load for various end conditions-effective length-slenderness ratio-limitations of Euler equation - Rankine formula for columns.

#### UNIT V THEORY OF TORSION

9+6

Torsion of shafts - torsion equation - polar modulus- stresses in solid and hollow circular shafts - torsional rigidity - power transmitted by the shaft – importance of angle of twist - strain energy due to torsion - modulus of rupture –torsional resilience – combined bending and torsion- stresses in helical springs - deflection of helical spring-leaf springs.

#### LECTURE: 45 TUTORIAL: 30 TOTAL : 75 PERIODS

OUT	COMES:	On completion of this course, students will be able to
1.	Determine the	stress, strain and modulus for different materials.
2.	Drawshear force	ee and bending moment diagrams for different beams.
3.	Calculate the co	omplex stresses in beams with different loading conditions.
4.	Evaluate the de	eflection behaviour of beams and slender columns.
5.	Apply the conc	epts of torsion in shafts and springs.
TEX	Г BOOKS:	
1.	Bansal R.K., "S	Strength of Materials", Laxmi Publications (P) Ltd., 2007
2.	Sadhu Singh, "	Strength of Materials", Khanna Publishers, New Delhi, 2000.
3. RajputR. K ., "		Strength of Materials", S. Chand & Company Ltd., New Delhi 2002.
<b>REFERENCES:</b>		
1.	Hibbeler R.C.,	"Mechanics of Materials", Pearson Education, Low Price Edition, 2007
2.	Jindal U C, " <b>T</b>	extbook on Strength of Materials", Asian Books Pvt. Ltd.,
	Learning India	, 2013.
3.	EgorP.Popov 2001	"Engineering Mechanics of Solids" Prentice Hall of India, New Delhi,
4.	Subramanian Education Seri	R., "Strength of Materials", Oxford University Press, Oxford Higher es,
5.	Ramamrutham Delhi, 2000.	S and Narayan R, "Strength of Materials", Dhanpat Rai and Sons, New

17MPC	2303	MAC	CHINE DRAWING	L			C	
		1	1 0 4				3	
OBJEC	CTIV	ES						
•	• To make the students to understand BIS standards for machine drawing.							
•	То	understa	nd Fits and Tolerances in manufacturing drawing.					
•	То	prepare a	assembly drawings of joints, couplings.					
•	То	prepare j	part and assembly drawing of bearing and valves.					
•	То	prepare a	assembly drawings of machine elements like screw jac	k, ta	ilsto	ck,e	tc.	
UNIT I		BASIC	CONCEPTS OF MACHINE DRAWING				3+9	
BIS code compone finish, sy drawing.	es for ents – ymbol	engineer systems s and re	ing drawing – abbreviations – conventional represent of dimensioning and dimensioning of common com- epresenting surface finish on drawing – application	tatic pone n of	on of ents f sy	f star – su mbol	ndard ırface ls on	
UNIT I	I	FITS , T	FOLERANCES AND SECTIONAL VIEWS	3			3+9	
Types of tolerance and fits of plane – ty	fits - s and on drav ypes o	- types of allowan wings. So f section	of tolerance – representation of tolerance on drawing ces– form and position tolerances – symbols –indica ectional views – need for sectioning – cutting plane – s – section lines - sectioning conventions.	g – ition loca	calc of tion	ulation toleration of cu	on of ances utting	
UNIT I	UNIT III ASSEMBLY DRAWING OF JOINTS AND COUPLINGS			3+9				
Preparati fasteners	Preparation of drawing for keys and keyways - cotter joints - knuckle joints and thr fasteners. Preparation of drawing for couplings - flange coupling and universal coupling.			thre	eaded			
UNIT I	UNIT IV PART AND ASSEMBLY DRAWING OF BEARING AND VALVES			)	3+9			
Preparati journal b	on of gearing	part and – stop v	assembly drawing for plummer block – foot step ball alve –stuffing box-safety valve.	beari	ing –	- foo	t step	
UNIT V	V	ASSEM	IBLY OF MACHINE PARTS				3+9	
Preparati –connect	Preparation of assembly drawing forscrew jack – tailstock – tool head of shaper – machine vi –connecting rod. Study of blue print drawings.				e vice			
			LECTURE: 15 TUTORIAL: 45 TOTAL :	60	) PF	CRI	ODS	
<b>OUTCOMES:</b>		S:	On completion of this course, students will be able to					
1.	1. Analyse the b		basic concepts of machine drawing.					
2.	Explain the bas		asic concepts of limits, fits and tolerances.					
3. Develop sect		lop secti	onal views of fasteners, joints and couplings.					
4. Develop assembly c		lop asser	mbly drawings of bearings and valves					
5.	Draw assembly of machine parts.							
TEXT	BOO	KS:						

1.	BhattN.D. and PanchalV.M., "Machine Drawing", Charotar Publishing				
	House, 49th Edition, 2013.				
2.	Narayanan, K.L., Kanniah, P., and Venkata Reddy, K., <b>"Machine Drawing</b> ", New Age International Publications, 2009.				
REFE	ENCES:				
1.	Gopalakrishna K.R., "Machine Drawing", Subhas publishing House, Bangalore, 2002.				
2.	Dhawan R.K., "A text book of Machine Drawing", SChand & Company, New Delhi, 2016.				
3.	Sidheswar N., Kannaiah, P., and Sastri, V.V.S., "Machine Drawing", TMH New Delhi, 2017.				
4.	John K.C., "Text book of Machine Drawing", PHI Learning private limited, New Delhi, 2010.				
5.	"PSG Design Data Book", Kalaikathir Achchagam, 2012.				

17MPC304

#### MANUFACTURING TECHNOLOGY I

Т Р С L 3 3 0 0

#### **OBJECTIVES**

To help students to acquire knowledge about different metal casting processes. • To acquire knowledge on various joining processes like welding, brazing, soldering, etc. • To enable them to understand various bulk deformation processes like forging, rolling, • extrusion, etc. To understand various operations performed in sheet metals. • To provide knowledge about various manufacturing techniques to fabricate plastic • components. METAL CASTING PROCESSES UNIT I 9 Introduction to concepts of manufacturing process -sand casting - sand moulds -type of patterns pattern materials - pattern allowances - types of moulding sand -properties - core making methods of sand testing -riser and gating design- moulding machines - types of moulding machines - melting furnaces- principles of special casting processes: shell-investment-pressure die casting-centrifugal casting-co2 process - sand casting defects .

#### **UNIT II** JOINING PROCESS

Fusion welding processes - types of gas welding - equipments used - flame characteristics - filler and flux materials - arc welding equipments - electrodes -coating and specifications - principles of resistance welding - spot/butt, friction welding and friction stir welding - percussion welding flux cored - submerged arc welding - electro slag welding - TIG welding-MIG weldingbrazing, soldering and adhesive bonding-weld defects.

#### **UNIT III BULK DEFORMATION PROCESSES**

Hot working and cold working of metals - forging processes - open and close die forging - types of forging machines – typical forging operations – rolling of metals – flat strip rolling – types of rolling mills – tube piercing – principles of extrusion – types of extrusion – hot and cold extrusion - principle of rod and wire drawing.

#### **UNIT IV** SHEET METAL PROCESSES

Sheet metal characteristics - shearing, bending and drawing operations - stretch forming operations- formability of sheet metal - test methods -special forming processes-working principle and applications - hydro forming - rubber pad forming - metal spinning- introduction of explosiveforming, magnetic pulse forming, peen forming.

#### MANUFACTURE OF PLASTIC COMPONENTS **UNIT V**

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Types and characteristics of plastics - moulding of thermoplastics and thermosets - working principles and typical applications - injection moulding - plunger and screw machines compression moulding, transfer moulding - typical industrial applications - introduction to blow moulding -rotational moulding - film blowing - extrusion - thermoforming.

#### **TOTAL: 45 PERIODS**

#### **OUTCOMES:**

On completion of this course, students will be able to

1. Apply the principles of metal casting for engineering applications.

2.	Select appropriate joining process for real time applications.				
3.	Apply the bulk deformation processes according to industrial needs.				
4.	Explain and use appropriate sheet metal operations in industries.				
5.	Explore the various methods of plastic component manufacturing.				
TEX	BOOKS:				
1.	Sharma P. C., "A Text book of Production Technology", S. Chand and Co. Ltd., 2009	).			
2.	Kalpakjian S., <b>"Manufacturing Engineering and Technology"</b> , Pearson Education I 7 <sup>th</sup> Edition, 2013.	ndia			
3.	HajraChoudhary S. K and Hajra Choudhury. AK., "Elements of works Technology",volume I and II, Media promoters and Publishers Private Ltd, Mumbai, 19	# <b>hop</b> #97			
REF	ERENCES:				
1.	R. K. Rajput, "A Text Book ofManufacturing Technology", Laxmi Publication Pvt Lta Edition, 2017.	ł 2 <sup>nd</sup>			
2.	Roy. A. Lindberg, " <b>Processes and Materials of Manufacture"</b> , PHI / Pearson Educa. 4th Edition, 2008.	tion,			
3.	Gowri P. Hariharan, A.SureshBabu, " <b>Manufacturing Technology I</b> ", Pearson Educa. 2008.	tion,			
4.	M. Adithan and A. B. Gupta, " <b>Manufacturing Technology"</b> , New Age International Ltd, 2003.	Pvt			
5.	P. N. Rao, " <b>Manufacturing Technology Foundry, Forming and Welding"</b> , Tata McG Hill 3 <sup>rd</sup> Edition, 2009.	Fraw			

#### **ENGINEERING METALLURGY**

L	Т	Р	С
3	0	0	3

#### **OBJECTIVES**

•	To ac hardn	equire knowledge on welding metallurgy and testing of materials ess, tension, etc.	like im	pact,		
•						
	To understand various processes involved in powder metallurgy and foundry					
•	To im	To impart knowledge on ferrous and non ferrous metals				
•	To make them aware of various heat treatment and surface treatment processes					
•	To pr diagra	ovide in depth knowledge to students about constitution of alloy	's and p	ohase		

Constitution of alloys – solid solutions, substitutional and interstitial -crystal physics – phase diagrams, isomorphous, eutectic, peritectic, eutectoid and peritectoid reactions, iron – iron carbide equilibrium diagram.

#### UNIT II

#### HEAT TREATMENT AND SURFACE TREATMENT

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Definition – full annealing, process annealing, stress relief, recrystallisation - spheroidizing – normalising, hardening and tempering of steels – austempering, martempering - isothermal transformation diagrams – cooling curves superimposed on I.T diagram- CCR - hardenability, Jominy end quench test - case hardening, carburising, nitriding, cyaniding, carbonitriding–flame and induction hardening.

#### UNIT III FERROUS AND NON FERROUS METALS

Plain carbon steels – alloy steels - effect of alloying elements (Mn, Si, Cr, Mo, V, Ni, Ti& W) on properties of steel - stainless and tool steels – gray, white, malleable, spheroidal graphite - alloy cast irons – heat resistant steels and die steels. Copper, aluminium, nickel, magnesium, titanium, lead, tin - important alloys - their composition, properties and applications - material specification and standards.

#### UNIT IV FOUNDRY AND POWDER METALLURGY

9

Solidification of pure metals and alloys – melting – super heating – fluxing – micro and macro segregation – hot tears – heat transfer and structural change - production of powders, mixing, blending, compacting, sintering and hot pressing – secondary operations- application of powder metallurgy – advantages and limitations.

#### UNIT V WELDING METALLURGY AND TESTING OF MATERIALS

9

Weldability – heat distribution during welding and thermal effects on parent metals – HAZ – factors affecting HAZ - hardening, cracking, distortion and residual stresses – stress relief treatment of welds – Mechanical tests - tension, compression, impact, hardness, nondestructive testing basic principles and testing method for radiographic testing, ultrasonic testing, magnetic particle inspection and liquid penetrant inspection test - eddy current testing.

**TOTAL : 45 PERIODS** 

OUT	<b>OUTCOMES:</b> On completion of this course, students will be able to			
1.	Predict the alloy components and composition variation with respect to temperature changes.			
2.	Select suitable m	naterials and heat treatment methods for various industrial applications.		
3.	Explain the ferro	ous and nonferrous materials and their application.		
4.	Apply the know processes.	vledge of foundry and powder metallurgy to solve industrial production		
5.	Gain knowledge industrial require	e about materials testing methods and welding techniques to meet ements.		
TEX	Г BOOKS:			
1.	Higgins R.A.,"E	Engineering Metallurgy", 5th edition, EIbs, 1983.		
2.	William D Callis	ster "Material Science and Engineering", Wiley India pvt Ltd 2007.		
3.	Sydney H.Avner, "Introduction to Physical Metallurgy", Tata McGraw Hill Book Company, 1994.			
REFI	ERENCES:			
1.	<i>Dieter</i> , G.E., " <i>N</i> 100406-8, 1988,	Mechanical metallurgy", SI metric edition,. McGraw-Hill, ISBN 0-07-		
2.	Lakhtin Yu., Publisher,1985.	"Engineering Physical Metallurgy and Heat Treatment", Mir		
3.	Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited, 4 <sup>th</sup> Indian Reprint, 2002.			
4.	GUY.A.G., "Eler	ments of Physical Metallurgy", Oxford & IBH Pub.Co,1990.		
5.	O.P.Khanna , "M	Iaterial Science And Metallurgy", Dhanpat Rai Publication ,2011		

#### **OBJECTIVES**

•	To enable students to understand the basic principles of classical thermodynamics andprepare them to apply basic conversion principles of mass and energy to closed and open systems.		
•	To understand second law of thermodynamics and apply it to various systems.		
•	To make them aware of various gas laws and thermodynamic relations.		
•	To impart knowledge on properties of pure substances and to analysevarious vapour power cycles.		
•	To explore various laws of gas mixtures and to understand various psychrometric processes.		

#### UNIT I CONCEPT OF THERMODYNAMICS

Basic definitions, microscopic and macroscopic approach, types of systems – thermodynamic processes – point and path function – thermodynamic equilibrium – quasi-static process. Heat and work – zeroth law – first law of thermodynamics – applications to closed and open systems – steady flow processes – applications.

#### UNIT II SECOND LAW OF THERMODYNAMICS AND ENTROPY 9

Second law of thermodynamics – Kelvin-Plank and Clausius statements-Carnot cycle – heat engines – refrigerators – heat pumps- efficiency and COP – entropy – principle of increase in entropy – availability- reversibility and irreversibility – applications.

#### UNIT III IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS

Properties of ideal gas- ideal and real gas comparison- equations of state for ideal and real gasesreduced properties- compressibility factor– generalised compressibility chart and its use -Maxwell relations, Tdsequations, difference and ratio of heat capacities, energy equation, Joule-Thomson coefficient, ClausiusClapeyron equation, phase change processes. Simple calculations.

#### UNIT IV PROPERTIES OF STEAM AND VAPOUR POWER CYCLE

Properties of steam – use of steam tables and Mollier chart – dryness fraction calculations. Basic Rankine cycle – Rankine cycle with reheating and regeneration – application ofbinary vapour cycle.

#### UNIT V

#### GAS MIXTURES AND PSYCHROMETRY

9

Mole and mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, psychrometric charts. Property calculations of air vapour mixtures by using chart and

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expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling,humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple applications.

		TOTAL : 45 PERIODS			
<b>OUTCOMES:</b>		On completion of this course, students will be able to			
1.	Apply thermodynamic principles to real life thermodynamic problems.				
2.	Analyze the p	rinciples of entropy generation.			
3.	Explain the ch	naracteristics of gases.			
4.	Appreciate an	d analyze the vapour power cycles.			
5.	Analyze prope	erties of gas mixture and Psychrometric process.			
TEXT	TEXT BOOKS:				
1.	Nag P.K., " <b>Engineering Thermodynamics</b> ", 4 <sup>th</sup> Ed., Tata McGraw - Hill, Delhi, 2008.				
2.	YunusCengel, "Thermodynamics" Tata McGraw - Hill Company, 8 <sup>th</sup> Edition, 2014.				
3.	Holman J.P., <b>"Thermodynamics</b> " Tata McGraw - Hill Company, 2000.				
REFE	<b>RENCES:</b>				
1.	Kothandaram	an C.P., <b>"Thermal Engineering",</b> Dhanpat Rai & Sons, 1998.			
2.	Arora C.P, " <b>T</b>	Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.			
3.	Rajput R.K. "Thermal Engineering" Laxmi Publications 8 <sup>th</sup> Edition. 2010.				
4.	Ballaney P.L., "Thermal Engineering", Khanna Publisher. 1996.				
5.	Mahesh. M. Rathore, " <b>Thermal Engineering</b> ", Tata McGraw - Hill Education Private Limited 1 <sup>st</sup> edition, 2010.				

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#### MANUFACTURING TECHNOLOGY -I LABORATORY

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#### **OBJECTIVES**

- To study and practice the various operations that can be performed in lathe machine. •
- To have hands on experience of Drilling, boring ,Counter sinking and milling. •
- To create simple machine elements using above operations. •

#### **LISTOFEXPERIMENTS:**

- 1. Facing, plain turning, step turning.
- 2. Taper turning
- 3. Eccentric Turning
- 4. Knurling and chamfering.
- 5. Thread cutting (Internal and external)
- 6. Counter sinking ,Drilling and boring
- 7. Square Head Shaping
- 8. Hexagonal Head Shaping
- 9. Profile cutting in milling machine.

			TOTAL:60 PERIODS
OUTCOMES:		On completion of this course, students will be able to	
1.	Demonstrate an	nd fabricate different types of component	s using the machine tools.
2.	Operate machi management.	nes tools for various assembly and fal	prication tasks and expose to time
3.	Set up machine	s like lathe shaper, grinding and milling	machine for various applications

TOTAL

17ME	CS308	STRENGTH OF MATERIALS LABORATORY	L	Т	Р	С
			0	0	4	2
OBJE	CTIV	<b>TES</b>				
•	To hel metho	p the students to practice the procedures for conducting various ds like Tension, compression, impact test, etc.	dest	ructiv	ve tes	sting
•	To ana	alyse hardness of various materials like Mild Steel, Brass, Copp	er and	l Alu	mini	um.
•	To practice tension and compression test on springs.					
LIST	OF EX	XPERIMENTS				
1.	Tension	n Test on steel rods using Universal Testing Machine.				
2.	2. Bending Test on rolled steel Joist Beam.					
3.	3. Double shear test on mild steel rod.					
4.	4. Torsion Test on Mild steel rod					
5.	5. Tension and Compression Test on Springs					
6.	6. Deflection test on simply supported aluminium beam					
7.	7. Hardness tests on metals like Mild Steel, Brass, Copper and Aluminium					
8.	8. Bend Test on Steel rod					

- 9. Compression Test
- 10. Impact test-izod and charpy

		TOTAL: 60 PERIODS		
OUTCOMES:		On completion of this course, students will be able to		
1.	Apply knowle materials.	dge of compression, tension, shear and torsion testing procedures on		
2.	Explore the det	flection and bending behaviour of different types of beams.		
3.	Examine the h results.	hardness of different metals and characterize materials based their test		

17MBS401	ST	ATISTICS AND NUMERICAL METHODS	L	Т	Р	С	
	·		3	1	0	4	
UNIT I TESTING OF HYPOTHESIS					9+3		
Large sample test based on Normal distribution for single mean and difference of means - Tests based on t, $\chi$ and F distributions for testing means and variances – Contingency table (Test for Independency) – Goodness of fit.							
UNIT II	UNIT II DESIGN OF EXPERIMENTS					9+3	
One v block design	vay and tw – Latin sq	vo way classifications - Completely randomized design uare design - $2^2$ factorial design.	- R	ando	omize	ed	
UNIT III	SOLUT	TION OF EQUATIONS AND EIGENVALUE PRO	BLI	EMS	5	9+3	
Newt – Iterative m – Eigen value	on Raphso ethods of C es of a mat	n method – Gauss elimination method – pivoting – Ga Gauss Jacobi and Gauss Seidel – Matrix inversion by G rix by power method.	uss J auss	orda Jor	an me dan r	ethods nethod	
UNIT IV	INTER NUME	POLATION, NUMERICAL DIFFERENTIATION RICAL INTEGRATION	AN	D		9+3	
Lagra backward dif – Numerical	nge's and ference in single and	Newton's divided difference interpolations – New terpolation – Approximation of derivates using interp double integrations using Trapezoidal and Simpson's	vton olati 1/3 r	's fo on p ules	orwa oolyn	rd and omials	
UNIT V	NUME EQUA	RICAL SOLUTION OF ORDINARY DIFFERENT	ΓΙΑΙ			9+3	
Taylo Runge-Kutta solving first	r's series r method fo order equat	nethod – Euler's method – Modified Euler's method – r solving first order equations – Milne's predictor corr tions – Finite difference methods for solving second or	Fou ector der e	rth o r me equa	order thods tions	s for	
		<b>TOTAL</b> (L : 45 + T :	15):	60	PER	IODS	
OUTCOME	S:						
• It I teo to	• It helps the students to have a clear perception of the power of statistical and numerical techniques, ideas and would be able to demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.						
TEXT BOO	KS:						
1. J	ohnson. R. <b>or Engine</b>	.A., and Gupta. C.B., " <b>Miller and Freund's Probabili</b> ers", 11th Edition, Pearson Education, Asia, 2011.	ty a	nd S	Statis	stics	
2. Grewal. B.S., and Grewal. J.S., " <b>Numerical Methods in Engineering and Science</b> ", 9 th Edition, Khanna Publishers, New Delhi, 2007							
REFERENC	REFERENCES:						
1 W	1 Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., " <b>Probability and Statistics fo</b> Engineers and Scientists", 0 <sup>th</sup> Edicion, Regime Provident UK, 2017			for			
$\begin{array}{c c} 2 \\ 2 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\ 3 \\$	Spiegel. M.R., Schiller. J., and Srinivasan. R.A., "Schaum's Outlines on Probability and Statistics" 4 <sup>th</sup> Edition Tata McCraw Hill Education New Dalki 2012						
$\begin{array}{c c} 3 & C \\ \hline & T \end{array}$	<i>Chapra. S.C., and Canale.R.P., "Numerical Methods for Engineers", 7<sup>th</sup> Edition, Tata McGraw Hill, New Delhi, 2016.</i>						

4	Gerald. C. F., and Wheatley. P. O., "Applied Numerical Analysis", 7 <sup>th</sup> Edition,
	Pearson Education, Asia, New Delhi, 2007.

17MES402		APPLIED ELECTRONICS AND MICROPROCESSOR	L	Т	Р	C		
	3 0 0							
OBJECTI	VE	S						
• Tc	ma	ke the students to understand basic Analog electronic circuits.						
• To	aco	quire knowledge on digital circuits.						
• To	stu	dy the architecture of microprocessor and to develop the progr	amme	for it	•			
• To	un	derstand various timing diagrams of microprocessor.						
• To	int	erface the microprocessor for different application						
UNIT I ANALOG ELECTRONIC CIRCUITS 9					9			
Review of cl Types of Bia pushpull amp RC phase shi	nara sing olifi ft o	cteristics of transistors - Need for biasing – DC Load line an g - Fixed and Self biasing - RC Coupled amplifier - Class A Pe er - Distortion in amplifiers. Concept of feedback - Oscillators scillator - Hartley Oscillator - Colpitts Oscillator	alysis ower a - Bark	- Bia mplit chaus	sing fier - en cri	of BJT- Class B iterion -		
UNIT II		II DIGITAL CIRCUITS						
Binary numb Adders and weighted res converter -D	Binary number system – AND, OR, NOT, NAND, NOR and XORgate – Combinational circuits - Adders and subtractors. Flip flops – RS flip flop, JK, D, T flip flops. A/D and D/A converters - weighted resistor DAC -R-2R ladder DAC - servo tracking A/D - successive approximation A/D converter -Dual slope ADC - Memories - ROM - EPROM – EEPROM-RAM							
UNIT III		IIIMICROPROCESSORARCHITECTUREANDPROGRAMMING (8085)						
Block diagra Instruction se	m o et —	of microcomputer – Architecture of 8085 – Pin configuration Addressing modes – Simple assembly language programs.	ı – Ins	tructi	ion fo	ormats -		
UNIT IV MICROPROCESSORTIMING DIAGRAM AND INTERRUPTS				D 9	9			

Instruction cycle - machine cycle - Timing diagram: OP code fetch cycle, Memory and I/O read cycle, memory and I/O write cycle, interrupt acknowledge machine cycle. Interrupts - Hardware Interrupts - Vectored Interrupts - Non-vectored interrupts – Priority interrupts - Data transfer schemes - synchronous transfer, asynchronous transfer, interrupt driven transfer and DMA transfer.

# UNIT V MICROPROCESSOR INTERFACING AND 9 APPLICATIONS

Interfacing of Input and output devices – Applications of microprocessor - Temperature control – Stepper motor control – Traffic light control- Digital clock- EPROM Programmer.

			TOTAL: 45 PERIODS			
OUTCOMES:		On completion of this course, students will be	able to			
1.	Understand bipolar junction and field effect transistors.					
2.	Understand t	ne design of amplifiers and oscillators.				
3.	Learn about	combinational and sequential logic circuits.				
4.	Explore know	vledge about A/D and D/A converters.				
5.	Understand t interfacing ci	he architecture and programming concepts of 8 reuits for real time applications.	8085 microprocessor and various			
TEXT	BOOKS:					
1.	Allen Motte	ershead "Electronic Devices and Circuits", Pr	entice Hall of India, 2008.			
2.	Morris Mano M., "Digital Design", Prentice Hall Of India Pvt. Ltd. 2008.					
3.	Ramesh S. Goankar, "Microprocessor Architecture and Programming and Applications 8085 / 8080a", Penram International Publishing (India) 2004.					
REFER	RENCES:					
1.	1. Mathur S.P., Kulshreshtha D.C., Chadha P.R. "Electronic Devices and Applications and Integrated Circuits", Umesh Publications, 2004.					
2.	Ajit Pal, "Microprocessor Principles and Applications", Tata Mcgraw Hill, New Delhi 2003.					

3.	David A. Bell, "Electronic Devices And Circuits", 5 <sup>th</sup> Edition, Oxford University Press, 2008.
4.	Charles H.Roth, Jr, " <b>Fundamentals of Logic Design</b> ", 4 <sup>th</sup> Edition, Jaico Publishing House, 2006.

#### FLUID MECHANICS AND MACHINERY

9

#### UNIT I FLUID PROPERTIES

Units and dimensions – fluid properties – density, specific gravity, viscosity, surface tension, capillarity, compressibility and bulk modulus – Pascal's Law – pressure measurements – manometers - Fluid statics - Total pressure and centre of pressure on submerged surfaces.

#### UNIT II FLUID KINEMATICS AND DYNAMICS

9

Types of fluid flow and flow lines – control volume – continuity equation in one-dimension and three dimension – velocity potential and stream function -energy equation – Euler and Bernoulli's equations – applications of energy equations- flow meters.

#### UNIT III FLOW THROUGH PIPES AND DIMENSIONAL ANALYSIS

9

Laminar flow through circular conduits and circular annuli-boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – flow through pipes in series and parallel- hydraulic and energy gradient – methods of dimensional analysis – dimensionless parameters- application of dimensionless parameters – model analysis.

#### UNIT IV PUMPS

working principle - discharge, work done and efficiencies – gear oil, centrifugal and reciprocating pumps - work done and efficiencies - negative slip - flow separation conditions - air vessels - indicator diagram and its variation - savings in work done.

# UNIT V HYDRAULIC TURBINE

Classification – construction, working principles and design of Pelton wheel, Francis and Kaplan turbines - head, losses, work done and efficiency - specific speed - operating characteristics - governing of turbines.

# **TOTAL : 45 PERIODS**

OUT	<b>COMES:</b>	On con	npletion of this course, students will be able to		
1.	Identify the importance of fluids properties and fluid principles at rest.				
2.	Explore phys	ical beha	viour of fluids system and equations under moving conditions.		
3.	Apply the con	ncept of a	flow through pipes and dimensional analysis.		
4.	Conduct the p	performa	nce study and selection of pumps for different applications		
5.	Conduct the performance test on different types of turbines.				
ТЕХ	TEXT BOOKS:				
1.	Rajput R. K. New Delhi, 2	, <b>"A tex</b> 015.	t Book of Fluid Mechanics and Machinery", S. Chand and Company,		
2.	Ramamrutham S. <b>"Hydraulics, Fluid Mechanics and Fluid Machines"</b> , Dhanpat Rai Publishing House (P) Ltd, New Delhi, 2012.				
3.	Modi P. N. Machines", S	and Set Standard	h S. M., "Hydraulics and Fluid Mechanics including Hydraulic book house, Delhi, 2004.		

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REF	ERENCES:	
1.	Streeter V. L. and Wyl	ie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2017.
2.	Kumar K. L., " <b>Engine</b> 2010	eering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi,
3.	R. K Bansal "A <b>Textb</b> (p) Ltd.,2017	ook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications
4.	Robert W.Fox, Alan 2011.	T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery",
5.	Graebel W. P, " <b>Engin</b>	eering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011.

	2404	KIN	EMATICS OF MACHINES	L	Т	Р	С
				3	0	0	4;
UNIT I		BASI	CS OF MECHANISMS				9
Classifica mobility - barchain descriptio	ation o – Kutz and sl on of s	f mecha bach cr ider cra ome co	nisms – basic kinematic concepts and definitions – deg iterion, Gruebler's criterion – Grashof's Law – kinema nk chains – limit positions – mechanical advantage – nmon mechanisms – quick return mechanisms.	gree tic in trar	of fr nver 1smi	eedo sions ssion	om, s of four n angle -
UNIT I	I	KINE	MATIC ANALYSIS				9
Displacen technique crank cha	ment, v es- inst un.	velocity antaneo	and acceleration analysis on simple mechanisms – graphics of the second	aphi cons	cal a truct	and a tion	nalytica for slide
UNIT I	II	KINE	MATIC OF CAM MECHANISMS				9
Classifica uniform v motions – pressure a	ation c velocit – layou angle a	of cams ty, para ut of pla and und	and followers – terminology and definitions – disp bolic, simple harmonic and cycloidal motions – de ate cam profiles – specified contour cams – circular ar ercutting – sizing of cams.	olace criva c an	men tives d ta	t dia s of ngen	ngrams - followe t cams -
UNIT I	V	GEAI	RS AND GEAR TRAINS				9
definition Gear train UNIT V	ns–gean ns – Sp 7	r tooth beed rat	action – contact ratio – interference and undercutting. io, train value – parallel axis gear trains – epicyclic gea TION DRIVES	Heli r Tra	cal, ains.	beve	el, worm
Belt and r effect of o	rope di	rive – o	non and areas half drive that materials areas and all		atio	of te	•
bearing - internal ex	friction friction	ugal for on clute ing brak	rce – condition for maximum power – friction in journ ches – single plate – multi plate – cone clutches-brai che only.	ip - i ial b kes	earin - sh	ng - i oe b	flat pivo rake and
bearing - internal ex	frictio	ugal for on clute ing bral	rce – condition for maximum power – friction in journ ches – single plate – multi plate – cone clutches-bra ce only. TOTAL :	$\frac{1p - 1}{kes}$	earin - sh <b>PE</b>	ng - T oe b	flat pivo rake and
bearing - internal ex OUTCO	friction xpand	fugal for on clute ing brak	TOTAL: On completion of this course, students will be	$\frac{10}{10} - 1$ hal b kes <b>45</b> able	earin - sh PE e to	ng - 1 oe b	flat pivo rake and
bearing - internal ex OUTCC 1. 1	friction xpand	fugal for on clute ing brak	TOTAL : On completion of this course, students will be mechanisms for practical applications.	$\frac{10 - 1}{10}$ al b kes 45 able	earin - sh PE e to	ng - : oe b	flat pivo rake and
bearing - internal e OUTCC 1. 1 2. 1	friction xpand DME Desigr	fugal for on clute ing brak S: n simple the velo	TOTAL : On completion of this course, students will be mechanisms for practical applications. city and acceleration diagram for simple mechanisms.	$\frac{10}{45}$	earin - sh PE e to	ng - : oe b	flat pivo rake and
bearing - internal e: OUTCC 1. 1 2. 1 3. 0	friction xpand Desigr Draw to Constr	fugal for on clute ing brak S: S: n simple the velo	TOTAL : On completion of this course, students will be mechanisms for practical applications. city and acceleration diagram for simple mechanisms. n profile for given follower motion.	$\frac{10}{45}$	earin - sh PE e to	ng - 1 oe b	flat pivo rake and
bearing - internal e: OUTCC 1. 1 2. 1 3. ( 4. 1	Constr Develo	S: S: S: The velocities The velocities Th	TOTAL : On completion of this course, students will be mechanisms for practical applications. city and acceleration diagram for simple mechanisms. a profile for given follower motion. trains for required application.	10 - 1 10 kes 45 able	earin - sh PE e to	RIC	flat pivo rake and
bearing - internal e: OUTCC 1. 1 2. 1 3. ( 4. 1 5. 5	Desigr Draw t Constr Develo Select	S: Tugal for ting brake S: The simple the veloce the veloce	TOTAL : On completion of this course, students will be mechanisms for practical applications. city and acceleration diagram for simple mechanisms. a profile for given follower motion. trains for required application. trains for required application.	al b kes 45 able	earin - sh PE e to		ensions - flat pivo rake and
bearing - internal e: OUTCC 1. 1 2. 1 3. ( 4. 1 5. \$ TEXT H	Desigr Draw t Constr Develo Select BOO	S: a simple the velo cuct cam appropri KS:	TOTAL : On completion of this course, students will be mechanisms for practical applications. City and acceleration diagram for simple mechanisms. Torfile for given follower motion. trains for required application. trains for required application.	45 able	earin - sh PE e to	RIC	DDS
bearing - internal e: OUTCC 1. 1 2. 1 3. ( 4. 1 5. \$ TEXT H 1. 1	Desigr Draw t Constr Develo Select BOOI Rattan	S: S: S: S: S: S: S: S: S: S:	Theory of Machines", Tata McGraw -Hill Publishers,	45 able	earin - sh PE e to	RIC	DDS
bearing - internal e: OUTCC 1. 1 2. 1 3. ( 4. 1 5. \$ TEXT H 1. 1 2. 1	Desigr Desigr Draw t Constr Develo Select BOOI Rattan	S: S: S: S: S: S: S: S: S: S:	Theory of Machines", Tata McGraw -Hill Publishers, n, "Theory of Machines", Parts of the set of the	45 able on. Nev	earin - sh PE to - v De 0	llhi, 2	DDS
bearing - internal ex- OUTCC 1. 1 2. 1 3. 6 4. 1 5. 5 <b>TEXT H</b> 1. 1 2. 7 3. 3. 1	Desigr Desigr Draw t Constr Develo Select BOOI Rattan Thoma John J	Tugal for     fon cluto     ing brain     S:     n simple     the veloc     the veloc     op gear     appropri     KS:     S. S, "     as Beva     Ulicke	Theory of Machines", Tata McGraw -Hill Publishers, n, "Theory of Machines", Pearson Education Limited, reference of Machines", Pearson Education Limited, reference of Machines, Piarson Education Limited, reference of Piarson Education Limited, r	<pre>4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -</pre>	earin - sh PE to v De 0 f M	llhi, 2	DDS
bearing - internal e: OUTCC 1. 1 2. 1 3. 0 4. 1 5. 5 TEXT H 1. 1 2. 7 3. J	Desigr Draw t Constr Develo Select BOO Rattan Thoma John J Mecha	Tugal for     on cluto     ing brain     S:     n simple     the velo     ruct cam     op gear     appropri     KS:     S. S, "     as Beva     Ulicke     anisms'	Theory of Machines", Tata McGraw -Hill Publishers, n, "Theory of Machines", Pearson Education Limited, r, Gordan R Penncok & Joseph E Shigley,"Theor ', Mcgraw Hill Inc,2010.	10 - 1 hal b kes 45 able on. Nev , 201 y 0	v De	llhi, 2	DDS

5.	V. P. Singh, "Theory of Machines", Dhanapatrai and Sons, 2017
6.	George H. Maritn, "Kinematics and Dynamics of Machines", Waveland PrInc, 2002.
7.	R L Norton, "Kinematics and Dynamics of Machinery", McGraw-Hill, 2017.
8.	C. E. Wilson, P. Sadler, "Kinematics and Dynamics of Machinery", 3 <sup>rd</sup> ed., Pearson, 2014.
9.	Khurmi, R. S., "Theory of Machines", 14th Edition, S Chand Publications, 2005

17MPC405

#### MANUFACTURING TECHNOLOGY II

3 0 0

#### UNIT I THEORY OF METAL CUTTING

Mechanism of metal cutting – types – cutting force – chip formation – Merchant's circle diagram – calculations – tool geometry – machinability-thermal aspects – tool wear – tool life – cutting tool materials – cutting fluids – types.

#### UNIT II AUTOMATS, SHAPING AND PLANING MACHINES

9

С

3

9

Capstan and turret lathes – construction - indexing mechanism - operations - working principle of single and multi - spindle automats – shaping and planning machines – types – construction - mechanism – principle of operation – different shaping operations - work holding devices.

#### UNIT III DRILLING, BROACHING AND GRINDING MACHINES 9

Drilling machines – specifications, types - feed mechanism, operations – drill tool nomenclature – broaching – specifications, types, tool nomenclature, broaching operations – grinding – types of grinding machines – grinding wheels, specifications – bonds – mounting and reconditioning of grinding wheels.

#### UNIT IV MILLING AND GEAR GENERATING MACHINES

9

9

Milling – specifications – types - cutter nomenclature – types of cutters – milling processes – indexing – gear forming in milling – gear generation - gear shaping and gear hobbing – specifications - cutters–coated tools & inserts- cutting spur and helical gears - bevel gear generators – gear finishing methods.

#### UNIT V MODERN MANUFACTURING PROCESSES

Numerical Control (NC) machine tools – CNC types, constructional details, special features,

machining centre, part programming fundamentals CNC - manual part programming -

micromachining – wafer machining, Introduction to RPT and powder metallurgy.

		TOTAL: 45 PERIODS			
<b>OUTCOMES:</b>		On completion of this course, students will be able to			
1.	Apply the theory of metal cutting in real life machining.				
2.	Explore the operating mechanisms of lathe, shaping and planning machine.				
3.	Compare the working principles of drilling, boring and grinding machines.				
4.	Understand the principles, operation and working of milling and gear generating machine.				
5.	Explain the concept of CNC Machining.				
TEXT	BOOKS:				

1.	Hajra Choudhry S. K. and Bose S. K. , <b>"Workshop Technology Vol II"</b> , Media Promoters and Publishers Pvt. Ltd., Bombay, 2004			
2.	Sharma P. C., "A Text Book of Production Technology", S. Chand& Company Ltd., New Delhi, 10 <sup>th</sup> revised <i>edition</i> , 2010			
3.	P. N. Rao, " <b>Manufacturing Technology Foundry, Forming and Welding</b> ", Tata McGraw - Hill 3 <sup>rd</sup> Edition, 2009			
REFE	CRENCES:			
1.	SeropeKalpakjian and Steven R. Schmid, " <b>Manufacturing Engineering and Technology</b> ", 7 <sup>th</sup> edition, Prentice Hall, 2013			
2.	Jain R. K. and Gupta S. C., " <b>Production Technology</b> ", Khanna Publishers, New Delhi, 1999			
3.	Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White, "Machine Tool <b>Practices</b> ", 8 <sup>th</sup> Edition, Pearson, 2005			
4.	Roy. A. Lindberg, "Process and Materials of Manufacture", Fourth Edition, PHI / Pearson Education 2006.			
5.	Hand book of HMT, "Production Technology'', Tata McGraw Hill, 2017.			

17MPC406			ERMALENGINEERING	L	Т	Р	С
				3	0	0	3
UNIT I	[	THEF	RMODYNAMIC CYCLES				9
Air stand effective	dard cy pressu	cles – re – P-V	Otto, Diesel, Dual and Brayton cycles – air standard V and T-S diagrams-comparison of cycles.	l eff	icier	ncy –	- mean
UNIT I	Ι	I.C. E	NGINES				9
I.C engir and lubr rating o performa	ne - 2 st ication f fuels ince ch	roke an system – con aracteri	d 4 stroke engines – valve and port timing diagrams. F for spark ignition and compression ignition engines mbustion, knocking and detonation, scavenging an stics of I.C.engines.	uel i -Cet id s	gniti ane uper	ion, c and charg	cooling Octane ging –
UNIT I	II	STEA	M NOZZLES AND TURBINES				9
Flow threfore flow. Imp	ough n pulse a	ozzles, nd react	shape of nozzle, effect of friction, critical pressure ratio tion turbines – compounding, velocity diagrams for sin	o ano gle s	d sup tage	oersa turb	turated ines.
UNIT I	V	AIR (	COMPRESSOR				9
Reciproc and perfe	ating c	ompres :-coolin	sors – effect of clearance – multi stage – optimum ir g – rotary, centrifugal and axial flow compressors.	ntern	nedia	ate p	ressure
UNIT	V	REFR	RIGERATION AND AIR CONDITIONING				9
Air refrigheating.V	geration apour s of air	n cycles absorp conditi	s, simple vapour compression refrigeration cycle – su tion system. Principles of psychrometry – use of psychroning – types of air conditioning system.	b co ychr	oling ome	g and tric o	1 super chart –
			TOTAL: 45	PF	CRI	ODS	5
OUTC	OME	5:	On completion of this course, students will be able to				
1.	Expla and T	in the f -S diag	unctioning of thermodynamic cycles including actual c rams for them.	cycle	s an	d dra	ıw P-V
2.	Deter	nine th	e performance of Internal Combustion engines.				
3.	Analy	se the f	functioning of steam nozzle and turbines.				
4.	Desig	n and a	nalyse different types of air compressors with and with	out	clear	ance	•
5.	Explo air co	re the v nditioni	working principles of vapour compression and absorpting system.	on r	efrig	gerati	on and
TEXT	TEXT BOOKS:						
1.	Rajput R. K. "Thermal Engineering" Laxmi Publications (P) Ltd., 2017.						
2.	Domkundwarand Kothandaraman C. P."Thermal Engineering" Khanna Publi New Delhi, 2010.		lishers,				
3.	3. Mahesh M Rathore, <b>"Thermal Engineering"</b> TataMcGraw Hill, New Delhi,2010.			).			
REFE	RENC	ES:					
1.	Rudra	moorth	y R. <b>"Thermal Engineering"</b> Tata McGraw-Hill, New	Del	hi,20	017.	
2.	Sarka	r B. K.	"Thermal Engineering" Tata McGraw-Hill, New Dell	hi, 20	017.		

3.	Ganesa, V. "Internal Combustion Engines" Tata McGraw-Hill, New Delhi, 2017.
4.	Ramalingam K. K. "Thermal Engineering" SCITECH Publications (India) Pvt. Ltd., 2009.
5.	Arora C. P. " <b>Refrigeration and Air Conditioning</b> " Tata McGraw-Hill Publishers, 2017.

#### MANUFACTURING TECHNOLOGY -- II LABORATORY

#### 0 2 4

#### LIST OF EXPERIMENTS:

- 1. Contour milling using vertical milling machine.
- 2. Spur gear cutting in milling machine.
- 3. Helical Gear Cutting in milling machine.
- 4. Gear generation in Hobbing machine.
- 5. Gear generation in gear shaping machine.
- 6. Plain Surface grinding.
- 7. Cylindrical grinding.
- 8. Centre less grinding.
- 9. Measurement of cutting forces in Milling / Turning Process.
- 10. CNC Part Programming and machining.

		TOTAL:60 PERIODS				
<b>OUTCOMES:</b>		On completion of this course, students will be able to				
1.	Use different	machine tools for manufacturing gears.				
2.	Use different grinder.	machine tools for finishing operations and manufacture tools using cutter				
3.	Develop CNC	c part programming and machining.				

#### 17MES408

#### FLUID MECHANICS AND MACHINERY LABORATORY

#### LIST OF EXPERIMENTS:

1.Determination of Darcy's friction factor

2.Determination of the Coefficient of discharge of given Orifice met

3.Determination of the Coefficient of discharge of given Venturi meter.

4.Calculation of the rate of flow using Rota meter.

5. Performance study on Gear oil Pump

6.Conducting experiments and drawing the characteristic curves of centrifugal pump/ submersible pump

7. Conducting experiments and drawing the characteristic curves of reciprocating pump.

8. Conducting experiments and drawing the characteristic curves of Pelton wheel.

9. Conducting experiments and drawing the characteristics curves of Francis turbine.

10. Conducting experiments and drawing the characteristic curves of Kaplan turbine.

		TOTAL:60 PERIODS	
<b>OUTCOMES:</b>		On completion of this course, students will be able to	
1.	Find the flow properties of fluids.		
2.	Estimate the flow measurements using flow measuring equipment's.		
3.	Conduct performance tests on pumps and turbines and draw the performance curves.		

#### 17MPC409

#### THERMAL ENGINEERING LABORATORY

L T P C 0 0 4 2

#### LIST OF EXPERIMENTS:

- 1. Valve timing and port timing diagrams of single cylinder diesel and petrol engines.
- 2. Determination of flash point and fire point of various fuels / lubricants.
- 3. Performance test on 4 stroke diesel engine with mechanical loading.
- 4. Performance test on 4 stroke diesel engine with electrical loading.
- 5. Performance test on 4 stroke diesel engine with hydraulic loading.
- 6. Heat balance test on 4 stroke diesel engine.
- 7. Retardation test to find frictional power of a diesel engine.
- 8. Morse test on multi cylinder petrol engine.
- 9. Performance and energy balance test on a steam generator.
- 10. Performance and energy balance test on steam turbine.
- 11. Performance test on single and twin stage reciprocating air compressor.
- 12. Determination of COP of a vapour compression refrigeration system.
- 13. Determination of COP of air -conditioning system.
- 14. Performance test in a vapour absorption refrigeration system.

			TOTAL:60 PERIODS		
<b>OUTCOMES:</b>		On completion of this course, students will be able to			
1.	Select the suitable thermal devices for the specified industrial applications.				
2.	Evaluate the performance of I.C engines.				
3.	Conduct experiments on boiler, turbine, compressors, refrigerator and air-conditioner.				

17MPC501		DE	SIGN OF MACHINE ELEMENTS	L	Т	Р	C
(Use of PSG Design data book is permitted) 4			4	0	0	4	
OBJE	OBJECTIVES						
•	То 1	nake the	e students to understand the Design methodology for ma	chine	elem	ents	
•	To I	Design s	hafts and couplings for power transmission.				
•	To and	Design t structur	the threaded fasteners, bolted joints and welded joints es.	for pre	essur	e ve	essels
•	To I cons	Design t stant loa	the various types of springs like helical, leaf springs as ds and varying loads.	nd Fly	whe	els ı	under
•	To I	Design v	various types of bearings like Rolling contact and Sliding	g conta	act b	earir	ıgs.
UNIT	I	INTR	ODUCTION TO MACHINE DESIGN			]	12
Introduct based o Theories loading	etion to n mech s of fai – Desig	the Des nanical lure – n for va	sign process – Factors influencing machine design – se properties - preferred numbers – Fits, tolerances - Factor of safety –stress concentration – Direct, Ben riable loading.	lection Princig ding a	n of pal s and 7	mate stres Tors	erials ses - sional
UNIT	II	DESI	GN OF SHAFTS AND COUPLINGS				
Design of splines -	Design of solid and hollow shafts based on strength, rigidity - critical speed – Keys, keyways ar splines - Rigid and flexible couplings.				s and		
UNIT	UNIT III DESIGN OF TEMPORARY AND PERMANENT JOINTS			12			
Threade Design o	readed fasteners - Bolted joints subjected to eccentric loading, Knuckle joints, Cotter joints sign of welded joints, Riveted joints for structures.				nts –		
UNIT IV DESIG		DESI	GN OF ENERGY STORING ELEMENTS				12
Design Design machine	Design of various types of springs, optimization of helical springs - rubber springs - Design of flywheels considering stresses in rims and arms, for engines and punching machines.					ıgs - ching	
UNIT V DESI		DESI	GN OF BEARINGS				12
Sliding contact and rolling contact bearings - Design of hydrodynamic journal bearings, McKee's Equation. Sommerfield Number, Raimondi & Boyd graphs, - Selection of Rolling Contact bearings.							
TOTA	L: 60	) PER	IODS				
		<b>S:</b>   On	completion of this course, students will be able to	<u> </u>			
1.	Apply the principles of design to solve problems dealing with static and variable loads.						
2.	Design shafts and couplings for various industrial applications.						
3.	Estimate the load carrying capacity of threads, welds and rivet joints.						
4.	Select and Design Springs and flywheels for various applications.						
5.	Apply the concept of selection and design rolling and sliding contact bearings.						
TEXT BOOKS:							

1.	Bhandari V.B, <b>"Design of Machine Elements"</b> , Second Edition, Tata McGraw-Hill Book Co, 2007.				
2.	Shigley J.E and Mischke C. R., "Mechanical Engineering Design", Sixth Edition, Tata McGraw-Hill, 2003.				
3.	Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4 <sup>th</sup> edition, Wiley, 2005				
REFE					
1.	Sundararajamoorthy T. V. Shanmugam.N., "Machine Design", Anuradha Publications, Chennai, 2003				
2.	Orthwein W., "Machine Component Design", Jaico Publishing Co, 2003				
3.	<i>Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements"</i> 8 <sup>th</sup> Edition, Printice Hall, 2003.				
4.	Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010				
5.	Robert L. Norton, "Machine design An integrated approach", Fifth edition, Pearson education, 2001				

17MPC502		HEAT AND MASS TRANSFER	L	T	Р	C		
(u		se of approved HMT data book is permitted)	3	0	0	3		
OBJE	CTIV	ES						
•	To make the students to understand the concept of conduction heat transfer.							
•	• To understand the convective heat transfer mechanism.							
•	• To determine the amount of radiation heat exchange between surfaces and its ther relations.					nal		
•	То	analyse the phase change heat transfer and sizing of heat exchang	ger.					
•	То	evaluate the mass transfer through diffusion and convection mech	nanisr	n.				
UNIT	Ι	CONDUCTION				9		
General Dimens Internal	Diffe ional S Heat C	rential equation of Heat Conduction– Cartesian and Polar C teady State Heat Conduction — plane and Composite Systems reneration – Extended Surfaces – Unsteady Heat Conduction.	Coordi – Cor	nate	s – tion	One with		
UNIT	II	CONVECTION				9		
Principl relation empirica planes,	es of c s for e al relat incline	onvection – convection boundary layer – laminar and turbulen xternal and internal forced convection flows – flat plate, cy ions for free convection flows – horizontal cylinders, horizon l surfaces and enclosed spaces.	t flov linde tal p	v — rs, s lates	emp pher , ve	oirical res – rtical		
UNIT	III	RADIATION				9		
Nature black be surface gray sur	of then ody rac – view faces –	nal radiation – radiation intensity – relation to emission, irradiat iation – loss of radiation – emissivity – surface emission – Kir factor – radiation exchange between black surfaces – radiation electrical analogy – radiation shields.	ion a choff exch	nd ra 's la ange	adios w – bet	sity – gray ween		
UNIT	UNIT IV CONDENSATION, BOILING AND HEAT EXCHANGERS					9		
Conden vertical Heat Tr method.	sation plate – ransfer	and Boiling – Film wise and drop wise condensation – Film Regimes of Boiling – Forced convection boiling- Heat Exchang Coefficient – Fouling Factors –Heat transfer Analysis: LMT	conde ger Ty D me	ensat /pes ethoo	tion - O d -	on a verall NTU		
UNIT	V	MASS TRANSFER						
Basic C Diffusic Convect	Concept on – C tive Ma	s – Diffusion Mass Transfer – Fick's Law of Diffusion – Stead Convective Mass Transfer – Momentum, Heat and Mass Tr Ass Transfer Correlations.	dy sta ansfe	ate N r Ai	/lole nalo	cular gy –		
		TOTAL	: 45	PE	RI	ODS		
OUTC	COME	S: On completion of this course, students will be able to						
1.	Apply transie	basic principles of heat conduction find heat transfer rate i nt systems.	n ste	ady	state	e and		
2.	Asses the concept of free and forced convection for various heat transfer applications.							
3.	Analy	ze theradiation heat transfer problems and radiation shields.						
4.	Analyze the phase change heat transfer and heat exchanger.							
<u> </u>								

5.	Assess different mass transfer systems.					
ТЕХТ	BOOKS:					
1.	Yunus A. Ceng Company Limi	Cengel, <b>"Heat Transfer-A Practical Approach"</b> Tata McGraw Hill Publishing Limited. 3 <sup>rd</sup> edition. 2007.				
2.	P. K. Nag, "Heat Transfer" Tata McGraw Hill Publishing Company Limited.3 <sup>rd</sup> edition 2011.					
3.	J. P. Holman, " <b>Heat Transfer</b> ",10 <sup>th</sup> Edition, McGraw-Hill Publishing Company Limited, 2009.					
<b>REFERENCES:</b>						
1.	C. P. Kothandaraman and S. Subramanyan, <b>"Heat and Mass Transfer Data Book"</b> ,8 <sup>th</sup> Edition, New Age International Publishers 2014.					
2.	Frank P. Incropera and David P. Dewitt, <b>"Fundamentals of Heat and Mass Transfer"</b> , 8 <sup>th</sup> Edition, John Wiley & Sons 2016.					
3.	Y. V. C. Rao, "Heat Transfer", First Edition, Universities Press (India) Limited, 2001.					
4.	Sarit K. Das, "Process Heat Transfer", Narosa Publishing House, 2009.					
5.	S. P. Venkates 2004.	han, <b>"First Course in Heat Transfer"</b> , 6 <sup>th</sup> edition, Ane Books Publishers,				

17MPC503		DYNAMICS OF MACHINES	L	Т	Р	С	
		·	3	2	0	4	
OBJEC	TIVE	5					
٠	To make the students to understand the concepts of dynamics of reciprocating engin						
•	To un engine	derstand the balancing procedures for rotating and reciprocating es.	g mass	es, r	otor	s and	
•	To an	alyse the effect of free and forced vibration.					
•	To un	derstand the governor mechanism for speed control of machin	es.				
•	To giv	ve insight effect of gyroscope and its application.					
UNIT I	F	ORCE ANALYSIS				9+6	
Dynamic Analysis i Crank sha	force a n recipt ft torqu	nalysis – Inertia force and Inertia torque– D Alembert's procating engines – Gas forces – Inertia effect of connecting re e – Turning moment diagrams –Fly Wheels	orincip od– Be	le – earin	Dyn g lo	amic ads –	
UNIT II	B	BALANCING				9+6	
Static and Primary a balancing	dynam nd seco of Loco	ic balancing – balancing of rotating masses–Balancing of Recondary unbalanced forces-partial balancing of unbalanced promotives-Variation of tractive force, Swaying couple and Hamiltonian couple and Hamilto	iproca rimary mer bl	ting for ow.	mas ce-p	sses - artial	
UNIT II	I F	<b>TREE VIBRATION</b>				9+6	
Basic feat natural fr Torsional	ures of equency system	vibratory systems –degrees of freedom– free vibration – equ y – types of damping – damped vibration - critical speeds s:single,two rotor systems.	ation of si	s of mple	mot e sh	ion – aft –	
UNIT IV		FORCED VIBRATION					
Response Disturban vibration	of one ce caus measure	e degree of freedom systems to periodic forcing – Harmo sed by unbalance – Support motion –transmissibility – ement.	onic d Vibrat	istur ion	banc isol	ces – ation	
UNIT V		MECHANISMS FOR CONTROL					
Governors governors Gyroscop ships and	s – Typ – Cha ic force airplane	es – Centrifugal governors – Gravity controlled and spring co aracteristics – Effect of friction – Controlling force cur es and torques – Gyroscopic stabilization – Gyroscopic effec es.	ontrollo ves. C ets in	ed ce Byros Auto	entri scop omo	fugal bes – biles,	
		LECTURE: 45 TUTORIAL: 30TOTAL	: 75	PE	RI	ODS	
OUTCO	<b>MES</b>	On completion of this course, students will be able to					
1. A	nalyze	the forces in mechanisms.					
2. A	Apply the concept of balancing and use it for reducing the unbalanced forces in rotating masses and reciprocating engines.						
3. A	Apply the concept of free vibration for industrial applications.						
	Analyze forced vibrations of machines, engines and structures.						
5.	Calculate the gyroscopic couple on various vehicles and apply concept of governors.						
------	---	--	--	--			
ТЕХТ	BOOKS:						
1.	Rattan, S.S, "T	<b>Theory of Machines</b> ", 3 <sup>rd</sup> Edition, Tata McGraw-Hill, 2009.					
2.	Uicker, J.J., Pennock G.R and Shigley, J.E., <b>"Theory of Machines and Mechanisms"</b> , 3 <sup>rd</sup> Edition, Oxford University Press, 2009.						
3.	Thomas Bevan	, "Theory of Machines", 3 <sup>rd</sup> Ed., CBS Publishers and Distributors, 2005					
REFE	REFERENCES:						
1.	Ghosh. A and West Pvt. Ltd.,	Mallick, A.K., <b>"Theory of Mechanisms and Machines"</b> , Affiliated East- New Delhi, 1988.					
2.	V.Ramamurthi, "Mechanics of Machines", Narosa Publishing House, 2002						
3.	Khurmi, R.S., "Theory of Machines", 14th Edition, S Chand Publications, 2005.						
4.	Cleghorn. W. L, "Mechanisms of Machines", 2 <sup>nd</sup> Edition, Oxford University Press, 2015						
5.	<i>Robert L. Norton, "Kinematics and Dynamics of Machinery", 5<sup>th</sup> Edition, Tata McGraw-</i> <i>Hill, 2012.</i>						

17MPC504		OP	RATIONS RESEARCH		L	Т	Р	С		
					3	0	0	3		
OBJE	CTIVE	ES								
٠	To provide students the knowledge of optimization techniques and approaches.									
٠	To e	nable th	em to understand the various transportation a	and network	twork models.					
•	To u	ndersta	d the different Inventory models.	the different Inventory models.						
٠	To s	tudy the	various queueing models and its application	s.						
٠	To u	ndersta	d the different decision models and apply the	em for opti	mizati	ion.				
UNIT	I	LINE	R MODELS				ļ	•		
Introdu Graphic	ction to cal metho	Opera od – Sin	ons Research – Linear Programming - plex method – Duality – Two Phase Simplex	Mathemati k method .	cal F	orm	ulati	on –		
UNIT	II	TRAN	SPORTATION AND NETWORK N	NODELS	5			12		
Transpo route – network	ortation Minima ks – Criti	Assignr 1 spanr cal path	ent Models –Traveling Salesman problem ng tree – Maximum flow models –Projec scheduling	- Network t network	mode – CP	els – Mai	Sho nd F	ortest ERT		
UNIT	III	INVE	TORY MODELS					6		
Invento Product	ry mod	els – els – St	arious Costs and Concepts–EOQ–Deterr chastic Inventory models – Buffer stock.	ninistic in	vento	ry n	node	els –		
UNIT	IV	QUEU	EING MODELS					9		
Queuein multi-se populat	ng mode erver mo ion – Sir	ls - Qu odels – nulatior	eueing systems and structures – Notation p Poisson input – Exponential service – Co – Sequencing models.	oarameter – onstant rate	- Sing	jle se ice -	ervei – In:	and finite		
UNIT V DECI		DECI	ION MODELS					9		
Decisio solution Econon	Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique.						braic ife –			
TOTA	L: 45	PER	ODS							
OUTC	COMES	S: On	completion of this course, students will be ab	ole to						
1.	Interpre	et the co	cepts of Linear programming techniques.							
2.	Apply the concept of CPM, PERT and sequencing models for engineering problems.									
3.	Explain the concept of different Inventory models and its applications in engineering.			ring.						
4.	Apply the concept of queueing models for different problems.									
5.	Analyze various decision models and apply for various applications.									
TEXT	BOOI	KS:								
1.	Sharma 1998.	, S.D.	<b>Operations Research</b> ", 2 <sup>nd</sup> Ed., kedarNa	th Ram Na	ath &	Co	. Me	eerut,		

2.	P.K. Gupta, D.S. Hira, <b>"Problems in Operations Research (Principles and Solutions)"</b> , S.Chand & Co. Ltd., 2003.					
3.	Taha Hamdy A., "Operations Research", 8 <sup>th</sup> Ed., Prentice Hall of India Pvt. Ltd., 2007.					
REFE	REFERENCES:					
1.	Dharani Venkatakrishnan. S. "Operations Research" (Principles and Problems), 5 <sup>th</sup> Edition, Keerthi Publishing House Pvt. Ltd., 1996.					
2.	Don. T. Phillips, Ravindren, A and James Solberg," <b>Operations Research</b> ", 2 <sup>nd</sup> Edition, John Wiley & Sons, 1987.					
3.	Hillier and Libeberman, "Operations Research", Holden Day, 1986					
4.	Budnick F.S., "Principles of Operations Research for Management", 2 <sup>nd</sup> Richard D Irwin, 1990.					
5.	Panneerselvam.K, "Operation Research", 2 <sup>nd</sup> Edition, Prentice Hall of India, 2006.					

17MPC505		EN	ERGY ENGINEERING	L	Т	Р	С	
				3	0	0	3	
OBJE	OBJECTIVES							
•	To	provide	students an overview of the global energy scenario.					
●	To enable them to understand the different types of conventional energy.							
●	То	understa	nd the basic principles of various non-conventional ener	gy ger	nerat	ion.		
•	To	familiari	ze the various techniques of bio mass energy generation.					
٠	То	expose the	heimportance of energy conservation techniques.					
UNIT	Ι	INTR	ODUCTION				9	
Introdu factors,	ction to general	energy classific	- Global energy scene – Indian energy scene - Units of cation of energy, energy crisis, energy alternatives.	energ	y, co	onve	rsion	
UNIT	II	CONV	ENTIONAL ENERGY				9	
Conven power j fluidize	tional e plants, e d bed co	energy re efficienc ombustic	esources, Thermal, hydel and nuclear reactors, thermal y, merits and demerits of the above power plants, cor on.	, hyde nbusti	l and on p	d nu roce	clear esses,	
UNIT	III	NON	CONVENTIONAL ENERGY				9	
Solar energy electric energy	Solar energy, solar thermal systems, flat plate collectors, solar thermal power generation, solar energy application in India - Wind energy, types of windmills, types of wind rotors - wind electric power generation, wind power in India, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy- Hybrid vehicles, Fuel cells					solar wind ermal		
UNIT	IV	BIO N	IASS ENERGY				9	
Biomas convers gasifier	Biomass origin - Resources – Biomass estimation. Thermochemical conversion – Biological conversion, Chemical conversion – Hydrolysis & hydrogenation, biodiesel power generation gasifier, biogas, integrated gasification.					gical ation		
UNIT	V	ENER	GY CONSERVATION				9	
Energy audit – balance	conserv Types , therma	vation - method al energy	Act; Energy management importance, duties and resp lology, reports, instruments - energy performance, m management.	onsibi ateria	lities 1 an	; Er d er	nergy nergy	
TOTA	L: 4	5 PERI	IODS					
OUTO	COME	S: On	completion of this course, students will be able to					
1.	Explain the concepts of energy generation and crisis in Indian and global scenario.		).					
2.	Interpret the di		fferent conventional energy generation methods.					
3.	Understand the concept of various non-conventional energy resources.							
4.	Examine the concept of Bio mass energy and its generation.							
5.	5. Describe the importance of energy conservation and energy auditing.							
TEXT	TEXT BOOKS:							

1.	Rao, S. and Parulekar, B.B., "Energy Technology", Khanna Publishers, 2005.					
2.	Rai, G.D., "Non-conventional Energy Sources", Khanna Publishers, New Delhi, 1984.					
3.	Paul W.O'Callaghan, "Energy Management", McGraw – Hill, 1993					
REFE	FERENCES:					
1.	Albert Thumann, P.E., C.E.M & William J Younger C.E.M, "Handbook of Energy Audit", 7th edition Faiment Press 2008					
2.	<i>T.D.Eastop and D.R.Croft</i> , <i>"Energy efficiency for engineers and technologists"</i> , <i>Longman Harlow</i> , 1996					
3.	El. Wakil, "Power Plant Technology", Tata McGraw Hill, New York, 2002.					
4.	Nagpal, G.R., "Power Plant Engineering", Khanna Publishers, 2008.					
5.	Attilio Bisio and Sharon Boots, "Encyclopedia of energy technology and the environment", volumes 1-4, Wiley-interscience publication, John wiley & sons, 1995					

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#### **OBJECTIVES**

- To make the students to perform experiments on heat transfer applications.
- To analyse the performance of a refrigeration systems.
- To understand and perform experiments on air conditioning system.

### LIST OF EXPERIMENTS:

#### **HEAT TRANSFER EXPERIMENTS: 30**

- 1. Thermal conductivity measurement using guarded plate apparatus.
- 2. Thermal conductivity measurement of pipe insulation using lagged pipe apparatus.
- 3. Determination of heat transfer coefficient under natural convection from a vertical cylinder.
- 4. Determination of heat transfer coefficient under forced convection from a tube.
- 5. Determination of Thermal conductivity of composite wall.
- 6. Determination of Thermal conductivity of insulating powder.
- 7. Heat transfer from pin-fin apparatus (natural & forced convection modes).
- 8. Determination of Stefan Boltzmann constant.
- 9. Determination of emissivity of a grey surface.
- 10. Effectiveness of Parallel/counter flow heat exchanger.

# LIST OF REFRIGERATION AND AIR CONDITIONING EXPERIMENTS:15

- 1. Determination of COP of a refrigeration system.
- 2. Experiments on Psychrometric processes.
- 3. Performance test on a Reciprocating air compressor.
- 4. Performance test in a HC Refrigeration System.

5. Performance test in a Fluidized Bed Cooling TowerDevices for thermal collectors and storage-Thermal applications-Solar thermal power plant-Solar Photo voltaic Conversion-Solar cell-PV application.

#### TOTAL : 45 PERIODS

<b>OUTCOMES:</b>		On completion of this course, students will be able to				
1.	Apply the heat transf	fundamental principles of heat transferto predict the thermal conductivity and er coefficient.				
2.	Demonstra refrigeratio	te the refrigeration and air conditioning cycle and predict COP of a on cycle.				
3. Determine		the amount of heat transfer in conduction, convection and radiation.				

#### **OBJECTIVES**

•	To make the students to understand and demonstrate the principles of kinematic mechanisms.
•	To perform experiments on governors and gyroscope systems and able to analyse its efficiencies.
•	To understand the principles of vibrating system and to determine the performance of a vibrating system.

# LIST OF EXPERIMENTS

- 1. a) Study of gear parameters.
- b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
- 2.a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillatingcylinder Mechanisms.
- b) Kinematics of single and double universal joints.
- 3.a) Determination of Mass moment of inertia of Fly wheel and Axle system.
  - b) Determination of Mass Moment of Inertia using bifilar suspension and compoundpendulum.
- 4. Motorized gyroscope Study of gyroscopic effect and couple.
- 5. Governor Determination of range sensitivity, effort etc., for Watt, Porter, Proell, and Hartnell Governors.
- 6. Cams Cam profile drawing, Motion curves and study of jump phenomenon.
- 7. Determination of natural frequency of a spring mass system.
- 8. Determination of torsional natural frequency of single and Double Rotor systems.
- 9. Vibration of Equivalent Spring mass system undamped and damped vibration.
- 10. Whirling of shafts Determination of critical speeds of shafts with concentrated loads.
- 11. a) Balancing of rotating masses.
- b) Balancing of reciprocating masses.
- 12. a) Transverse vibration of Free-Free beam with and without concentrated masses.
- b) Forced Vibration of Cantilever beam Mode shapes and natural frequencies.
- c) Determination of transmissibility ratio using vibrating table.

#### **TOTAL:45 PERIODS**

OUTCOMES:		On completion of this course, students will be able to
1. Demonstrate t		ne principles of kinematics of machinery.
2.	Demonstrate the principles of dynamics of machinery.	
3. Use the measu		ring devices for dynamic testing.

17ZEE50	9 COMMUNICATION AND SOFT SKILLS LABORATORY	L	Т	Р	C	
		0	0	4	2	
OBJECTIVES						
•	To help the students to improve the listening, speaking, reading and writing skills.					

•	To make them to prepare for national and international examinations and placements.
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• To help them to improve the interview and soft skills.

### LISTENING AND SPEAKING SKILLS

Conversational skills (formal and informal)- group discussion- making effective presentations using computers, listening/watching interviews conversations, documentaries. Listening to lectures, discussions from TV/ Radio/ Podcast.

# **READING AND WRITING SKILLS**

Reading different genres of tests ranging from newspapers to creative writing. Writing jobApplications- cover letter – resume – emails – letters – memos- reports. Writing abstracts – summaries interpreting visual texts.

# ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS ANDPLACEMENTS

International English Language Testing System (IELTS) - Test of English as a Foreign Language (TOEFL) - Civil Service(Language related)- Verbal Ability.

# **INTERVIEW SKILLS**

Different types of Interview format- answering questions- offering information- mock interviewsbodylanguage( paralinguistic features)- articulation of sounds- intonation.

# SOFTSKILLS

Motivation- emotional intelligence-Multiple intelligences- emotional intelligence- managing changes-time management-stress management-leadership straits-team work- career planning - Intercultural communication- creative and critical thinking.

			TOTAL:45 PERIODS	
OUTC	OMES:	On completion of this course, students will	be able to	
4.	. Make presentations and participate in group discussions.			
5.	Take international examinations such as IELTS and TOEFL.			
6.	5. Successfully answer questions in interviews.			

17MPC601

#### COMPUTER AIDED DESIGN AND MANUFACTURING

L	Т	Р	С
3	0	0	3

#### **OBJECTIVES**

UNIT I		INTRODUCTION TO CAD	12	
•	To understand the product data management and its uses.			
•	To understand the various shop floor control techniques used in manufacturing plant.			
•	То	understand the concepts of NC, DNC and CNC.		
•	То	To use mathematical representation for curves and surfaces.		
•	То	To make the students to understand and apply concepts of modelling in 2D and 3D.		

Product cycle- Design process- sequential and concurrent engineering- Computer aided design – CAD system architecture – co-ordinate systems- 2D and 3D transformations- homogeneous coordinates - Line drawing -Clipping- viewing transformation-standards for computer graphics-Graphical Kernel System (GKS) - standards for exchangeimages- Open Graphics Library (OpenGL) - Data exchange standards - IGES, STEP, etc.

# UNIT II GEOMETRIC MODELLING

Representation of curves- Hermite curve- Bezier curve- B-spline curves-rational curves-Techniques for surface modeling – surface patch- Coons and bicubic patches- Bezier and B-spline surfaces. Solid modeling techniques- CSG and B-rep.

# UNIT III NC,CNC AND DNC

Numerical control - classifications – point-to-point, straight cut and contouring – positioning – incremental and absolute systems – driving devices – feedback devices – NC part programming – manual programming for simple components – computer aided part programming- Introduction to Automatically Programmed Tools (APT) programming – programming with interactive graphics – computer automated part programming.

# UNIT IV COMPUTER AIDED SHOP FLOOR CONTROL

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Introduction to group technology, part classification and coding, production flow analysis, cellular manufacturing systems – computer aided material handling system – computer aided process planning – variant and generative process planning methods – artificial intelligence in process planning.

# UNIT V PRODUCT DATA MANAGEMENT

Introduction to product data management (PDM) - CAD integration in product data management – issues related to integration of CAD with PDM – examples, tools and uses.

TOTAL: 45 PERIODS			
OUTO	COMES:	On completion of this course, students will be able to	
1.	Identify the	e different concepts of design process and its standards.	
2.	Apply the application	various types of curves and solid modelling techniques for engineering us.	

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3.	Create and develop NC, CNC and DNC part programming.		
4.	Apply the concept of process planning and group technology.		
5.	Analyze the process of product data management.		
ТЕХТ	BOOKS:		
1.	Zeid Ibrahim, International Ec	<b>"CAD/CAM Theory and Practices</b> ", 2 <sup>nd</sup> Edition, McGraw H dition,2009.	Hill
2.	P. Radhakrishnan and S. Subramanyan, Raju. V., "CAD/CAM/CIM" New Age International(P) Ltd, New Delhi – 2002		Age
3.	Mikell P. Groover, Emory W. Zimmers, Jr. "CAD/CAM", 5 <sup>th</sup> Impression Pearson Education, New Delhi, 2008.		
REFE	CRENCES:		
1.	Kundra T. K., I Manufacturing	Rao P. N. and Tiwari N. K., <b>"CNC Machine Tools and Computer Aid</b> <b>,"</b> Tata Mc Graw Hill Pub. New Delhi, 1991.	ded
2.	Steve Krar, A Pub.Company,	Arthar Gill, <b>"CNC Technology and Programming"</b> , McGraw H New Delhi, 1990	Hill
3.	David Bedworth, "Computer Integrated Design and Manufacturing", TMH, New Delhi, 1998		lew
4.	Kant Vajpayee S, "Principles of Computer Integrated Manufacturing", Prentice Hall India, 2003.		
5.	Donald Hearn d	and M. Pauline Baker, "Computer Graphics", Prentice Hall Inc., 2002.	

### GAS DYNAMICS AND JET PROPULSION

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#### **OBJECTIVES**

UNIT I		BASIC CONCEPTS	9
•	To analyze the performance of space propulsion system.		
•	To analyze the performance of jet propulsion system.		
•	To derive the conditions for change in pressure, density and temperature for flows through normal and oblique shocks.		r flows
•	To enable them to formulate and solve problems in one –dimensionalsteady compressible flow.		ılsteady
•	To provide students with an insight into the applications of compressible flows and the fundamentals of jet propulsion system.		and the

#### UNIT I BASIC CONCEPTS

Energy and momentum equations of compressible fluid flows - Stagnation states, Mach waves and Mach cone – Effect of Mach number on compressibility – Isentropic flow through variable ducts – Nozzle and Diffusers.

#### UNIT II FLOW THROUGH DUCTS

Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow) -Variation of flow properties.

#### UNIT III NORMAL AND OBLIQUE SHOCKS

Governing equations - Variation of flow parameters across the normal and oblique shocks -Prandtl – Meyer relations – Applications.

#### UNIT IV JET PROPULSION

Theory of jet propulsion – Thrust equation – Thrust power and propulsive efficiency – Operating principle, cycle analysis and use of stagnation state performance of ram jet, turbojet, turbofan and turbo prop engines - Applications of jet propulsion.

#### UNIT V SPACE PROPULSION

Types of rocket engines – Propellants-feeding systems – Ignition and combustion – Theory of rocket propulsion - Performance study - Staging - Terminal and characteristic velocity -Applications – space flights.

#### **TOTAL : 45 PERIODS OUTCOMES:** On completion of this course, students will be able to Explain the basic concepts of compressible flow and jet propulsion. 1. 2. Solve problems of Rayleigh and Fanno flow. 3. Apply the concept of normal and oblique shocks for various applications. 4. Apply the concept of jet propulsion in turbojet, turbofan and turboprop engines. 5. Analyze the concept of space propulsion of rockets.

ТЕХТ	BOOKS:		
1.	Yahya, S. M International (H	<ul> <li>"Fundamentals of Compressible Flow", 6<sup>th</sup> Edition, New Age</li> <li>P) Limited, NewDelhi, 2018.</li> </ul>	
2.	Somasundaram. PR. S. L., "Gas Dynamics and Jet Propulsions", New Age InternationalPublishers, 1996.		
3.	Ganesan. V., "	Gas Turbines'', Tata McGraw Hill Publishing Co., New Delhi, 1999.	
REFE	REFERENCES:		
1.	Anderson, J. D	., "Modern Compressible flow", 3rd Edition, McGraw Hill, 2003.	
2.	Babu. V., '' <b>Fu</b>	ndamentals of Gas Dynamics'', ANE Books India, 2008.	
3.	Hill. P. and C. Wesley Publish	Peterson, "Mechanics and Thermodynamics of Propulsion", Addison – ning company, 1992.	
4.	Zucrow. N. J., 1970.	"Principles of Jet Propulsion and Gas Turbines", John Wiley, New York,	
5.	Shapiro. A. H. wiley, New Yor	,," <b>Dynamics and Thermodynamics of Compressible fluid Flow</b> ", John k, 1953.	

17MPC603		DESIGN OF TRANSMISSION SYSTEMS	L	Т	Р	С
(Use of PSG Design		esign data book is permitted)	2	2	0	3
OBJE	OBJECTIVES					
•	• To make the students to understand and design the flexible elements of a transmission system.					
٠	To de	sign clutch and brake system.				
•	To un	derstand and design spur and helical gears of transmission syst	em.			
٠	To un	derstand and design bevel and worm gears.				
٠	To de	sign and develop gear box for different applications.				
UNIT	ΙΙ	DESIGN OF FLEXIBLE ELEMENTS				6+6
Design ropesan	of Flat b d pulleys	elts and pulleys - Selection of V belts and pulleys – Selection – Design of Transmission chains and Sprockets.	on of	hois	ting	wire
UNIT	II F	<b>FRICTION CLUTCHES AND BRAKES</b>				6+6
Design of plate clutches – axial clutches-cone clutches - Band and Block brakes - external shoe brakes						
brakes -	– Internal	expanding shoe brakes.				
brakes - UNIT	III S	PUR AND HELICAL GEARS				6+6
UNIT Speed a strength helical	III S ratios and n - Factor n and wea gear termi	<b>EPUR AND HELICAL GEARS</b> I number of teeth-Force analysis -Tooth stresses - Dynamic of safety - Gear materials – Design of straight tooth spur &hel ar considerations – Pressure angle in the normal and transve nology - estimating the size of the pair of crossed-helical gears	c effe lical g erse p s.	cts - gears lane	- Fa base - cro	6+6 tigue ed on ossed
UNIT Speed is strength helical g	III S ratios and n - Factor n and wea gear termi IV E	EPUR AND HELICAL GEARS I number of teeth-Force analysis -Tooth stresses - Dynamic of safety - Gear materials – Design of straight tooth spur &hel ar considerations – Pressure angle in the normal and transve nology - estimating the size of the pair of crossed-helical gears BEVEL AND WORM GEARS	c effe lical g erse p s.	cts - gears lane	- Fa base - cro	6+6 tigue ed on ossed 6+6
UNIT Speed a strength helical g UNIT Straight teeth,es Terming the wor	III S ratios and n - Factor n and wea gear termi IV E t bevel g stimating t ology. The	EXPANDING Shoe brakes. EPUR AND HELICAL GEARS I number of teeth-Force analysis -Tooth stresses - Dynamic of safety - Gear materials – Design of straight tooth spur &hel ar considerations – Pressure angle in the normal and transve nology - estimating the size of the pair of crossed-helical gears EVEL AND WORM GEARS gear: Tooth terminology, tooth forces and stresses, equi- he dimensions of pair of straight bevel gears. Worm Gear: Me ermal Capacity, Materials-forces and stresses, efficiency, esti- ir.	c effe lical g erse p s. valen erits a imatii	cts - gears lane t nu nd d ng th	- Fa base - cro	6+6 tigue ed on ossed 6+6 er of rits – ze of
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ТЕХТ	BOOKS:	
1.	Bhandari V. B,	"Design of Machine Elements", 3 <sup>rd</sup> Ed., Tata McGraw-Hill, 2010.
2.	Shigley J. E and Mischke C. R., "Mechanical Engineering Design", Sixth Edition, Tata McGraw-Hill, 2003.	
3.	Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4 <sup>th</sup> edition, Wiley, 2005.	
REFE	RENCES:	
1.	Sundararaja m 2003.	noorthy T. V. Shanmugam.N., "Machine Design", Anuradha Publications,
2.	Orthwein W, "	Machine Component Design", Jaico Publishing Co, 2003.
3.	Merhyle F. Sj <b>Elements"</b> 8th	potts, Terry E. Shoup and Lee E. Hornberger, <b>"Design of Machine</b> Edition, Printice Hall, 2003.
4.	Alfred Hall, H BookCo.(Schai	Ialowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill <i>um's Outline)</i> , 2010.
5.	Robert L. Nor education, 200	ton, <b>"Machine design An integrated approach"</b> , Fifth edition, Pearson 1.

17MPC604

#### METROLOGY AND MEASUREMENTS

#### **OBJECTIVES**

UNIT I		BASICS OF METROLOGY	9
•	• To provide themthe latest advances in metrology.		
•	To get knowledge on various power, flow and temperature measurements.		
•	То	understand the various form measurement techniques.	
•	То	explore different types of linear and angular measuring instruments.	
•	To make the students to understand the basics of metrology.		

Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Typesof standards – Introduction to interferometry - Reliability and Calibration – Readability and Reliability.

#### UNIT II LINEAR AND ANGULAR MEASUREMENTS

Linear Measuring instruments - Vernier instruments - micrometer, height gauge, dial indicators, Boregauges, Slip gauges, Comparators -Mechanical, Electrical, Optical and Pneumatic, Optical Projector. Angle measuring instruments - Bevel protractor, Spirit level, Sine bar, Autocollimator, Angle dekkor - Applications.

#### UNIT III FORM

# FORM MEASUREMENTS

Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications – Limit gauges.

#### UNIT IV MEASUREMENT OF POWER, FLOW AND TEMPERATURE

Force, torque, power - mechanical, Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, Electrical resistance thermometer – Pressure measurement.

# UNIT V ADVANCES IN METROLOGY

Tool maker's microscope - Computer controlled CMM - Universal measuring machine - Automatic and multidimensional inspection machine - Computer aided inspection -Machine vision-Laser interferometer – Clean room standards.

### TOTAL : 45 PERIODS

OUT	COMES:	On completion of this course, students will be able to
1.	Interpret th	ne need, errors and types of measurement.
2.	Identify and compare various linear and angular measuring instruments.	
3.	Identify an	nd compare various form measurement techniques.

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9

4.	Explain the principle of measuring power, flow and temperature.					
5.	Discuss the rec	Discuss the recent advances in metrology.				
ТЕХТ	FEXT BOOKS:					
1.	Jain.R. K., <b>"E</b> r	gineering Metrology", Khanna Publishers, Delhi, 2004.				
2.	Gupta. I. C., "Engineering Metrology", Dhanpatrai Publications, 2005.					
3.	Thomas G. Beckwith, Roy D, Marangoni, John H.Lienhard V., "Mechanical Mesurements", Addison WeleyPublishing Company, 2004.					
REFE	REFERENCES:					
1.	Charles Reginald Shotbolt, "Metrology for Engineers", 5th edition, Cengage Learning EMEA, 1990.					
2.	Holman J P., "Experimental Methods for Engineers" McGrawHill, 2004					
3.	Rajput R. K., "Engineering Metrology and instrumentation", Kataria and sons publishers, 2013					
4.	Gayler G. N. a	nd Shotbolt C. R., "Metrology for Engineers", ELBS 2000.				
5.	"ASTE Handb	ook of Industrial Metrology", Prentice Hall of India Limited, 2002.				

17MPC605

#### FINITE ELEMENT ANALYSIS

L	Т	Р	C
3	2	0	4

#### **OBJECTIVES**

•	To make the students to understand the basics concepts of finite element analysis.	
•	To provide them in depth knowledge in approximate methods in structural mechanics problems.	
•	To understand one dimensional finite element analysis with various types of elements.	
•	• To get exposed to plane problems in engineering analysis including two dimensional finite element analysis.	
•	• To understand the usage of higher order element in finite element analysis.	

#### UNIT I

INTRODUCTION

9+6

9+6

9+6

Historical background-basic concept of FEM – discretization of 1D, 2D and 3D Domains, mesh refinement, convergencerequirements - gradient and divergence theorems - boundary and initial value problems.

# UNIT II CHARACTERISTIC MATRICES AND LOAD VECTORS 9+6

One dimensional governing equations - structural and heat transfer problems - variational methodvariation calculus – weighted residual methods - Galerkin's method - Ritz method - generalized coordinate's approach - principle of minimization of potential energy.

### UNIT III ONE DIMENSIONAL PROBLEMS

Derivation of shape functions, Stiffness matrices and force vectors - Assembly of Matrices - shape function characteristics - problems in axial load members, trusses, heat transfer through composite walls and fins - Gauss elimination and Cholesky'smethods of solving equations..

### UNIT IV TWO DIMENSIONAL PROBLEMS

Derivation of shape functions for CST and LST triangular and rectangular elements, Stiffness matrices and force vectors-Pascal's triangle- concept of plane stress and plain strain and axi-symmetry. Structural and heat transfer application -introduction to coupled field analysis.

# UNIT V HIGHER ORDER ELEMENTS

9+6

Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – One and two dimensions – Jacobian transformation - Serendipity and Lagrangian elements – Numerical integration - Matrix solution technique.

# LECTURE:45 TUTORIAL:30 TOTAL : 75 PERIODS

OUTO	COMES:	On completion of this course, students will be able to	
1.	Recognize equation.	the basic fundamental equations of elasticity and solving linear system of	
2.	Make familiar of basic approximate methods in Structural applications.		
3.	Solve one dimensional structural and heat transfer problems.		
4.	Analyze and solve two dimensional problems.		

5.	Solve problems using higher order elements.				
ТЕХТ	KT BOOKS:				
1.	Tirupathi R. Chandrupatla and Ashok D. Belegundu,"Introduction to Finite Element in Engineering", PearsonEducation ,2003				
2.	Reddy. J. N., "An Introduction to the Finite Element Method", 3 <sup>rd</sup> Edition, Tata McGraw-Hill,2005				
3.	Seshu, P, <b>"Text Book of Finite Element Analysis"</b> , Prentice-Hall of India Pvt. Ltd., New Delhi,2007.				
REFE	REFERENCES:				
1.	Bhatti Asghar M, " <b>Fundamental Finite Element Analysis and Applications</b> ", John Wiley &Sons,2005 (Indian Reprint 2013)				
2.	Larry J. Segerlind, <b>"Applied Finite element Analysis"</b> , 2 <sup>nd</sup> Ed, John Wiley & Sons, 1987				
3.	David V.Hutton "Fundamentals of finite element Analysis" McGraw Hill Inc, Newyork, 2004.				
4.	Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis". 4th Edition, Wiley Student Edition, 2002.				
5.	Singiresu.S.Ra Heinemann, 20	o, <b>"The Finite Element Method in Engineering"</b> , ButterWorth 001.			

### METROLOGY AND MEASUREMENTS LABORATORY

0 0 4 2

#### **OBJECTIVES**

•	To familiarize the students on the working of various measuring instruments.
•	To use the appropriate measuring instruments according to the requirement.
•	To perform measurements of parts to check the quality.

### LIST OF EXPERIMENTS

- 1. Tool Maker's Microscope
- 2. Comparator
- 3. Sine Bar
- 4. Gear Tooth Vernier Caliper
- 5. Floating gauge Micrometer
- 6. Co ordinate Measuring Machine
- 7. Surface Finish Measuring Equipment
- 8. Vernier Height Gauge
- 9. Bore diameter measurement using telescope gauge
- 10. Bore diameter measurement using micrometer
- 11. Force Measurement
- 12. Torque Measurement
- 13. Temperature measurement
- 14. Autocollimator
- 15. Roundness Measurement
- 16.Introduction to electron microscopy

			TOTAL:45 PERIODS
OUTCOMES:		On completion of this course, students will	be able to
1.	Apply the fund	lamental principles of metrology and measur	rements.
2.	Handle different measurement instruments.		
3.	Perform measu	rements to check quality of parts.	

17MPC608	CAD/CAM LABORATORY		Т	Р	С
		0	0	4	2

#### **OBJECTIVES**

•	To make the students to develop 3D modelling of parts using design software.
•	To assemble the parts and prepare drawings of engineering components
•	To develop CNC part programming and to perform machining in CNC machines.

# LIST OF EXPERIMENTS

# **3D GEOMETRIC MODELING**

#### List of Experiments

1.Introduction of 3D Modelling software Creation of 3D assembly model of following machine elements using 3D Modelling software

- 2. Flange Coupling
- 3. Plummer Block
- 4. Screw Jack
- 5. Lathe Tailstock
- 6. Universal Joint
- 7. Machine Vice
- 8. Stuffing box
- 9. Crosshead
- 10. Safety Valves
- 11. Non-return valves
- 12. Connecting rod
- 13. Piston
- 14. Crankshaft

# **Manual Part Programming**

- (i) Part Programming CNC Machining Centre
- a) Linear Cutting.
- b) Circular cutting.
- c) Cutter Radius Compensation.
- d) Canned Cycle Operations.
- (ii) Part Programming CNC Turning Centre
- a) Straight, Taper and Radius Turning.
- b) Thread Cutting.
- c) Rough and Finish Turning Cycle.
- d) Drilling and Tapping Cycle.

TOTAL:45
PERIODS

OUTCOMES:		On completion of this course, students will be able to
1.	1. Develop 2D and 3D models using modelling software.	
2.	Design, Assemble and generate Drawings of various mechanical assemblies.	
3.	Prepare CNC part programming and perform manufacturing in CNC machines.	

17MEE609

OBJECTIVES							
•	To help the students to develop the personal and social communication.						
•	To improve the presentation and speaking skills.						
•	To develop and improve the employability and corporate skills.						

# PERSONAL COMMUNICATION

Day-to-day conversation with family members, neighbours, relatives, friends on various topics, context specific – agreeing/disagreeing, wishing, consoling, advising, persuading, expressingopinions, arguing.

# SOCIAL COMMUNICATION

Telephone calls (official), colleagues in the work spot, discussing issues (social, political, cultural) clubs (any social gathering), answering questions, talking about films, books, news items, T.V. programmes, sharing jokes.

# **GROUP/MASS COMMUNICATION**

Group discussion (brainstorming), debate, panel discussion, anchoring/master of ceremony, welcome address, proposing vote of thanks, introducing speakers, conducting meetings, making announcements, Just-a-minute (JAM), Block and tackle, shipwreck, spoof, conducting quiz, negotiations, oral reports.

# INTEGRATED SPEAKING AND PRESENTATION SKILLS

Listening to speak (any radio programme/lecture), reading to speak, writing to speak, watching to speak, (any interesting programme on TV) Reading aloud any text/speech, lecturing, PowerPoint presentation, impromptu, Interviews of different kinds (one to one, many to one, stress interview, telephonic interview)

# EMPLOYABILITY AND CORPORATE SKILLS

Interview skills – Types of interview, preparation for interview, mock interview. Group Discussion – Communication skills in Group Discussion, Structure of GD, GD process, successful GD techniques, skills bought out in GD – leadership and co-ordination. Time management and effective planning – identifying barriers to effective time management, prudent time management techniques, relationship between time management and stress management. Stress management – causes and effect.

**Note:** Students will undergo the entire programme similar to a Seminar. It is an activity based course. Student individually or as a group can organize event(s), present term papers etc. This will be evaluated by the faculty member(s) handling the course and the consolidated marks can be taken as the final mark. No end semester examination is required for this course

**TOTAL : 30 PERIODS** 

OUTCOMES:			On completion of this course, students will be able to				
	4.	Speak confidently with any speakers of English, including native speakers					
	5.	'Think on feet' even in difficult circumstances					
	6.	Hold interestin	ng and meaningful conversations with others, including strangers				

17MES701

# ENGINEERING ECONOMICS AND MANAGEMENT

L T P C

3 0 0 3

#### **OBJECTIVES**

IINIT I		SUPPI V AND DEMAND	8						
•	To make them aware of various concepts of engineering management								
•	To learn the different depreciation methods								
•	То	learn the different cash flowtechniques							
•	То	To acquire basic knowledge onvalue engineering							
•	То	To make the students to understand thefundamental concepts of supply and demand							

# UNIT I SUPPLY AND DEMAND

Introduction - Economics - Scope and Definition - Importance of Economics in Engineering -Demand and Revenue Analysis - Law of Demand - Demand Forecasting -Methods of Demand Forecasting - Demand curves - Factors affecting Demand - Demand Elasticity - Production Analysis - simple problems.

Supply - Supply schedule - Law of Supply - Elasticity of Supply - Cost and Supply Analysis -Types of Costs - Price and output Determination - Price Fixation – Pricing methods - Pricing Policies - Factors governing Pricing Policies - Break-Even analysis - Estimation of Break-Even Point - simple problems

### UNIT II

#### VALUE ENGINEERING

Elementof costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Make or buy decision, Value engineering – Function, aims, value engineering procedure. Interestformulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment seriespayment Present worth factor- equal payment series capital recovery factor - Uniform gradient seriesannual equivalent factor, Effective interest rate, Examples in all the methods.

# UNIT III CASH FLOW

Methods of comparison of alternatives – present worth method (Revenue dominated cash flowdiagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flowdiagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cashflow diagram), rate of return method, Examples in all the methods.

# UNIT IV REPLACEMENT, MAINTENANCE ANALYSISANDDEPRECIATION

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return.

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/Annuity method of depreciation, service output method of depreciation.

# UNIT V ENGINEERING MANAGEMENT

10

Definition - Functions - Evolution - Different Schools of Management - Types and Forms of Business Organization - Human Resource Development - Motivating individuals and workgroups

9

10

8

– Leadership for Managerial Effectiveness - Team working and Creativity – Managerial Communication - Time Management - Performance Appraisal- Career Planning

Management by Objectives (MBO) - Principles and Steps - Advantages and Disadvantages - Management by Exception (MBE) - Strategic management – SWOT analysis - Enterprise Resource Planning (ERP) - Supply Chain Management (SCM) - Activity Based Management (ABM).

			TOTAL: 45 PERIODS						
OUTC	COMES:	On completion of this course, students w	vill be able to						
1.	Explore the different engineering economic principles.								
2.	Explain the co	Explain the concept of time value of money							
3.	Understand co	Understand concept of cash flow.							
4.	Decide when	to replace an asset and understand the cor	ncept of depreciation						
5.	Explain the m	odern management concepts							
TEXT	<b>BOOKS:</b>								
1.	Sasmita Misl 2009.	Sasmita Mishra, "Engineering Economics and Costing"Eastern economy Edition, 2009.							
2.	Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001								
3.	Ernest Dale, <b>"Management Theory and Practice"</b> , International Student Edition,McGraw Hill Publishing Co., New Delhi, 1973.								
REFE	REFERENCES:								
10.	Richard Petti 2000.	nger, "Mastering Organizational Behav	viour", Macmillan Press,London,						
11.	Chandran J.S, "Organizational Behaviours", Vikas Publishing House Pvt. Ltd., New Delhi, 1994.								
12.	Gail Freeman - Bell and Janes Balkwill, "Management in Engineering – Principles and Practive", Prentice Hall of India Pvt.Ltd., 1998.								
13.	Barathwal.R.	R, ''Engineering Economics'', McGraw I	Hill, 1997.						
14.	Zahid A Kindersley,20	xhan: Engineering Economy, '' <b>Eng</b> 112	ineering Economy'', Dorling						

3       0       0       3         OBJECTIVES         •       To make the students to understand basics of industrial automation.       •         •       To explore various types of sensors and transducers.       •         •       To get knowledge on electrical drives and machine vision system.       •         •       To design simple mechatronics systems.       8         UNT1       INTRODUCTION TO AUTOMATION       8         Industrial Automation - General Aspects - Advantages and Limitations of Automation - Application of Automation - Low Cost Automation - Mechanisation and Automation - Types of Automation - Low Cost Automation - Assembly Automation Equipment .       9         Introduction to sensors and transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- optical measurements, stemperature measurements, Chemical measurements, stemperature measurements, Chemical measurements, stemperature acelerometers - ultrasonic sensors and transducers- flow, distance, velocity measurements.       10         Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors, signal processing and Analysis, Applications.       9         Programmable logic controller - Basic structure - Programming units - Memory - Input - Output Modules - Mnemories - Latching, Times - Internal relays - Counters - Shift Registers - Master and Place robots, Car park barries, Bar code reader, Wind screen wiper wing stepper motor control Taffic Control Interface - IOT applications.       9	17M	PC702			IND	USTRL	IAL 2	AUT	OMA	ΔTΙ	[ON			L	Τ	P	C
OBJECTIVES         •       To make the students to understand basics of industrial automation.         •       To explore various types of sensors and transducers.         •       To get knowledge on electrical drives and machine vision system.         •       To programme programmable logic controllers.         •       To design simple mechatronics systems.         UNIT I       INTRODUCTION TO AUTOMATION       8         Industrial Automation - General Aspects - Advantages and Limitations of Automation and Automation - Types of Automation - Low Cost Automation - Mechanisation and Automation - Types of Automation - Low Cost Automation - Assembly Automation Equipment.       9         Introduction to sensors and transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- optical measurements pizzoelectric - accelerometers - ultrasonic sensors and transducers- flow, distance, velocity measurements.       10         Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors, serve motors, Proportional, Integral, Derivative and PID controller - Microcontroller.Introduction to machine visionsystem - Proportional, Integral, Derivative, and pLic CONTROLLERS       9         Programmable logic controller - Basic structure - Programming units - Memory - Input - Output Modules - Mnemonics - Latching - Timers - Internal relays - Counters - Shift Registers - Master and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper moto controll-Traffic Control - Brogr									3	0	0	3					
<ul> <li>To make the students to understand objects of mutuation and undation.</li> <li>To explore various types of sensors and transducers.</li> <li>To get knowledge on electrical drives and machine vision system.</li> <li>To programme programmable logic controllers.</li> <li>To design simple mechatronics systems.</li> <li>UNIT I INTRODUCTION TO AUTOMATION 8</li> <li>Industrial Automation - General Aspects – Advantages and Limitations of Automation – Appendix and Automation – Appendix Automation – Aims of Automation – Mechanisation and Automation – Appendix Automation – Low Cost Automation – Assembly Automation Equipment.</li> <li>UNIT II SENSORS AND TRANSDUCERS 9</li> <li>Introduction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- solid state sensors and transducers - gold state sensors and transducers - gold state sensors and transducers - gold state sensors and transducers - flow, distance, velocity measurements.</li> <li>UNIT II ELECTRICAL DRIVES AND MACHINE VISION 10</li> <li>Electromagnetic Principles, Solenoids and Relays, Electrical drives - stepper motors, servo motors.</li> <li>Signal processing and Analysis, Applications.</li> <li>UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9</li> <li>Programmable logic controller – Basic structure - Programming units - Memory – Input - Output Modules - Microcontroller. Jundations - Programming the PLC using Ladder diagram -Simple example of PLC application.</li> <li>UNIT V MCHATRONICS SYSTEM DESIGN AND APPLICATION 9</li> <li>Mechatronics in Engineering Design, Traditional and mechatronics design, Applications - Internal relays - Counters - Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application.</li> <li>UNIT V MCHATRONICS SYSTEM DESIGN AND APPLICATION 9</li> <li>Mechatronics in Engineering Design, Traditional and mechatronics design, Applications - Pick</li></ul>	OBJ	<b>UBJECTIVES</b>															
<ul> <li>To explore various types of sensors and transducers.</li> <li>Toget knowledge on electrical drives and machine vision system.</li> <li>To programme programmable logic controllers.</li> <li>To design simple mechatronics systems.</li> <li>UNIT I INTRODUCTION TO AUTOMATION 8</li> <li>Industrial Automation - General Aspects – Advantages and Limitations of Automation and Automation – Types of Automation – Low Cost Automation – Assembly Automation Equipment .</li> <li>UNIT II SENSORS AND TRANSDUCERS 9</li> <li>Introduction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- optical measurement systems-encoders, photo electric, vision sensor, fibre optic transducers- solid state sensors and transducers-magnetic measurements, temperature measurements, chemical measurements procelectric – accelerometers - ultrasonic sensors and transducers- flow, distance, velocity measurements.</li> <li>UNIT III ELECTRICAL DRIVES AND MACHINE VISION 10</li> <li>Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors.</li> <li>Signal processing, A/D and D/A converters – Introduction to Data acquisition system - Proportional,Integral, Derivative and PID controller – Microcontroller.Introduction to machine vision-system - Camera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications.</li> <li>UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9</li> <li>Programmable logic controller – Basic structure - Programming units - Memory – Input - Output - Outpu</li></ul>	•	T					1 0 4 510		nuusu		uton	lation.					
Toget knowledge on electrical drives and machine vision system.     To programme programmable logic controllers.     To design simple mechatronics systems.     To design simple mechatronics systems.     INIT I INTRODUCTION TO AUTOMATION 8 Industrial Automation - General Aspects - Advantages and Limitations of Automation - Application of Automation - Elements of Automation - Ansm of Automation - Mechanisation and Automation - Types of Automation - Low Cost Automation - Assembly Automation Equipment .     UNIT II SENSORS AND TRANSDUCERS 9 Introduction to sensors and transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- low, distance, velocity measurements.     UNIT III ELECTRICAL DRIVES AND MACHINE VISION 10 Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors. Signal processing, A/D and D/A converters - Introduction to mat acquisition system - Proportional,Integral, Derivative and PID controller - Microcontroller.Introduction to machine visionsystem - Gramera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications.     UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9 Programmable logic controller - Basic structure - Programming units - Memory - Input - Output Modules - Mnemonics - Latching- Timers - Internal relays - Counters - Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application.     UNIT V MECHATRONICS System DESIGN AND APPLICATION 9 Mechatronics in Engineering Design, Traditional and mechatronics design,Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor c	•	• To explore various types of sensors and transducers.															
To programme programmable logic controllers.           To design simple mechatronics systems.           UNIT I         INTRODUCTION TO AUTOMATION         8           Industrial Automation - General Aspects - Advantages and Limitations of Automation - Application of Automation - Lelements of Automation - Aims of Automation - Mechanisation and Automation - Types of Automation - Low Cost Automation - Aims of Automation Equipment.           UNIT II         SENSORS AND TRANSDUCERS         9           Introduction to sensors and transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- solid state sensors and transducers- unders, Photo electric, vision sensors and transducers- solid state sensors and transducers - ultrasonic sensors and transducers flow, distance, velocity measurements.         10           Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors. Signal processing, AD and D/A converters - Introduction to Data acquisition system - Proportional, Integral, Derivative and PID controller - Microcontroller. Introduction to machine visionsystem - Camera, Frame Grabber, Sensing and Digitizing Image Data - Lighting Techniques, Image Processing and Analysis, Applications.         9           Programmable logic controller - Basic structure - Programming units - Memory - Input - Output Modules - Mnemonics - Latching. Timers - Internal relays - Counters - Shift Registers - Master and Jump Controls. Programming the PLC using Ladder diagram -Simple example of PLC application.         9           MIT IV         MECHATRONICS SYSTEM DESIGN AND APPLICATION         9           Mechatronics in Engin	•	То	oget kn	owledge	on electri	ical drive	es and	d macl	hine vi	isior	n sys	tem.					
<ul> <li>To design simple mechatronics systems.</li> <li>UNIT I INTRODUCTION TO AUTOMATION 8</li> <li>Industrial Automation - General Aspects - Advantages and Limitations of Automation - Application of Automation - Lelements of Automation - Aims of Automation - Mechanisation and Automation - Types of Automation - Low Cost Automation - Aims of Automation Equipment .</li> <li>UNIT II SENSORS AND TRANSDUCERS 9</li> <li>Introduction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- solid state sensors and transducers-magnetic measurements, themical measurements-piezoelectric - accelerometers - ultrasonic sensors and transducers- solid state sensors and transducers- sensoric sensors and transducers and transducers-encoders, photo electric, vision sensor, Fibre optic transducers- solid state sensors and transducers-magnetic measurements, themical measurements-piezoelectric - accelerometers - ultrasonic sensors and transducers- flow, distance, velocity measurements.</li> <li>UNIT III ELECTRICAL DRIVES AND MACHINE VISION 10</li> <li>Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors. Signal processing, A/D and D/A converters - Introduction to Data acquisition system - Proportional, Integral, Derivative and PID controller - Microcontroller.Introduction to machine visionsystem - Camera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications.</li> <li>UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9</li> <li>Programmable logic controller - Basic structure - Programming intis - Memory - Input - Output Modules - Mnemonics - Latching- Timers - Internal relays - Counters - Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application.</li> <li>UNIT V MECHATRONICS SYSTEM DESIGN AND APPLICATION 9</li> <li>Mechatronics in Engineering Design, Traditional</li></ul>	•	• To programme programmable logic controllers.															
UNIT 1       INTRODUCTION TO AUTOMATION       8         Industrial Automation – General Aspects – Advantages and Limitations of Automation and Automation – Types of Automation – Cow Cost Automation – Aissembly Automation Equipment .       P         Types of Automation – Low Cost Automation – Assembly Automation Equipment .       9         Introductive and resonant transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre – topic transducers- optical measurements collectric – accelerometers - ultrasonic sensors and transducers- nogatic time assurements, chemical measurements collectric – accelerometers - ultrasonic sensors and Limitation on Data acquisition system - stoper motors, servo motors.         Signal processing, A/D and D/A converters – Introduction to Data acquisition system - Camera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications.       9         Programmable berotroller – Basic structure - Programming units - Memory – Input - Output Modules - Memorics – Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controller – Basic structure - Programming units - Memorics – Shift Registers - Master and Jump Controller – Basic structure - Programming units - Memorics - Shift Registers - Master and Jump Controller – Basic structure - Programming units - Memory – Input - Output Modules - Nemorics - Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controller – Basic structure - Programming units - Memory – Input - Output Modules - Memorics - Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controller – Basic structure - Programming units - Memorics - Robet and Jump Controller – Metabacer - Internal relays - Counters – S	•	То	o desig	n simple	mechatro	nics syst	stems.										
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Introduction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- solid state sensors and transducers-magnetic measurements, temperature measurements, Chemical measurements-piezoelectric – accelerometers - ultrasonic sensors and transducers- flow, distance, velocity measurements. <b>UNIT III ELECTRICAL DRIVES AND MACHINE VISION 10</b> Electromagnetic Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors. Signal processing, A/D and D/A converters – Introduction to Data acquisition system - Proportional,Integral, Derivative and PID controller – Microcontroller.Introduction to machine visionsystem -Camera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications. <b>UNIT IV PROGRAMMABLE LOGIC CONTROLLERS 9</b> Programmable logic controller – Basic structure - Programming units - Memory – Input - Output Modules - Mnemonics – Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application. <b>UNIT V MECHATRONICS SYSTEM DESIGN AND APPLICATION 9</b> Mechatronics in Engineering Design, Traditional and mechatronics design,Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor control- Traffic Control interface - IOT applications – Industry 4.0.Case studies: Coin counters, Robot walking machine. <b>10</b> <b>10</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>11</b> <b>1</b>	UNI		SEN	SORS A	AND TR	<u>KANSD</u>		ERS			1	1.	6.0				<u> </u>
UNIT III       ELECTRICAL DRIVES AND MACHINE VISION       10         Electromagnetic       Principles, Solenoids and Relays, Electrical drives -stepper motors, servo motors.       Signal processing, A/D and D/A converters – Introduction to Data acquisition system –       Proportional,Integral, Derivative and PID controller – Microcontroller.Introduction to machine visionsystem - Camera, Frame Grabber, Sensing and Digitizing Image Data- Lighting Techniques, Image Processing and Analysis, Applications.       9         UNIT IV       PROGRAMMABLE LOGIC CONTROLLERS       9         Programmable       logic controller – Basic structure - Programming units - Memory – Input - Output Modules - Mnemonics – Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application.       9         Mechatronics in Engineering Design, Traditional and mechatronics design, Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor control-Traffic Control interface - IOT applications – Industry 4.0.Case studies: Coin counters, Robot walking machine.       9         OUTCOMES:       On completion of this course, students will be able to       1         1.       Explain the key elements of automation.       2         2.       Explore the Performance of commonly used sensors and transducers.       3         3.       Compare the different actuation systems, controllers and machine vision systems       4         4.       Understand the PLC and develop pr	induc senso tempo senso	induction to sensors and transducers- classifications- Principle and working of Resistive, capacitive, inductive and resonant transducers- optical measurement systems-encoders, photo electric, vision sensor, Fibre optic transducers- solid state sensors and transducers-magnetic measurements, temperature measurements, Chemical measurements-piezoelectric – accelerometers - ultrasonic															
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UNIT IV       PROGRAMMABLE LOGIC CONTROLLERS       9         Programmable logic controller – Basic structure - Programming units - Memory – Input - Output       Modules - Mnemonics – Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controls - Programming the PLC using Ladder diagram -Simple example of PLC application.       Import 2000         UNIT V       MECHATRONICS SYSTEM DESIGN AND APPLICATION       9         Mechatronics in Engineering Design, Traditional and mechatronics design, Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor control–Traffic Control interface - IOT applications – Industry 4.0.Case studies: Coin counters, Robot walking machine.       TOTAL : 45 PERIODS         OUTCOMES:       On completion of this course, students will be able to       Import 1.         1.       Explore the Performance of commonly used sensors and transducers.       Import 2.         3.       Compare the different actuation systems, controllers and machine vision systems       Import 2.         4.       Understand the PLC and develop programs using ladder logic.       Import 2.         5.       Design the mechatronics systems for various applications.       Import 2.	Signa Propo vision Image	l proce ortional,I nsystem e Proces	essing, Integra -Came sing ar	A/D a l, Deriva era, Fran nd Analys	nd D/A ative and ne Grabb sis, Applic	convert d PID c er, Sensi cations.	rters contro sing a	– In oller and D	troduc – Mic igitizir	tion croc ng I	to contro Imag	Data oller.Intr e Data-	acqui oduct Ligh	siti tion ting	on 1 to g Te	syste mac chnie	m - chine ques,
Programmable       logic       controller       Basic       structure       Programming       units       Memory       Input       Output         Modules       - Mnemonics       - Latching-       Timers       Internal relays       Counters       Shift       Registers       Master       and         UNIT       MECHATRONICS SYSTEM DESIGN AND APPLICATION       9         Mechatronics       in Engineering       Design, Traditional       and mechatronics       design, Applications       Pick       and         Place       robots, Car       park       barriers, Bar       code       reader, Wind       screen       wing       stepper       motor       ontor	UNI	TIV	PRO	GRAM	MABL	E LOG	GIC	CON	TRO	LL	<b>ER</b>	S					9
UNIT V       MECCHATRONICS SYSTEM DESIGN AND APPLICATION       9         Mecharmonics       in Engineering Design, Traditional and mechatronics design, Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor controllers and mechatronics. Car park barriers, Bar code reader, Wind screen wiper wing stepper motor controllers and mechatronics. Coin counters, Robot walking machine.       Image: Stepper and the counters, Robot walking stepper motor controllers. Robot walking machine.         OUTOTAL:       45 PERION       Image: Stepper and the counters of automation.       Image: Stepper and the counters of commonly used sensors and transducers.       Image: Stepper and the counter of commonly used sensors and transducers.       Image: Stepper and the counter of commonly used sensors and transducers.       Image: Stepper and the counter of the counter of commonly used sensors and transducers.       Image: Stepper and the counter of the counter o	Progr Modu Jump	Programmable logic controller – Basic structure - Programming units - Memory – Input - Output Modules - Mnemonics – Latching- Timers – Internal relays - Counters – Shift Registers - Master and Jump Controls -Programming the PLC using Ladder diagram -Simple example of PLC application.															
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TOTAL : 45 PERIODS         OUTCOMES:       On completion of this course, students will be able to         1.       Explain the key elements of automation.	Mechatronics in Engineering Design, Traditional and mechatronics design, Applications - Pick and Place robots, Car park barriers, Bar code reader, Wind screen wiper wing stepper motor control–Traffic Control interface - IOT applications – Industry 4.0.Case studies: Coin counters, Robot walking machine.																
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<ol> <li>Explain the key elements of automation.</li> <li>Explore the Performance of commonly used sensors and transducers.</li> <li>Compare the different actuation systems, controllers and machine vision systems</li> <li>Understand the PLC and develop programs using ladder logic.</li> <li>Design the mechatronics systems for various applications.</li> </ol>	OUI	ГСОМ	ES:	On com	pletion of	f this cou	ourse, s	studen	nts will	l be	able	to					
<ol> <li>Explore the Performance of commonly used sensors and transducers.</li> <li>Compare the different actuation systems, controllers and machine vision systems</li> <li>Understand the PLC and develop programs using ladder logic.</li> <li>Design the mechatronics systems for various applications.</li> </ol>	1.	Explain	n the k	ey eleme	nts of aut	omation.	l.										
<ol> <li>Compare the different actuation systems, controllers and machine vision systems</li> <li>Understand the PLC and develop programs using ladder logic.</li> <li>Design the mechatronics systems for various applications.</li> </ol>	2.	Explor	e the P	Performan	nce of con	nmonly u	used s	sensor	s and t	tran	sduc	ers.					
<ol> <li>Understand the PLC and develop programs using ladder logic.</li> <li>Design the mechatronics systems for various applications.</li> </ol>	3.	Compa	re the	different	actuation	systems	s, con	troller	rs and i	mac	chine	vision s	ysten	ıs			
5. Design the mechatronics systems for various applications.	4.	Unders	tand th	ne PLC an	nd develo	p progra	ams u	ising la	adder l	ogic	с.						
	5.	Design	the m	echatroni	ics system	ns for var	rious	applic	cations								

- Bolton.W, "Mechatronics", Addison Wesley, 4th Edition, New Delhi, 2010. 1.
- 2. Bradley.D.A, Dawson.D Burd N.C.and Loader A.J, "Mechatronics", Chapman and Hall

	Publications, New York, 1993.				
3.	Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.				
REF	FERENCES:				
1.	Janakiraman P.A., "Robotics and Image Processing", Tata Mc Graw Hill, 1995.				
2.	David W. Pessen, "Industrial Automation Circuit Design and Components", John Wiley, New York, 1990.				
3.	Rohner.P, "Automation with Programmable Logic Controllers", Macmillan /McGraw Hill, New York, 1996.				
4.	Brian Morris, "Automatic Manufacturing Systems Actuators, Controls and Sensors", McGraw Hill, New York, 1994.				
5.	Jacob Fraden, "Handbook of Modern Sensors Physics, Designs, and Applications", Third Edition, Springer-Verlag New York, 2004.				

<b>17MPC</b> <sup>7</sup>	706

OBJECTIVE	ES
•	To train the students in hydraulic and pneumatic circuit design using different control devices.
•	To practice Speed control of AC and DC motor using PID controller interfacing.
•	To Program and execute PLCand pick and placerobot.
LIST OF EX	PERIMENTS:

1. Assembly language programming of 8085 – Addition – Subtraction – Multiplication – Division – Sorting – Code Conversion.

2. Stepper motor interface.

3. Traffic light interface.

4. Speed control of DC motor.

5. Study of various types of sensors and transducers.

6. Study of hydraulic, pneumatic and electro-pneumatic circuits.

7. Modelling and analysis of basic hydraulic, pneumatic and electrical circuits using software.

8. PLC control of electro-pneumatic and electro-hydraulic systems.

9. Study of image processing technique.

10.Speed control of AC and DC motor using PID controller interfacing.

11. Writing program for pick and place operation of a robot.

12.Design and testing of fluid power circuits to control

(i) velocity (ii) direction and (iii) force of single and double acting actuators

13. Computerized data logging system with control for process variables like pressure flow and temperature.

			TOTAL:45 PERIODS			
OUTCO	<b>DMES:</b>	On completion of this course, students will	be able to			
7.	7. Apply the fundamental principles of programmable controllers to the solution of practical problems in industrial automation.					
8.	Demonstrate a fundamental knowledge of field devices and associated control with PLCs.					
9.	Interface appropriate field devices and programming controller in automating the systems.					

**17MEE803** 

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OBJECTIVES						
•	To provide opportunity to explore a problem or issue of particular personal or professional interest.					
•	To address the problem or issue through focused study and applied research under the direction of a facultymember.					

•	To synthesize and apply the knowledgeand skills acquired in his/her academic program to real-world issues and problems.
•	To improve ability to think critically and creatively, to solve practical problems,

•	Tomake reasoned and ethical decisions, and to communicate effectively.
•	

The students in a group of 3 to 4 works on a topic approved by the head of thedepartment under the guidance of a faculty member and prepare a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews in that any one review will be conducted with external examiner.

The review committee may be constituted by the Head of the Department. A project port is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

				TOTAL :	: 90 PER	IODS
OUTCOMES:		On completion of this course, students will be able to				
1	Identify the real time Engineering problems in their day to day life.					
2	Apply the knowledge andskills acquired in their courses to a specific problem or issue					
3	Think critically and creatively to address and help solve these professionalor social issues and to further development.					
4	Refine research skills and demonstrate their proficiency in written and oral communication skills.					
5	Take on the challenges of teamwork, prepare a presentation in aprofessional manner, and document all aspects of design work.					

17MPE001		<b>REFRIGERATION AND AIR CONDITIONING</b>	L	Т	Р	С	
			3	0	0	3	
OBJE	OBJECTIVES:						
• To make the students to understand vapour compression and vapour absorption Operation.					on sy	stem	
•	• To analyse the refrigeration cycles and methods for improving Performance.						
•	• To acquire the knowledge on components of refrigeration systems.						
•	To de	sign air conditioning systems using cooling load calculations.					
•	To ex	plore the application of refrigeration and air conditioning system	s.				
UNIT	I	INTRODUCTION			4	5	
Introduc Desirabl	tion to	Refrigeration - Unit of Refrigeration and C.O.P.– Ideal critics – Classification - Nomenclature - ODP & GWP.	ycles-	Re	frige	erants	
UNIT	II	VAPOUR COMPRESSION REFRIGERATION SY	YSTI	EM		10	
Vapour compression cycle: p-h and T-s diagrams - deviations from theoretical cycle – sub cooling and super heating- effects of condenser and evaporator pressure on COP- multipressure system – low temperature refrigeration - Cascade systems – problems. Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.							
UNIT III OTHER		<b>OTHER REFRIGERATION SYSTEMS</b>	R REFRIGERATION SYSTEMS				
Working principles of Vapour absorption systems and adsorption cooling systems – Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic -Vortex and Pulse tube refrigeration systems.							
Magneti	c -Vort	tex and Pulse tube refrigeration systems.	Air r	cing			
Magneti UNIT	c -Vort	PSYCHROMETRIC PROPERTIES AND PROCES	Air r	5		10	
Magneti UNIT Properti saturatio Thermoo processe	c -Vort IV es of n on, Re dynami	<b>PSYCHROMETRIC PROPERTIES AND PROCES</b> noist Air-Gibbs Dalton law, Specific humidity, Dew point temp elative humidity, Enthalpy, Humid specific heat, Wet c wet bulb temperature, Psychrometric chart, Psychrometric ng of airstreams.	SSES peratu bulb of air	S re, I tem	Degra	<b>10</b> ee of ature, oning	
Magneti UNIT Properti saturatio Thermoo processe 6UNIT	c -Vort IV es of n on, Re dynami es, mixi	PSYCHROMETRIC PROPERTIES AND PROCES noist Air-Gibbs Dalton law, Specific humidity, Dew point tempelative humidity, Enthalpy, Humid specific heat, Wet c wet bulb temperature, Psychrometric chart, Psychrometric ng of airstreams. AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION	Air r SSES peratu bulb of air	re, I tem	Degra	10ee of ature, oning12	
Magnetii UNIT Propertii saturatio Thermoo processe <b>6UNIT</b> Air con Solar R selection calculatii distribut Humidit	c -Vort <b>IV</b> es of n on, Re dynami es, mixi <b>C V</b> ditionin adiation n-fresh ion of ion systems	PSYCHROMETRIC PROPERTIES AND PROCES noist Air-Gibbs Dalton law, Specific humidity, Dew point tempelative humidity, Enthalpy, Humid specific heat, Wet c wet bulb temperature, Psychrometric chart, Psychrometric ng of airstreams. AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION ng loads- Outside and inside design conditions- Heat transfer n- Electrical appliances- Infiltration and ventilation- internal h air load-Human comfort & IAQ principles- effective tem summer &winter air conditioning load- Classifications- Lay stem- Filters- Air-conditioning Systems with Controls- Temper prs, Actuators &Safety controls.	Air r SSES peratu bulb of air throu eat lo operat out c ature,	S re, I tem r-con ure oad-A ure of pl Pres	Degr ppera ditio	10 ee of ature, oning 12 12 cture- tratus chart- - Air e and	
Magneti UNIT Properti- saturatic Thermoo processe <b>6UNIT</b> Air con Solar R selection calculati distribut Humidit	c -Vort <b>IV</b> es of n on, Re dynami es, mixi <b>CV</b> ditionir adiation n-fresh ion of ion systems	PSYCHROMETRIC PROPERTIES AND PROCES noist Air-Gibbs Dalton law, Specific humidity, Dew point tempelative humidity, Enthalpy, Humid specific heat, Wet c wet bulb temperature, Psychrometric chart, Psychrometric ng of airstreams. AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION ng loads- Outside and inside design conditions- Heat transfer n- Electrical appliances- Infiltration and ventilation- internal h air load-Human comfort & IAQ principles- effective tem summer &winter air conditioning load- Classifications- Lay stem- Filters- Air-conditioning Systems with Controls- Temper ors, Actuators &Safety controls. TOTAL : 4	Air r SSES peratu bulb of air throu eat lo uperati out of ature,	S re, I tem r-con r-con ugh so oad-A ure of pl Pres	Degr apera ditio	10 ee of ature, oning 12 12 cture- tratus chart- - Air e and S	
Magnetii UNIT Propertii saturatio Thermoo processe <b>6UNIT</b> Air con Solar R selection calculatii distribut Humidit	c -Vort <b>IV</b> es of n on, Re dynami es, mixi <b>C V</b> ditionin adiation n-fresh ion of ion sys cy senso	PSYCHROMETRIC PROPERTIES AND PROCES noist Air-Gibbs Dalton law, Specific humidity, Dew point tempelative humidity, Enthalpy, Humid specific heat, Wet c wet bulb temperature, Psychrometric chart, Psychrometric ng of airstreams. AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION ng loads- Outside and inside design conditions- Heat transfer n- Electrical appliances- Infiltration and ventilation- internal h air load-Human comfort & IAQ principles- effective tem summer &winter air conditioning load- Classifications- Lay stem- Filters- Air-conditioning Systems with Controls- Temper ors, Actuators &Safety controls. TOTAL: 4 S: On completion of this course, students will be able to	Air r SSES peratu bulb of air throueat lo aperat out co ature,	S re, I tem r-con ure oad-A ure of pl Pres	Degripera ditio	10 ee of ature, oning 12 12 cture- tratus chart- - Air e and S	

2.	Understand the concept of vapour compression refrigeration system.				
3.	Learn the components and working of other refrigeration and air conditioning systems				
4.	Evaluating different psychrometric properties and processes.				
5.	Perform heating and cooling load calculations.				
ТЕХТ	TEXT BOOKS:				
1.	Arora, C. P., "Refrigeration and Air Conditioning", 3 <sup>rd</sup> ed., McGraw Hill, Delhi, 2010.				
2.	Manohar Prasad., "Refrigeration and Air Conditioning", 2 <sup>nd</sup> ed., New Age Int., 2011.				
3.	Rex Milter, Mark R.Miller, "Air conditioning and Refrigeration", McGraw Hill 2006.				
REFE	EFERENCES:				
1.	Roy J. Dossat, "Principles of Refrigeration", 4 <sup>th</sup> edition, Pearson Education Asia, 2009.				
2.	Stoecker, W. F. and Jones J. W., "Refrigeration and Air Conditioning", McGraw Hill, New Delhi, 1986.				
3.	<i>Ahmadul Ameen.</i> , "Refrigeration and Air Conditioning", 1 <sup>st</sup> edition, prentice-hall of India Private limited New Delhi 2006.				
4.	Jones W. P., "Air conditioning engineering", 5 <sup>th</sup> edition, Elsevier Butterworth-Heinemann, 2001.				
5.	Wilbert F. Stoecker, Jerold W. Jones., "Refrigeration and Air Conditioning", McGraw- Hill 1982.				

17MPE002		MANUFACTURING PLANNING AND CONTROL	L	Т	Р	С	
			3	0	0	3	
OBJE	CTIVE	S:					
٠	• To study the concepts of manufacturing planning and the activities in production planning and control.						
•	• To get clear idea about various types of production like job, batch and continuous.						
•	• To find out the sales forecasting, various types of demands and different methods.						
•	To acque enginee	uire knowledge in product planning and process planning, value pring and break even analysis.	e analy	ysis a	and v	value	
•	To be f	amiliar in operation scheduling and routing etc.					
UNIT	I	WORK STUDY AND ERGONOMICS				9	
Method techniq – produ	l study – ues – mic iction stud	- basic procedure - steps in method study, recording, sele ro motion and memo motion study – techniques of workmeasury ly - work sampling - ergonomics.	ction remer	and 1t - ti	recon ime s	rding study	
UNIT	II I	PLANT LOCATION				9	
Objecti model f	ve and su for wareh	bjective factors–single facility location problem –multi facility bouse location problem - facility locationmodel – Brown and Gib	locatio son m	on pi iodel	oble	ms –	
UNIT	III I	PLANT LAYOUT AND MATERIAL HANDLING				9	
Introdu COREI materia	ction – LAP. Mat l handling	classification of layout – layout design procedures – CRA erials Handling – unit load concept – material handling principle g equipments.	AFT, es –cl	ALI assif	DEP icati	and on of	
UNIT IV PRODUCTION PLANNING		PRODUCTION PLANNING				9	
Deman – Mater	d forecast rial resour	ing - Time series forecasting models - Delphi method of forecastice planning (MRP) and Enterprise resource planning(ERP).	sting-1	forec	ast e	rrors	
UNIT V		V PRODUCTION CONTROL					
Functio analysis control- shortag	ons of pro- s – standa - need for es – simp	duction control - product design and analysis – process planning ardization – simplification and specialization – make or buy de inventory-purchase order model-economic orderquantity - mod le problems in determination of EOQ	and cision cision lel wit	lesig 1s – 1 h an	n – v Inve d wi	value ntory thout	
		TOTAL	: 45	PE	RI	DDS	
OUT	COMES	: On completion of this course, students will be able to					
1.	On completion of this course, students will be able toLearn different work studies and the concept of ergonomics.						
2.	Identify and appropriate different types of plant location.						
3.	Apply th	e layout and material handling techniques.					
4.	Underst	and the product planning models					

5.	Analyzing the concept of value analysis and Inventory control techniques.				
TEXT	EXT BOOKS:				
1.	Samuel Eilon, "Elements of Production Planning and Control", Universal BookCorporation, 1984				
2.	Panneerselvam, R., "Production and Operations Management", 2 <sup>nd</sup> edition, PrenticeHall of India, New Delhi, 2006.				
3.	Buffa, E.S., "Modern Production/Operations Management", 8th edition, John Wileysons, 2009				
REFE	EFERENCES:				
1.	Barnes, "Motion and Time Study", John Wiley, New York, 1990				
2.	Apple, J.M. "Plant Layout and Materials Handling", Ronald Press Company, NewYork, 1977				
З.	ILO, "Introduction to work study", Geneva, 1974.				
4.	Evan D. Scheele "Principles & Design of Production Control Systems", Prentice Hall Inc., 1960				
5.	Norman Gaither G. Frazier, "Operations Management", Thomson Learning, 9 <sup>th</sup> Edition IE, 2007				

17MPE003		DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	L	Т	Р	С	
			3	0	0	3	
OBJE	OBJECTIVES:						
•	• To help the students explore the various locating and clamping methods.						
•	To desi	gn and development of jigs and fixtures for given component.					
•	To und	erstand press working terminologies and elements of cutting di	es				
•	To desi	gn bending and drawing dies.					
•	To und bending	lerstand the functions and design principles of various form g, forming, drawing, etc.	ning te	chni	ques	like	
UNIT	I I	LOCATING AND CLAMPING PRINCIPLES			8	3	
Objectiv principle clampin bushes a	ves of to es of loo g –Mech und Jigbu	ool design- Function and advantages of Jigs and fixtures - cation – Locating methods and devices – Redundant Locat nanical actuation – pneumatic and hydraulic actuation - Sta attons – Tolerances and materials used.	- Basi ion – ndard	c el Prin part	emen iciple is –	nts – es of Drill	
UNIT	II J	GS AND FIXTURES					
Design and development of jigs and fixtures for given component- Types of Jigs – Post, Turnover, Channel, latch, box, pot, angular post jigs – Indexing jigs – General principles of milling, Lathe, boring, broaching and grinding fixtures – Assembly, Inspection and Welding fixtures – Modular fixturing systems- Quick change fixtures.							
UNIT III PRE		PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES					
Press Working Terminologies - operations – Types of presses – press accessories – Computation of press capacity – Strip layout – Material Utilization – Shearing action – Clearances – Press Work Materials – Center of pressure- Design of various elements of dies – Die Block – Punch holder, Dieset, guide plates – Stops – Strippers – Pilots – Selection of Standard parts – Design and preparationof four standard views of simple blanking, piercing, compound and progressive dies.							
UNIT	IV I	BENDING AND DRAWING DIES				10	
Difference between bending and drawing – Blank development for above operations – Types of Bending dies – Press capacity – Spring back – knockouts – direct and indirect – pressure pads – Ejectors – Variables affecting Metal flow in drawing operations – draw die inserts – draw beads- ironing – Design and development of bending, forming, drawing, reverse redrawing and combination dies – Blank development for axi-symmetric, rectangular and elliptic parts – Single and double actiondies.							
UNIT	T V OTHER FORMING TECHNIQUES					7	
Bulging, Swaging, Embossing, coining, curling, hole flanging, shaving and sizing, assembly, fine blanking dies – recent trends in tool design- computer Aids for sheet metal forming Analysis – basic introduction - tooling for numerically controlled machines- setup reduction for work holding – Singleminute exchange of dies – Poka Yoke.							

	TOTAL : 45 PERIODS					
<b>OUTCOMES:</b> On completion of this course, students will be able to						
1.	On completion of this course, students will be able to Explore various locating and clamping principles.					
2.	Understand functions and design of Jigs & Fixtures.					
3.	Analyzing functions and design Press work and cutting die.					
4.	Evaluatingfunctions and design of press working and elements of cutting dies.					
5.	Applyingfunctions and various design to other forming techniques.					
TEXT BOOKS:						
1.	Joshi, P.H. "Jigs and Fixtures", Second Edition, Tata McGraw Hill, NewDelhi, 2004.					
2.	Joshi P.H "Press tools - Design and Construction", wheels publishing, 1996.					
3.	Cyril Donaldson, George H. LeCain, V. C. Goold, Joyjeet Ghose, "Tool Design", Fourth Edition, Tata McGraw Hill Publishing Co., Ltd., NewDelhi, 2012.					
REFERENCES:						
1.	Venkataraman. K., "Design of Jigs Fixtures & Press Tools", Tata McGraw Hill,2005.					
2.	Donaldson, Lecain and Goold "Tool Design", 3 <sup>rd</sup> Edition, Tata McGraw Hill, 2000.					
3.	Kempster, "Jigs and Fixture Design", Third Edition, Hoddes and Stoughton, 1974.					
4.	"Design Data Hand Book", PSG College of Technology, Coimbatore.					
5.	Hoffman "Jigs and Fixture Design", Thomson Delmar Learning, Singapore, 2004.					
17MPE004		DESIGN FOR MANUFACTURE	$\mathbf{L}$	Т	Р	C
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			3	0	0	3
<b>OBJE</b>	CTIVE	S:				
•	To mak compor	te the students to study the various factors influencing the ients and the use of tolerances in manufacturing.	manuf	actur	abili	ty of
•	To disc machini	cover the application of this study to various forging, coing Processes.	asting,	wel	ding	and
•	To help	the students to design features to facilitate machining.				
•	To mak	e the students to design features to facilitate casting.				
•	To help	the students to design the components by considering enviro	nmenta	al fac	tors.	
UNIT I	ΙΙ	DESIGN PRINCIPLES FOR MANUFACTURAB	ILIT	Y		7
General selection assembly	design j n, evalua y limits -	principles for manufacturability – strength and mechanical tion method, process capability – feature tolerances–geo-datum features – tolerance stacks.	factor metric	s,me tole	echar eranc	nisms æs –
UNIT I	II F	FACTORS INFLUENCING FORM DESIGN				9
Working of mater	g principl rials on fo	e, material, manufacture, design- possible solutions - materi orm design - form design of welded members, forgings andca	als cho stings.	oice -	influ	ience
UNIT III COMPONENT DESIGN - MACHINING						
		COMPONENT DESIGN - MACHINING	1 1'			10
UNIT Design f counter s amalgam for acces	III ( features t sunk screen nation - ( ssibility -	<b>COMPONENT DESIGN - MACHINING</b> to facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for a design for assembly.	doweli n - sin clampa	ingpr 1plifi bility	roced catio 7 - de	<b>10</b> lures, on by esign
UNIT Design f counter s amalgam for acces	III   C     features   t     sunk   screen     nation   -     ssibility   -     IV   C	COMPONENT DESIGN - MACHINING to facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for o design for assembly.	doweli n - sin lampa	ngpr nplifi bility	roced catio / - do	10 lures, on by esign 10
UNIT I Design f counter s amalgam for acces UNIT I Redesign machine modifyir	III   C     features   t     sunk   screen     nation   -     ssibility   -     IV   C     n   of     case   holes, f     ng the   de	COMPONENT DESIGN - MACHINING to facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for of design for assembly. COMPONENT DESIGN - CASTING stings based on parting line considerations - minimizing redesign of cast members to obviate cores. Identification of usign - group technology.	doweli n - sin clampa core necono	ingpr nplifi bility requ mica	roced catio 7 - de hirem 1 des	10 lures, on by esign 10 nents, sign -
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UNIT I Design f counter s amalgam for acces UNIT I Redesign machine modifyir UNIT V Introduct methods impact –	IIIIfeaturesfeaturessunkscreennation-ssibility-IVInofcaseofcaseofcaseofvIction-caseofcase-designof-designofofcase-feature-ofofcase-designofofofofofcase-designof <td>COMPONENT DESIGN - MACHINING to facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for a design for assembly. COMPONENT DESIGN - CASTING trings based on parting line considerations - minimizing redesign of cast members to obviate cores. Identification of sign - group technology. DESIGN FOR ENVIRONMENT nvironmental objectives – global issues – regional and locat n guidelines – lifecycle assessment method – techniques tor for energy efficiency – design to regulations andstandards.</td> <td>doweli n - sin clampa core necono issues educe</td> <td>ingpr nplifi bility requ mica</td> <td>roced catic 7 - de irem 1 des asic</td> <td>10 lures, on by esign 10 nents, sign - 9 DFE ental</td>	COMPONENT DESIGN - MACHINING to facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for a design for assembly. COMPONENT DESIGN - CASTING trings based on parting line considerations - minimizing redesign of cast members to obviate cores. Identification of sign - group technology. DESIGN FOR ENVIRONMENT nvironmental objectives – global issues – regional and locat n guidelines – lifecycle assessment method – techniques tor for energy efficiency – design to regulations andstandards.	doweli n - sin clampa core necono issues educe	ingpr nplifi bility requ mica	roced catic 7 - de irem 1 des asic	10 lures, on by esign 10 nents, sign - 9 DFE ental
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UNIT I Design f counter s amalgam for acces UNIT I Redesign machine modifyir UNIT V Introduct methods impact – 1. 2. 3.	IIICfeaturesfsunkscranation-isibility-IVCnofcasedholes-ofcasecdholesingthedeIction-er-designfcomes-designfcomes-formanuUnderstaAnalyzin	COMPONENT DESIGN - MACHINING o facilitate machining - drills - milling cutters - keyways – ews - reduction of machined area- simplification byseparatic design for machinability - design foreconomy - design for a design for assembly. COMPONENT DESIGN - CASTING stings based on parting line considerations - minimizing redesign of cast members to obviate cores. Identification of sign - group technology. DESIGN FOR ENVIRONMENT nvironmental objectives – global issues – regional and local n guidelines – lifecycle assessment method – techniques tor or energy efficiency – design to regulations andstandards. TOTAL : Con completion of this course, students will be able to beletion of this course, students will be able to complete the various factors which are influencing the form design ing different component which are used for machining.	doweli n - sin clampa core necono issues educe <b>45 P</b>	ingpr nplifi bility requ mica s – b envir <b>ERI</b> ples	oced catic 7 - de irem 1 des asic conm	10 lures, on by esign 10 nents, sign - 9 DFE ental S esign
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ТЕХТ	TBOOKS:
1.	Robert Matousek, "Engineering Design- A systematic approach", Blackie& Sons ltd.,
	1963.
2.	Harry Peck, "Design for Manufacture", Pitman Publishers, 1983.
3.	O. Molloy, E.A. Warman, S. Tilley, "Design for manufacture assembly", Springer Science & Business Media. 1998.
REFE	CRENCES:
1.	Bralla, "Design for Manufacture handbook, McGraw hill, 1999
2.	Boothroyd, G, "Design for Assembly Automation and Product Design". New York,
	Marcel Dekker. 1980
3.	Swift, K.G., "Knowledge Based Design for Manufacture", Kogan Page Ltd., 1987
4.	Alan Redford and Chal, "Design for Assembly-Principles and Procedures", McGraw Hill International Europe, London, 1994
5.	James G.Bralla, "Hand Book of Product design for Manufacturing", McGraw Hill Co., 1986.

17MPE005		COMPUTATIONAL FLUID DYNAMICS	L	Т	Р	С	
		•	3	0	0	3	
OBJE	CTIV	ES:					
•	To ma fluid d	ke the students understand the Governing Equations and boundary or ynamic problems.	conditi	ons	of va	rious	
•	To int	oduce numerical modelling and its role in the field of fluid flow and h	eat tra	nsfer			
•	To ena turbule	ble the students to understand the various discretization methods, solence modelling.	ution j	proce	edure	s and	
•	То арр	ly finite volume method for convection and diffusion problems.					
•	To an	alyse the finite volume approach to discretize the governing equa	ations				
UNIT	I	GOVERNING EQUATIONS AND BOUNDARY CONDITIONS			8	3	
Basics of Moment Time-av Mathem	of comp tum and reraged aticalbo	outational fluid dynamics – Governing equations of fluid dyna l Energy equations – Chemical species transport – Physical bou equations for Turbulent Flow – Turbulent–Kinetic En- ehavior of PDEs on CFD - Elliptic, Parabolic and Hyperbolic equ	mics indary ergy iation	– Co cor Equ s.	ontir ditio ation	iuity, ons – 1s –	
UNIT	II	FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION				9	
Derivati order ac diffusion onellipti	on of fi curacy n probl c and p	nite difference equations – Simple Methods – General Methods – Finite volume formulation for steady state One, Two and T ems –Parabolic equations – Explicit and Implicit schemes – arabolic equations – Use of Finite Difference and Finite Volume	for fir Three Exam meth	st ar –din ple ods.	nd se nens prob	cond ional lems	
UNIT	III	FINITE VOLUME METHOD FOR CONVECTION	N AN	JD		10	
Steady propertic Power-la	one-din es of di aw,QU	nensional convection and diffusion – Central, upwind dif scretization schemes – Conservativeness, Boundedness, Transp ICK Schemes.	ferenc	ing ness	sch , Hy	emes ′brid,	
UNIT	IV	FLOW FIELD ANALYSIS				9	
Finite volume methods -Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correctionequation, SIMPLE algorithm and its variants – PISO Algorithms.							
UNIT V TURBULENCE MODELS AND MESH GENERATIO		ΓΙΟΝ	I		9		
Turbulence models, mixing length model, Two equation (k-€) models – High and low Reynolds number models – Structured Grid generation – Unstructured Grid generation – Mesh refinement – Adaptive mesh – Software tools.							
	TOTAL : 45 PERIODS						
OUTC	OME	S: On completion of this course, students will be able to					
1.	. On completion of this course, students will be able toDerive governing equations of fluid dynamics by applying different boundary conditions.				fluid		

2.	Understand finite difference and volume methods for diffusion.					
3.	Apply finite volume method to solve convection diffusion problems.					
4.	Learn the concept of flow field analysis.					
5.	Creating different turbulence models and grid generation.					
ТЕХТ	BOOKS:					
1.	Versteeg, H.K., and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: Thefinite volume method", Pearson Education Ltd. 2 <sup>nd</sup> Edition, 2007.					
2.	Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw Hill Publishing Company Ltd., 1998.					
3.	Anil W. Date, "Introduction to computational fluid dynamics", Cambridge University Press, Cambridge, 2009.					
REFE	CRENCES:					
1.	Patankar, S.V. "Numerical Heat Transfer and Fluid Flow", Hemisphere Publishing Corporation, 2004.					
2.	Chung, T.J. "Computational Fluid Dynamics", Cambridge University, Press, 2002.					
3.	Ghoshdastidar P.S., "Heat Transfer", Oxford University Press, 2005					
4.	Muralidhar, K., and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", NarosaPublishing House, New Delhi, 1995.					
5.	Suhas.V. Patankar, "Numerical Heat Transfer and Fluid Flow", Hemisphere Publishing Corporation, 2009.					

17MPE006	INDUSTRIAL ROBOTICS	L	Т	Р			
		3	0	0			

### **OBJECTIVES:**

•	To make the students to understand the basic concepts of robotics.
•	To learn the concepts and techniques of robot manipulator and its kinematics.
•	To learn the various end effectors and sensors.
•	To understand the Robots cell design and programming.
•	To explore the industrial applications of robot.

# UNIT I FUNDAMENTALS OF ROBOT

Robot - Definition - Robot Anatomy - Coordinate Systems, Work Envelope, Types and Classification-Specifications-Pitch, Yaw, Roll, Joint notations, Speed of Motion, Pay Load- Robot Parts and theirFunctions-Need for Robots-Different Applications.

# UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS

9

12

13

5

6

С

3

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives, End Effectors – Grippers-Mechanical Grippers, Pneumatic and Hydraulic Grippers, Magnetic Grippers, Vacuum Grippers; Two Fingered and Three Fingered Grippers; Internal Grippers and ExternalGrippers; Selection and Design Considerations.

# UNIT III SENSORS AND MACHINE VISION

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors – Piezo-electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors, Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors, Binary Sensors, Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data-Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications-Inspection, Identification, Visual Serving and Navigation.

# UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 D), Four Degrees of freedom (in3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robotprogramming Languages-VAL Programming-Motion Commands, Sensor Commands, End effectorcommands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS	
---	--

RGV, AGV, Implementation of Robots in Industries-Various Steps, Safety Considerations for RobotOperations - Economic Analysis of Robots.

# **TOTAL : 45 PERIODS**

**OUTCOMES:** On completion of this course, students will be able to

1.	On completion of this course, students will be able toAnalysing fundamentals of robotics.				
2.	Understand the design concepts of robot drives and end effectors				
3.	Applying the concept of sensors and machine vision system				
4.	Learn the concept of Robot kinematics and write robot programming				
5.	Evaluating the safety and economics of robots				
ТЕХТ	BOOKS:				
1.	Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003.				
2.	Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.				
3.	J. Norberto Pires., "Industrial Robots Programming" Springer, 2007.				
REFE	FERENCES:				
1.	Craig J.J., "Introduction to Robotics Mechanics & Control", Pearson Education, 2008.				
2.	Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill, 1994.				
3.	Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.				
4.	Rajput R.K., "Robotics and Industrial Automation", S. Chand and Company, 2008.				
5.	Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.				

17MPE007		PLANT LAYOUT AND MATERIAL HANDLING	L	T	Р	C
		·	3	0	0	3
OBJEC	CTIVE	S:				
•	To mak handlin	the students to understand basic layout for industries, g equipment for industrial layout	the usa	ge of	f ma	terial
•	To disc	over the techniques and procedures of work study.				
•	To gain	knowledge on industrial buildings and utilities.				
•	To unde measure	erstand the concepts of ergonomics of work design, produement.	ction ar	nd pro	oduc	tivity
•	To learn	n the concept of Production Planning and Control.				
UNIT I	I I	NTRODUCTION				9
Factors t plant op space rec	o be con eration. quiremen	nsidered for location of plant layout - physical facilities – e Capacity, serviceability and flexibility and analysis in s nts, manpower requirements.	quipmer election	nts reo of ec	quire luipr	ed for nents
UNIT I	I P	PLANT LAYOUT				9
UNIT I Principle Types of	IIIN S, impor material	MATERIAL HANDLING rtance and scope of material handling. Planning, operation l handling systems, Factors influencing their choice.	and cost	ingpi	rinci	<b>9</b> ples -
UNIT I	<b>IV UTILITIES</b>					9
Industria building, maintena forpacka	l buildir lighti nce,was ging - pa	ngs and utilities - centralized electrical pneumatic water ng heating, air-conditioning and ventilation util te handling statutory requirements. Packing and storage ackaging machinery - wrapping and packing of materials, c	line sys ities. l of mat ushion n	tems Plann erials nateri	Ty ing - 1 als.	pesof and ayout
UNIT V	V A	ANALYSYS OF MATERIAL HANDLING				9
Analysis safety an	of mate alysis an	erial handling - factors involved, motion analysis, flow anand equipment cost analysis, analysis of operation materialha	lysis, gr indling s	aphic urvey	ana /s	lysis,
		ΤΟΤ	AL: 4	5 PE	RI	ODS
OUTC	OMES	• On completion of this course, students will be able to				
1.	On completion of this course, students will be able toUnderstand the basics of plant layou and material handling.					ayout
2.	Learn various tools and techniques used for developing plant layout.					
3.	Explore	Explore different material handling methods and systems.				
4.	Applying different packing and storage methods.					
	Appiying	g different packing and storage methods.				

ТЕХТ	BOOKS:			
1.	James, M. Apple., "Plant Layout and Material Handling", John Wiley & Sons, INC,			
	1977.			
2.	Rudenko. N., "	Materials handling equipment", ELnvee Publishers, 1970		
3.	Groover. M. P.	, "Automation, Production Systems and CIM", Prentice hall India, 2007.		
REFERENCES:				
1.	James, M. Moo	ore, " <b>Plant Layout and Design",</b> Macmillan Company, NY, 1963		
2.	Muther, R., <b>"P</b>	ractical Plant Layout", Mc Graw Hill Book Company, NY, 1955		
3.	Ray Asfahl. C, "Robots and Manufacturing Automation", 2nd edition, John Wiley & Sons, New York, 1992			
4.	James A. Tomp	James A. Tompkins., "Facilities planning", John wiley & Sons Inc, 1984.		
5.	Morris A. Coh	en, Uday M. Apte., "Manufacturing Automation", Irwin, Chicago, 1997.		

17MPE008		MECHANICAL VIBRATIONS	L	Т	Р	C
			3	0	0	3
OBJEC	CTIVI	ES:				
•	To ma	ke the students to understand different types of vibration.				
•	To ma	ke them to understand the sources of vibration and noise in aut	omobi	les		
•	To ma the co	ke design modifications to reduce the vibration and noise and mponents	1 impr	ove t	he l	ife o
•	To ana	alyze the Single Degree, Two Degree and Multi degree of Freed	dom S	ysten	ıs	
•	To stu	dy the numerical methods for vibration analysis				
UNIT I		BASICS OF VIBRATION				9
determina UNIT I	ation o	fnatural frequencies. BASICS OF NOISE	-			9
Introducti averaging noise,mea	ion, an g dec: asurem	nplitude, frequency, wavelength and sound pressure level, addi ibel levels, noise dose level, legislation, measurement ent environment, equipment, frequency analysis, tracking and	tion, s and alysis,	ubtra ana soun	ction alysi ad qu	n and s of uality
unitysis.	II	AUTOMOTIVE NOISE SOURCES				9
Noise Ch assessmen necessary	aracter nt of contri	ristics of engines, engine overall noise levels, assessment of co mechanical noise, engine radiated noise, intake and exh buted noise, transmission noise, aerodynamic noise, tire noise,	ombus naust brake	tion noise noise	nois e, ei	e and ngine
UNIT IV CONTROL TECHNIQUES			9			
Vibration dynamic themass e	i isolat forces elastic	ion, tuned absorbers, un-tuned viscous dampers, damping tre generated by IC engines, engine isolation, crank shaft dampin model shock absorbers.	atmen g, mo	its, aj dal ai	oplic	ation sis o
UNIT V	7	SOURCE OF NOISE AND CONTROL				9
Methods	for co	ontrol of engine noise, combustion noise, mechanical noise,	predi	ctive	ana	lysis

palliative treatments and enclosures, automotive noise control principles, sound in enclosures, soundenergy absorption, and sound transmission through barriers.

			TOTAL : 45 PERIODS		
<b>OUTCOMES:</b>		On completion of this course, students will be able to			
1.	Understand causes, source and types of vibrations in machineries.				
2.	Gaining knowledge in basics and measurement of noise.				
3.	Design and develop vibrations and noise control systems.				
4.	Know about the various control techniques of dampers and shock absorbers.				
5.	Learn aboutvarious sources of noises and its control.				

TEXT	BOOKS:					
1.	Singiresu S.Ra	o, "Mechanical Vibrations", 5 <sup>th</sup> Edition, Pearson Education, 2010				
2	William T. The	omson, Marie Dillon Dahleh, Chandramouli Padmanabhan, "Theory of				
	Vibration with	n Application", 5 <sup>th</sup> Edition Pearson Education, 2011				
3	David Bies and Edition,E and I	d Colin Hansen, " <b>Engineering Noise Control – Theory and Practice</b> ",4 <sup>th</sup> FN Spon, Taylore & Francise e-Library, 2009				
REFE	RENCES:					
1.	Benson H. Ton	gue, "Principles of Vibrations", 2nd Edition, Oxford University, 2007				
2.	Grover. G.T., "	Mechanical Vibrations", Nem Chand and Bros., 1996				
3.	Julian Happian-Smith - "An Introduction to Modern Vehicle Design"- Butterworth- Heinemann, 2004					
4.	4. Rao, J.S and Gupta, K., "Introductory course on Theory and Practice of Mechanical					
	Vibration", 2n	d Edition, New Age International Publications, 2010				
5.	Shabana. A.A.,	"Theory of vibrations – An introduction", 2nd Edition, Springer, 2010				

17MPE009		NEWER PRODUCTION PROCESSES	L	T	Р	С	
			3	0	0	3	
OBJE	CTIV	ES:					
•	To lea influe	rn about various newer production processes, their process parar nee on performance.	neters	and	thei	r	
•	To inc	ulcate the knowledge on electrochemical and chemical metal ren	noval	proc	cess.		
•	To illu	strate the procedure to develop forming processes and foundry t	echni	ques	•		
•	To an	lyse the thermal metal removal process.					
•	To co	npare the effort of human and rapid prototyping on production p	proces	ses .			
UNIT	NIT I MODERN MACHINING PROCESSES					9	
Need of processe (USM)	f moder es – at	n machining processes – classification and selection of techn rasive jet machining (AJM), water jet machining (WJM),ult	ology trason	–m ic n	echa nach	nical ining	
UNIT	II	ELECTROCHEMICAL AND CHEMICAL META REMOVALPROCESSES	L			9	
Electroc and hon	hemica ing – cł	l machining (ECM), electrochemical grinding (ECG), electro emical machining (CHM).	ochem	icalo	lebu	rring	
UNIT	III	THERMAL METAL REMOVAL PROCESSES				9	
Electric machini machini	dischar ng (PA ng (IBN	ge machining (EDM), wire cut electric discharge machining (WM), Electron beam machining (EBM), Laser beam machining (J).	VEDN g(LBN	1).Pl 1), I	asm Ion 1	a arc beam	
UNIT	IV	FORMING PROCESSES AND FOUNDRY TECH	NIQI	JES	5	9	
Explosiv high pre	ve form ssure m	ing, Electro – hydraulic forming, electro – magnetic forming oulding, squeeze casting, vacuum castings.	, dyna	apak	mac	hine-	
UNIT	V	RAPID PROTOTYPING					
Introduction – advantages – limitations – principle – rapid prototyping systems – stereolithography(SLG), selective laser sintering(SLS), fused deposition modelling (FDM),laminated object manufacturing (LOM), solid ground curing (SGC), 3D printing, Application of reverse engineering in rapid prototyping.							
		TOTAL: 4	5 PE	RIC	DDS	5	
OUTC	OME	S: On completion of this course, students will be able to					
1.	Analys metalro	ing appropriate machining process and set their parame	eters	for	effe	ctive	
2.	Select	and apply suitable forming process rabid prototyping techniques					
3.	Learn	bout various types of unconventional machining					
4.	Know	about different forming and special casting methods	•				
5.	Gain k	nowledge about prototyping methods					

TEXT	BOOKS:					
1. P.C.Pandey, "I		Modern machining processes", Tata McGraw Hill publishing company				
	Ltd. 2007					
2.	P.C.Sharma, "A text book of Production Technology", S.Chand & Company Ltd.					
	2007.					
3.	V. K. Jain, "Ac	dvanced Machining Process", Allied Publishers PVT Ltd 2007				
REFE	<b>RENCES:</b>					
1.	Bhattacharya,	"New Technology", Institution of Engineers, 1997				
2.	CMTI, <b>"Electr</b>	ochemical machining", Bangalore, 1978				
3.	Gary. F. Benea	lict, "Nontraditional machining Processes", Marcell Dekker Inc, 2001				
4.	4. HMT, "Production Technology", Tata McGraw Hill Publishers, 1992.					
5.	Ronenthal. C,	"Principles of Metal Castings", Tata McGraw Hill Publishing co. Ltd,				
	1996					

17MP	E010	LEA	AN MANUFACTURING	L	Т	P	С	
				3	0	0	3	
OBJE	CTIVES	5:						
•	To make	e the s	rudents to study the concept and implementation of lean	manu	factu	urin	g.	
•	To learn	the S	ustainable engineering concepts.					
•	To analy	yse the	multi attributes decision making methods					
•	To unde	rstand	the concept of lean manufacturing management.					
•	To explo	To explore the applications in lean manufacturing.						
UNIT	I I	NTR	ODUCTION				9	
Objectivov vs. lean	ves of lear manufact	n manı uring -	facturing-key principles and implications of lean manuf - Lean benefits.	acturi	ing t	radi	tional	
UNIT	II L	EAN	MANUFACTURING CONCEPTS				9	
Value c pull pro analysis	reation an oduction-c s – Compo	d was ontinu osite pa	e elimination- Major kinds of waste- pull production – o ous flow – Kaizen – Worker involvement; Part family art concept – Machinecell design -Case studies.	liffer - Pro	ent 1 oduc	nod tion	els of flow	
UNIT	III L N	EAN IETH	MANUFACTURING TOOLS & IODOLOGIES				9	
Standar visual manage	d work -c controls-q ment-total	commu uality l produ	nication of standard work to employees -standard wor at the source- 5S principles –preventive mainten active maintenance -changeover/setuptime -batch size red	k an ance luctio	d fle -tota on.	exib l q	ility - uality	
UNIT	IV V	ALU	E STREAM MAPPING				9	
The <i>as</i> balancin system.	<i>-is</i> diagrang -poke	am-the yoka-	future state map-application to the factory simula Kanban – overall equipment effectiveness -JIT - elemen	ition its of	sce JIT	nari -Ka	o-line anban	
UNIT	V I	MPL	EMENTING LEAN				9	
Road m Toyota	ap-Senior	<sup>.</sup> mana n syste	gement Involvement-best practices- reconciling lean war- m-lean six sigma-lean and ERP-lean with ISO9001:2000	ith ot )	her	syst	ems -	
		_	TOTAL	: 45	PE	RI	ODS	
OUTO	COMES:	On	completion of this course, students will be able to					
1.	Evaluatir	ngthe o	bjectives and benefits of lean manufacturing.					
2.	Understa	nd var	ious lean manufacturing concepts with case studies.					
3.	Learn var	rious l	ean manufacturing tools and methodologies.					
4.	Analysin	g abou	t value stream mapping techniques.					
5.	Learn the	e best j	practices used for implementation of lean manufacturing	syste	m.			
TEXT	BOOK	S:						
1.	Michael Hill Inc.,	L Geo New	rge, David T Rowlands, Bill Kastle, <b>"What is Lean Si</b> x York, 2004.	K Sig	ma"	,Mc	Graw	
2.	Askin R JohnWile	.G, G ey & S	oldberg J.B, "Design and Analysis of Lean Prod ons, New York, 2003.	uctio	on S	yst	ems",	
3.	S. R. I Manufao Private li	Devada c <b>turin</b> mited,	asan, V. Sivakumar, R. Murugesh, P. R. Shalij, ' g: Theoretical, Practical and Research Futurities New Delhi, 2012.	<sup>•</sup> Leaı s", F	n ai PHI	nd Lea	<b>Agile</b> arning	

<b>REFERENCES:</b>		
1.	Joseph A De F <b>Beyond",</b> Tata	Feo, William W Bearnard Juran Institute, <b>"Six Sigma Break Throughand</b> McGraw Hill, New Delhi, 2004.
2.	Richard B Cha for Competitiv	ase F Robert Jacobs and Nicholas J Aquilano, <b>"Operations Management</b> <b>e Advantage",</b> McGraw Hill Inc., New York, 10 <sup>th</sup> Edition, 2003.
3.	Dennis P. Hol Manual for An	bbs, "Lean Manufacturing Implementation: A Complete Execution ny Size", J. Ross Publishing, 2005.
4.	Micheal Wade Productivity ar	er, "Lean Tools: A Pocket guide to Implementing Lean Practices", and Quality Publishing Pvt Ltd, 2002.
5.	Akhilesh N. Sin	ngh, "Lean Manufacturing: Principles to Practice", L.B. Associates, 2010

17MPE011		WELDING TECHNOLOGY	L	Т	Р	С		
			3	0	0	3		
OBJE	CTIVE	S:						
•	To mak	te the student to understand the basics of welding technology.						
•	To disc metallu	cover the methods of testing of weldments and the basic corrgy.	oncep	ts of	we	lding		
•	To und	To understand welding techniques for various alloys.						
•	To lear	n the various advance welding processes.						
•	To acqu	ire the knowledge on mechanized welding techniques.						
UNIT	I (	GAS AND ARC WELDING PROCESSES				9		
Fundam Shielded and Elec	ental pri l metal a ctro-slagy	nciples – Air-acetylene welding, Oxy-acetylene welding, Caurc welding, Submerged arc welding, TIG & MIG welding, H welding processes - advantages, limitations and applications.	arbon Plasma	arc a arc	wel wel	ding, lding		
UNIT	II I	RESISTANCE WELDING PROCESSES				9		
Spot we Percussi andappl	elding, Solon weld ications.	eam welding, Projection welding, Resistance Butt welding, F ing and High frequency resistance welding processes - adva	Flash antage	Butt es, li	wele mita	ding, tions		
UNIT	III S	SOLID STATE WELDING PROCESSES			(	9		
Cold w Forgewe applicat	elding, 1 elding, R ions.	Diffusion bonding, Explosive welding, Ultrasonic welding, coll welding and Hot pressure welding processes - advantag	Fric ges, li	tion mitat	wel tions	ding, and		
UNIT	IV	OTHER WELDING PROCESSES				9		
Thermit stir wel transpor	welding lding, U tvehicles	, Atomic hydrogen welding, Electron beam welding, Laser bear nderwater welding, Welding automation in aerospace, nu , Cold metal transfer and explosive welding.	m wel ıclear	ding and	, Fri l su	ction rface		
UNIT	V I	DESIGN OF WELD JOINTS, WELDABILITY AN TESTING OF WELDMENTS	ND			9		
Various andnone	weld joi lestructiv	nt designs – Weld ability of Aluminium, Copper, and Stainless re testing of weldments, Heat affected zone	s steel	s. De	estru	ctive		
		TOTAL	: 45	PE	RI(	DDS		
OUTC	OMES	: On completion of this course, students will be able to						
1.	Learn ar	d Compare different types of Weldingprocesses.						
2.	Analysi	ng the principles of resistance welding processes.						
3.	Understa	and the concept of solid state welding process.						
4.	Learn ne	ewer welding techniques.						
5.	Design v	veld joints and learn different testing methods.						
TEXT	BOOK	S:						
1.	Parmer NewDel	R.S., <b>"Welding Engineering and Technology"</b> , 1 <sup>st</sup> edition, hi, 2008.	Khanı	na Pi	ublis	hers,		
2.	Parmer 1992.	R.S., "Welding Processes and Technology", Khanna Publ	ishers	, Ne	w D	)elhi,		
3.	Little R	L., "Welding and welding Technology", Tata McGraw H	lill Pu	ıblisl	ning	Co.,		

	Ltd., NewDelh	i, 34 <sup>th</sup> reprint, 2008.
<b>REFERENCES:</b>		
1.	Schwartz M.M.	"Metals Joining Manual". McGraw Hill Books, 1979.
2.	Tylecote R.F. London,1968.	"The Solid Phase Welding of Metals". Edward Arnold Publishers Ltd.
3.	Nadkarni S.V. 2005.	<i>"Modern Arc Welding Technology"</i> , 1 <sup>st</sup> edition, Oxford IBH Publishers,
4.	Christopher De	avis. "Laser Welding- Practical Guide". Jaico Publishing House, 1994.
5.	Davis A.C., " Cambridge,199	<b>The Science and Practice of Welding</b> ", Cambridge University Press, 93

17MPE012		,	THEORY OF METAL CUTTING	L	Т	P	С	
				3	0	0	3	
OBJE	CTIVI	ES:						
•	To ma	ke 1	the students to understand the concept and basic mechanics of	of met	al cu	ttin	g.	
•	To uno	ders	tand the nomenclature of standard machine tools.					
•	To uno	ders	stand the various thermal aspects of cutting fluids.					
•	To ana	To analyse the cutting tool materials, tool life and tool wear.						
•	To des	To design the cutting tools.						
UNIT	UNIT I ORTHOGONAL CUTTING			9				
Introdu breaker Mercha model -	ction - N s - Expr nt Upper Stress a	/Iac essi r bc nd	hining fundamentals – Metal Cutting - Chip formation - ty ion for Shear plane angle - Cutting force and velocity relat bund solution - Lee and Shaffer Lower bound solution - Oxl Strain in the chip - Energy consideration in machining.	pes of ionshi ey's th	f chi ip - I nin sl	ps - Ern: heai	Chip st and zone	
UNIT	II	OF	BLIQUE CUTTING				9	
Direction angles -	on of Ch Cutting	ip f rat	low - Normal, Velocity and Effective Rake angles - Relation in oblique cutting - Shear angle and Velocity relationship	onship o - Sta	betv bler'	veei s ru	1 rake le.	
UNIT	III	TH	IERMAL ASPECTS AND CUTTING FLUIDS				10	
Heat dia tool ten Selectio	stribution operature on of Cut	ns i e - ( tting	n machining - Experimental determination and Analytical ca Cutting fluids - Effects of cutting fluid - Functions - Requir g Fluids.	alculat ement	tion ( ts - T	of c Type	utting es and	
UNIT	IV	CUTTING TOOL MATERIALS, TOOL LIFE AND TOOL WEAR					9	
Essentia - Machi	al require nability	eme - E	ents of tool materials – development of tool materials - Tool conomics of metal machining - Theory of Chatter.	l wear	and	То	ol life	
UNIT	V	DE	ESIGN OF CUTTING TOOLS				8	
Nomen Milling	clature c cutters.	of S	ingle point and Multi point cutting tools - Design of Turn	ing to	ol, I	Drill	ls and	
			TOTAL : 4	15 PE	ERI	OD	S	
OUTO	COME	S:	On completion of this course, students will be able to					
1.	Applyi	ng t	he orthogonal metal cutting theory in engineering.					
2.	Evaluat	ing	the oblique metal cutting theory in engineering.					
3.	Learn H	Iea	t distributions in machining and cutting fluids.					
4.	Unders	tand	d the essential requirements of tool material and its life.					
5.	Design	the	cutting tools for metal removal process.					

TEXT	BOOKS:		
1.	Bhattacharyya Calcutta, 1984	A., "Metal Cutting Theory and Practice", Central Book Publishers,	
2.	Juneja B L., Sekhon G. S., <b>"Fundamentals of Metal Cutting and Machine Tools"</b> , Ne Age International (P) Limited, 1995		
3.	Shaw M C., "N	Metal Cutting Principles", Oxford Press, 1984.	
REFE	RENCES:		
1.	David A. Steph 2006	nenson, John S. Agapio, "Metal Cutting Theory and Practice", CRC Press,	
2.	Armarego E.J.	A., Brown R.H., "The Machining of Metals", Prentice Hall Inc., 1969.	
3.	Geoffrey Booth Marcel Dekkor	hroyd, Knight W.A., " <b>Fundamentals of Machining and Machine Tools</b> ", ; New York, 1989	
4.	Rodin P., "Des	sign and Production of Cutting Tools'', MIR Publishers, 1968	
5.	P C Sharma, " Delhi 2008.	A Textbook of Production Engineering", S. Chand & Company Ltd. New	

17MPE013			PROFESSIONAL ETHICS IN ENGINEERING	L	T	Р	C
				3	0	0	3
OBJE	CTIV	ES:	:				
•	To en	able	e the students to create an awareness on Engineering ethics an	nd hu	man	valu	es.
•	Toins	ill 1	moral, social values and loyalty.				
٠	To get	t the	e knowledge about safety, responsibility and rights.				
٠	To un	ders	stand Engineering as a social experimentation.				
٠	To an	alys	se various global issues.				
UNIT	Ι	H	UMAN VALUES				10
Morals, others – –Comm andmed	Values Living itment itation f	anc pea – E for p	d Ethics – Integrity – Work ethic – Service learning – Civic acefully – Caring – Sharing – Honesty – Courage – Valuing Empathy – Self-confidence – Character – Spirituality – In professional excellence and stress management.	virtue time trodu	e – Re – Co ction	oper to	ct for ation Yoga
UNIT	II	EN	NGINEERING ETHICS				9
	utonom					М	
Moral a of profe Ethical ' UNIT	Theorie	y – role s. <b>EN</b>	- Kohlberg's theory – Gilligan's theory – Consensus and Co es - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATION	ontrovo l Relig ON	ersy - gion -	– Wi – Us	es of
Moral a of profe Ethical ' <b>UNIT</b> Enginee Balance	Theorie III ering as	y – role s. <b>EN</b> Exj ok (	- Kohlberg's theory – Gilligan's theory – Consensus and Co es - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATION perimentation – Engineers as responsible Experimenters – O on Law.	ontrovo l Relig ON Codes	gion -	- Us	9 9 9 rs –A
Moral a of profe Ethical ' UNIT Enginee Balance UNIT	Theorie III ering as ed Outlo	y – role s. EN Exj ok o	- Kohlberg's theory – Gilligan's theory – Consensus and Co es - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATIO perimentation – Engineers as responsible Experimenters – O on Law. AFETY, RESPONSIBILITIES AND RIGHTS	ontrovo l Relig ON Codes	gion -	- Us	9 9 9 9 9 9
Moral a of profe Ethical ' UNIT Enginee Balance UNIT Safety a Respect Occupat – Discri	Theorie Theori	y - role s. $EN$ $Exy$ ok ( $SA$ $x - uth$ imme n.	<ul> <li>Kohlberg's theory – Gilligan's theory – Consensus and Coes - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATIOn perimentation – Engineers as responsible Experimenters – Gon Law.</li> <li>AFETY, RESPONSIBILITIES AND RIGHTS</li> <li>Assessment of Safety and Risk – Risk Benefit Analysis at pority – Collective Bargaining – Confidentiality – Conf</li></ul>	ontrovo l Relig ON Codes nd Re flicts operty	ersy gion - s of I educin of I y Rig	Ethic	9 9 8 4 9 4 5 8 7 9 4 5 8 8 7 9 1 7 8 9 1 7 8 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 7 9 1 9 1
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Moral a of profe Ethical ' UNIT Enginee Balance UNIT Safety a Respect Occupat – Discri UNIT Multina Enginee Moral L	Theorie The	y = -role s. $EN$ Exp ok of SA $c = -role$ uther innee innee Corppliana iip - S:	<ul> <li>Kohlberg's theory – Gilligan's theory – Consensus and Coes - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATION of the perimentation – Engineers as responsible Experimenters – Con Law.</li> <li>AFETY, RESPONSIBILITIES AND RIGHTS</li> <li>Assessment of Safety and Risk – Risk Benefit Analysis at a pority – Collective Bargaining – Confidentiality – Confidentiali</li></ul>	ontrovo l Relig ON Codes nd Re flicts operty ons D sses at 45 P	ersy - gion - s of H educin of I y Rig evelo nd A ERI	- Us - Us Ethic Ethic ng R ntere hts ( oppme dvis OD	9 3 3 3 3 3 3 3 3
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Moral a of profe Ethical ' UNIT Enginee Balance UNIT Safety a Respect Occupat – Discri UNIT Multina Enginee Moral L 1. 2.	III Theorie III Theorie III Theorie III Theorie and Risk of Outlo IV and Risk of A tional Cr minatio V tional C ers as M ceadersh COME Apply Realize	y = -role s. EN Exj ok o SA SA C Corp Inne	<ul> <li>Kohlberg's theory – Gilligan's theory – Consensus and Coes - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATION (Section 1) and the perimentation – Engineers as responsible Experimenters – Con Law.</li> <li>AFETY, RESPONSIBILITIES AND RIGHTS         <ul> <li>Assessment of Safety and Risk – Risk Benefit Analysis and tority – Collective Bargaining – Confidentiality – Con</li></ul></li></ul>	ontrovo l Relig ON Codes nd Re flicts operty ons D sses at 45 P	ersy gion - s of H educin of I y Rig evelo nd A ERI	- Us - Us Ethic mg R ntere hts ( dvis TOD	9 9 s -A 9 Cisk - est - (IPR) 8 ent - ors - S
Moral a of profe Ethical ' UNIT Enginee Balance UNIT Safety a Respect Occupat – Discri UNIT Multina Enginee Moral L 1. 2. 3.	III Theorie III Theorie III Theorie III Theorie and Risl of A tional Cr minatio V tional C ers as M ceadersh COME Apply Realize Analys	y = -role s. EN Exj ok o SA SA C = -uth ime n. GI Corp Iana iip = S: ethi ing	- Kohlberg's theory – Gilligan's theory – Consensus and Co es - Theories about right action – Self-interest – Customs and NGINEERING AS SOCIAL EXPERIMENTATION of Law. AFETY, RESPONSIBILITIES AND RIGHTS Assessment of Safety and Risk – Risk Benefit Analysis an ority – Collective Bargaining – Confidentiality – Confi e – Professional Rights – Employee Rights – Intellectual Pr LOBAL ISSUES porations – Environmental Ethics – Computer Ethics – Weap agers – Consulting Engineers – Engineers as Expert Witnes –Code of Conduct – Corporate Social Responsibility TOTAL : On completion of this course, students will be able to ics in society and discuss the ethical issues related to engineer e responsibilities and rights in thesociety. g the responsibilities to the society as an Engineer.	ontrovo l Relig ON Codes nd Re flicts operty ons D sses at 45 P. ering.	ersy - gion - s of H educin of I y Rig evelo nd A ERI	- Us	9 9 s -A 9 Cisk - est - (IPR) 8 ent - ors - S

5.	Study the multi	national corporations and ethics of an engineer.			
TEXT	BOOKS:				
1.	Mike W. Martin and Roland Schinzinger, "Ethics in Engineering", Tata McGraw Hil New Delhi,2003.				
2.	Govindarajan M of India,New D	M, Natarajan S, Senthil Kumar V. S, <b>"Engineering Ethics"</b> , Prentice Hall Delhi, 2004.			
3.	R. Subramania	n, "Professional Ethics", OUP India, 2013.			
REFE	<b>RENCES:</b>				
1.	Charles B. Fla 2004.	eddermann, <b>"Engineering Ethics",</b> Pearson Prentice Hall, New Jersey,			
2.	Charles E. Ha Conceptsand C	rris, Michael S. Pritchard and Michael J. Rabins, <b>"Engineering Ethics –</b> C <b>ases",</b> Cengage Learning, 2009			
3.	John R Boatrig 2003	ht, "Ethics and the Conduct of Business", Pearson Education, New Delhi,			
4.	Edmund G Sea Engineers", O.	ebauer and Robert L Barry, <b>"Fundametals of Ethics for Scientists and</b> xford University Press, Oxford, 2001			
5.	Laura P. Hartn	nan and Joe Desjardins, <b>"Business Ethics: Decision Making for Personal</b>			
	<i>Integrity and S</i> 2013.	Social Responsibility" Mc Graw Hill education, India Pvt. Ltd., New Delhi			

17MPE014ADDITIVE MANUFACTURINGLTP						С
			3	0	0	3
OBJE	CTIVI	S:				
•	To ma limitat	ke the students to know the principle methods, areas of usage to a swell as environmental effects of the Additive Manufacture	ge, pos ring to	ssibi echn	lities olog	s and gies.
•	To fan Manuf	iliarise the characteristics of the different materials those are us acturing.	ed in	Add	itive	
•	• To familiarize with Liquid based and Solid based additive manufacturing technologie					es.
•	• To expose to other additive manufacturing technologies like 3Dprinter, ballistic part method, Shape deposition modelling, Reverse engineering.					
•	To far techno	niliarize with the post processing and tooling methods of addi logies.	itive r	nanu	fact	uring
UNIT	UNIT I INTRODUCTION			-	10	
Overvie develop	ew – H oment-M	story – Need-Classification -Additive Manufacturing Tech aterials for Additive Manufacturing Technology – Tooling - Ap	nolog plicati	y in ions.	pro	oduct
UNIT	II	CAD & REVERSE ENGINEERING				10
Manufa Model MIMIC	Slicing Slicing S,MAG	Fechnology: CAD model preparation – Part Orientation and su –Tool path Generation – Softwares for Additive Manufact CS. LIOUID BASED AND SOLID BASED ADDITIVE	upport turing	gen Tec	erati chno	ion – logy: 10
		MANUFACTURING SYSTEMS				
Classifi advanta Process	cation – iges and ,Advant	Liquid based system – Stereo-lithography Apparatus (SLA)- applications - Solid based system –Fused Deposition Moc ages and Applications, Laminated Object Manufacturing.	Princ delling	g - ]	pro Princ	cess, ciple,
UNIT	IV	V POWDER BASED ADDITIVE MANUFACTURING SYSTEMS				
Selectiv Printing Electron	ve Laser g - Princ n Beam	Sintering – Principles of SLS process - Process, advantages and ple, process, advantages and applications- Laser Engineered Nullelting.	nd app letSha	olica ping	tions (LE	3, 3D ENS),
UNIT	V	MEDICAL AND BIO-ADDITIVE MANUFACTUR	RING	ſ		5
Custom Compu	ized im terAided	plants and prosthesis: Design and production - Bio-Additi Tissue Engineering (CATE) – Case studies.	ve M	anuf	factu	ring-
		TOTAL : 4	45 PI	ERI	OD	S
OUTO	COME	<b>S:</b> On completion of this course, students will be able to				
1.	Compa technol	re different methods and discuss the effects of the Addit ogies.	ive N	/Ianu	fact	uring
2.	Learn t	ne applications of CAD in tool path generation.				
3.	Gain kı	owledge about liquid and solid based additive manufacturing sy	ystems	5.		

4.	Analysing about powder based additive manufacturing systems.				
5.	Understand the medical and bio additive manufacturing systems.				
ТЕХТ	BOOKS:				
1.	Chua C.K., applications",	Leong K.F., and Lim C.S., <b>"Rapid prototyping: Principles and</b> 3 <sup>rd</sup> Edition, World Scientific Publishers, 2010.			
2.	Gebhardt A., "	Rapid prototyping", Hanser Gardener Publications, 2003.			
3.	Steinar Westh	rin Kill "Additive Manufacturing: Design, Methods, and Processes",			
	Pan Stanford P	ublishing Pte. Ltd.2017.			
REFE	<b>RENCES:</b>				
1.	Liou L.W. and forprototype de	<i>Liou F.W., "Rapid Prototyping and Engineering applications: A tool box evelopment", CRC Press, 2007.</i>			
2.	Kamrani A.K. d	and Nasr E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.			
3.	Hilton P.D. Applications",	and Jacobs P.F., <b>"Rapid Tooling: Technologies and Industrial</b> CRCpress, 2000.			
4.	Ian Gibson, I <b>Printing, Rapi</b>	David Rosen, Brent Stuck <b>, "Additive Manufacturing Technologies: 3D</b> d <b>Prototyping, and Direct Digital Manufacturing",</b> Springer, 2015.			
5.	Amit Bandyopa	udhyay, Susmita Bose, "Additive Manufacturing", CRC Press, 2015.			

17MP	E015	ENTREPRENEURSHIP DEVELOPMENT	L	Т	Р	С	
			3	0	0	3	
OBJE	CTIVE	S:					
•	• To develop and strengthen entrepreneurial quality and motivation in students.						
٠	To impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.						
٠	To und	erstand the various business world.					
•	To acq	aire the knowledge of finance and accounting.					
•	To und	erstand the growth Strategies in smallindustry.					
UNIT	I I	ENTREPRENEURSHIP			9	9	
Entrepr Entrepr	eneur – eneurship	Types of Entrepreneurs – Difference between Entrepreneuro in Economic Growth, Factors Affecting Entrepreneurial Grow	r and vth.	ent	repre	eneur	
UNIT	II I	MOTIVATION				9	
Major Busines Develop	motives s game omentPro	influencing an Entrepreneur – Achievement motivation tr s, Thematic apperception Test – Stress Management grams – Need, Objectives.	raining , Ent	g, Se repre	elf-ra eneu	ıting, rship	
UNIT	III I	BUSINESS				9	
Small I Formula opportu of Preli Needsa	Enterprise ation – S nity, Mar minary I nd Agenc	es – Definition, Classification – Characteristics, Ownership S teps involved in setting up a Business – identifying, selectir eket Survey and Research, Techno-economic Feasibility Asses Project Reports – Project Appraisal – Sources of Information eies.	Structu Ig a G sment – Cla	ures lood – Pr assifi	– Pr Bus repar	oject iness ation on of	
UNIT	IV ]	FINANCING AND ACCOUNTING				9	
Need – ofworki Sales T	Sources ing Capit ax, GST.	of Finance, Term Loans, Capital Structure, Financial Institutio al, Costing, Break Even Analysis, and Taxation – Income	n, and Fax, E	Ma Excis	nage e Di	ment 1ty –	
UNIT	V S	SUPPORT TO ENTREPRENEURS				9	
Sicknes - Busin smallin	s in smal ess Incul dustry – 1	l Business – Concept, Magnitude, Causes and Consequences, Coators – Government Policy for Small Scale Enterprises – Coexpansion, Diversification, Joint Venture, Merger and Sub Cor	Correct Frowth	tive Strang.	Mea ategi	sures es in	
		TOTAL :	<b>45 P</b>	ERI	[OD	S	
OUTO	COMES	: On completion of this course, students will be able to					
1.	Gain kn	owledge and skills needed torun a business successfully.					
2.	Applyin	g motivation concept in all types of business.					
3.	Analysi	ng the business strategies.					
4.	Know th	ne cost analysis and various taxation systems.					
5.	Learn th	e government policies for small enterprises.					

TEXT	BOOKS:					
1.	Khanka. S.S., <b>"Entrepreneurial Development"</b> S.Chand & Co. Ltd., Ram Nagar, New Delhi,2013.					
2.	Donald F Kuratko, <b>"Entreprenuership – Theory, Process and Practice"</b> , 9 <sup>th</sup> Edition, CengageLearning, 2014.					
3.	S. Anil Kumar, "Entrepreneurship Development", New Age International Pvt Ltd.2003.					
REFE	<b>RENCES:</b>					
1.	Hisrich R D, P	eters M P, "Entrepreneurship" 8th Edition, Tata McGraw-Hill, 2013.				
2.	Mathew J Man 2 <sup>nd</sup> Edition Dree	nimala, <b>"Enterprenuership theory at cross roads: paradigms and praxis",</b> am tech, 2005.				
З.	Rajeev Roy, " <b>E</b>	Entrepreneurship", 2nd Edition, Oxford University Press, 2011.				
4.	<b>"Faulty and</b> <b>Publishers:En</b> 1986.	<i>External Experts – A Hand Book for New Entrepreneurs</i> <i>trepreneurship Development</i> ",2 <sup>nd</sup> Edition, Institute of India, Ahmadabad,				
5.	Ramachandran company Ltd. N	n <b>, "Enterpreneurship Development",</b> Tata McGraw-Hill Publishing New Delhi, 2009				

17MPI	E016		NON DESTRUCTIVE TESTING AND MATERIALS	L T P C		С	
				3	0	0	3
OBJE	CTIV	ES:	•				
•	• To study and understand the various Non-Destructive Evaluation and Testing methods.						
•	To lea	arn t	the theory and industrial applications of NDT.				
•	To un	ders	stand the concepts of thermography and eddy current testing.				
•	To ob	otain	the knowledge onultrasonic testing and acoustic emission.				
•	To ex	plor	re the principles of radiography.				
UNIT	I	0	VERVIEW OF NDT			,	7
Non-De of manu Various andaided	structiv ifacturi physica lvisual	ve T ng ul c insp	esting Versus Mechanical testing, Overview of NDT Metho defects as well as material characterisation. Relative men- characteristics of materials and their applications in pection.	ods for rits an NDT	r the id lin	dete nitat Una	ction tions, aided
UNIT	II	SU	JRFACE NDE METHODS				8
advantag Magneti Interpret Residua	ges and c Parti tational l magne	d li cle nd o etisr	mitations of various methods, Testing Procedure, Interp Testing- Theory of magnetism, inspection materials Mag evaluation of test indications, Principles and methods on n.	retation netisation of der	on o tion nagn	f re met etiza	sults. hods, ation,
UNIT	III	TH	HERMOGRAPHY AND EDDY CURRENT TES	TIN	G		10
Thermo liquid Instrume Properti arranger	graphy- crystals entatior es of e nent,Aj	- Pri s, A ns a eddy pplio	inciples, Contact and non-contact inspection methods, Tech Advantages and limitation - infrared radiation and nd methods, applications. Eddy Current Testing-Generatio v currents, Eddy current sensing elements, Probes, Instrum cations, advantages, Limitations, Interpretation/Evaluation.	nique infrar n of o nentat	s for ed eddy ion,	app detec curr Typ	lying ctors, rents, es of
UNIT	IV	UI	<b>LTRASONIC TESTING AND ACOUSTIC EMI</b>	SSIO	N		10
Ultrasor angle b Ultrasou Applicat	Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A-Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique –Principle, AE parameters, Applications.						
UNIT	ΓV RADIOGRAPHY			10			
Principle filters a density, Radiogr Tomogr	e, intera nd scre spec aphicec aphy.	actio eens ed, quiv	on of X-ray with matter, imaging, film and film less technique, geometric factors, Inverse square law, characteristics of contrast, characteristic curves, Penetrameters, alence. Fluoroscopy- Xero-Radiography, Computed Radio	ies, ty films Expo ograph	pes a 5 - g sure 1y, C	nd u raini cl Comj	ise of ness, narts, puted
			TOTAL :	45 PI	ERI	OD	S
OUTC	OME	S:	On completion of this course, students will be able to				

1.	Understand need of non-destructive testing methods.				
2.	Evaluating the liquid penetrant and magnetic particle testing				
3.	Learn the principles and operations of thermography and eddy current testing				
4.	Analysing the ultrasonic testing and acoustic emission.				
5.	Applying the principle and operation of radiography.				
ТЕХТ	BOOKS:				
1.	Baldev Raj, T. Jayakumar, M. Thavasimuthu, " <b>Practical Non-Destructive Testing</b> ", Narosa Publishing House, 2009.				
2.	Ravi Prakash, <b>"Non-Destructive Testing Techniques"</b> , 1st revised edition, New Age International Publishers, 2010				
3.	Jayamangal Prasad, C. G. Krishnadas Nair, <b>"Non-Destructive Test And Evaluation Of</b> Materials", Tata McGraw-Hill Publishing Company Ltd. 2008.				
REFE	RENCES:				
1.	ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.				
2.	Paul E Mix, "Introduction to Non-destructive testing: a training guide", Wiley, $2^{nd}$ Edition NewJersey, 2005.				
3.	Charles, J. Hellier, "Handbook of Nondestructive evaluation", McGraw Hill, New York 2001.				
4.	Barry Hull, Vernon John "Non-Destructive Testing", Springer, 1988.				
5.	Amandeep Singh Wadhwa, Er. Harvinder Singh <b>"A Textbook of Engineering Material</b> and Metallurgy", Laxmi Publications, 1 <sup>st</sup> edition 2015.				

<b>17MP</b>	E017	ENGINEERING TRIBOLOGY	L	Т	Р	С		
			3	0	0	3		
OBJE	CTIV	E <b>S:</b>						
•	To study the principles of lubrication, friction and wear and their measurement.							
●	To identify the friction and wear in materials.							
●	To stu	dy various types of lubricants and its properties.						
•	To un	derstand performance characteristics of fluid film bearings.						
•	To lea	rn the tribo measurement in instrumentation.						
UNIT	Ι	INTRODUCTION			-	10		
Introduce equation Infinite	ction – ns – en y long,	Navier Stoke's equations – derivation of Reynolds equation from the regulation – mechanisms of pressure development – Idealize short journal bearing and gas lubrication bearings.	om N edjou	lavie rnal 1	r St bear	oke's ing –		
UNIT	II	LUBRICATION PRINCIPLES				8		
Lubrica hydrody	nts and namic	their physical properties – Lubrication Regimes – Elasto, I ubrication – hydrostatic lubrication – gas lubrication	Plasto	anc	lMag	gneto		
UNIT	III	SURFACE TOPOGRAPHY, FRICTION AND WE	AR			9		
contact, Stick-sl fatigue Measur	Theori ip, Rol and in ement c	es of friction, Friction of metal and non-metals, Temperature of ing friction, wear of metals, Adhesive, Abrasive and corros spact wear, Wear of elastomers, wear of ceramicsand configuration and wear.	of slid live v mpos	ding vear, ite 1	surf erc mate	aces, osion, orials,		
UNIT	IV	FLUID FILM BEARINGS				10		
Perform Idealize bearing	ance ch d hydro – Anal	aracteristics – Numerical solutions – Hydrodynamic instability dynamic bearings – Plane slider bearings – Thrust bearing an- vsis of externally pressurized bearings.	– Bea d Mu	aring Iti re	des des	ign – 5 pad		
UNIT	V	TRIBO MEASUREMENT IN INSTRUMENTATIO	DN			8		
Surface Laser m Bearing	topogr ethod - vibrati	phy measurements – Electron microscope and friction and we Instrumentation – International standards – Bearingperformant on measurement.	ar me ce me	easur easur	reme reme	nts – nts –		
		TOTAL: 4	45 PI	ERI	OD	S		
OUTO	COME	S: On completion of this course, students will be able to						
1.	Applying the principle of tribology to design bearings.							
2.	Evaluating the different lubrication principles.							
3.	Analys	ing the types of friction and wear.						
4.	Under	tand the various types of bearings and operations.						
5.	Learn	bout different tribo measurement techniques.						

TEXT	BOOKS:					
1.	Cameron. A., "Basic lubrication theory", Ellis Herward Ltd, UK, 1981.					
2.	Sushil Kumar Srivastava, "Tribology in Industries", S. Chand & Company Ltd, NewDelhi, 2004.					
3.	Gwidon Stachowiak, Andrew W Batchelor, "Engineering Tribology",4 <sup>th</sup> Editio Elsevier Inc. 2014.					
REFE	<b>RENCES:</b>					
1.	Williams. J.A.,	"Engineering Tribology", Oxford University Press, 1994				
2.	Moore. D.F., "	Principle And Application Of Tribology", Pergamon Press, New York				
З.	Prasanta Saho	o" <b>Engineering Tribology",</b> PHI Learning Pvt. Ltd., New Delhi, 2011.				
4.	John Williams,	"Engineering Tribology", Cambridge University Press, 2008.				
5.	Shizhu Wen, Pi	ing Huang <b>"Principles of Tribology",</b> Wiley, 2011.				

17MP	17MPE018		ADVANCED INTERNAL COMBUSTION ENGINES	L	Τ	Р	С	
				3	0	0	3	
ORIE	OBJECTIVES:							
•	To make the students to understand the underlying principles of operation of different IC Engines and components.							
•	To un	der	stand the working of engine auxiliary systems.					
•	To an	alys	se the combustion aspects of SI Engines.					
•	To un	der	stand the combustion aspects of CI Engines.					
•	To pr	ovic	le knowledge on pollutant formation, control, alternate fuel	etc.				
UNIT	Ι	SF	PARK IGNITION ENGINES				9	
Mixture Stages Combu	e requir of coml stioncha	eme oust amb	ents – Fuel injection systems – Mono point, Multipoint & ion – Normal and Abnormal combustion – Knock - Factor ers.	& Dire rs affe	ect in cting	nject g kno	ion - ock –	
UNIT	II	C	OMPRESSION IGNITION ENGINES				9	
Diesel Directar structur	Fuel In nd Indi e andsp	jecti rect ray	ion Systems - Stages of combustion – Knocking – Factor injection systems – Combustion chambers – Fuel Spray penetration – Air motion - Introduction to Turbocharging.	s affe behav	cting viour	kno - \$	ock – Spray	
UNIT	III	PC	OLLUTANT FORMATION AND CONTROL				9	
Pollutan Nitroge Selectiv Catalyti Driving	nt – S n,Smok ve ic Redu cycles.	ouro e ar	ces – Formation of Carbon Monoxide, Unburnt hydro nd Particulate matter – Methods of controlling Emissions – o on and Particulate Traps – Methods of measurement – E	ocarbo Cataly Emissio	n, C tic co on no	onve onve	es of erters,	
UNIT	IV	A	LTERNATIVE FUELS				9	
Alcoho Propert	l, Hydr ies,Suita	oge abili	n, Compressed Natural Gas, Liquefied Petroleum Gas ity, Merits and Demerits - Engine Modifications.	and	Bio	Die	sel -	
UNIT	V	RI	ECENT TRENDS				9	
Air ass Geomet NOx A	Air assisted Combustion, Homogeneous Charge Compression Ignition Engines – Variable Geometry turbochargers – Common Rail Direct Injection Systems - Hybrid Electric Vehicles – NOx Adsorbers -Onboard Diagnostics.							
			ΤΟΤΑΙ	.: 45	S PE	RI	ODS	
OUTO	COME	S:	On completion of this course, students will be able to					
1.	Analys	sing	the combustion characteristics of SI engine.					
2.	Evalua	ting	g the combustion characteristics of CI engine.					
3.	Under	stan	d the sources of pollutants and methods of controlling emiss	ions.				
4.	Learn	the	different alternative fuels.					
5.	Applying the latest technologies of engine system.							

TEXT	BOOKS:					
1.	Ganesan, "Inte	ernal Combustion Engines",2 <sup>nd</sup> Edition, TMH, 2002.				
2.	Ramalingam. Publications, 2	K.K., "Internal Combustion Engine Fundamentals", Scitech 002				
3.	S. S. Thipse, "Internal Combustion Engines", Jaico Publishing House, 2010.					
REFE	<b>RENCES:</b>					
1.	Mathur. R.B. a 2007.	and R.P. Sharma, "Internal Combustion Engines", Dhanpat Rai & Sons				
2.	Duffy Smith, "2	Auto Fuel Systems", The Good Heart Willcox Company, Inc., 1987.				
3.	Eric Chowenitz	z, "Automobile Electronics", SAE Publications, 1995				
4.	H. N. Gupta, Learning Pvt. I	<b>"Fundamentals of Internal Combustion Engines",</b> 2 <sup>nd</sup> Edition, PHI Ltd. Delhi, 2013.				
5.	Shyam K. Agra	wal "Internal Combustion Engines", newagepublishers, 2006.				

	E019	TOTAL QUALITY MANAGEMENT	L	Т	Р	C
			3	0	0	3
OBJE	CTIVE	S:				
٠	To facil	litate the understanding of quality management principles and p	proce	ss.		
•	To und	erstand needs of various TQM principles.				
•	To acquire knowledge on TQM tools and techniques.					
•	To imp	lement and assure Quality in Management.				
•	То асqu	uire knowledge about various quality standards				
UNIT	I I	NTRODUCTION			9	9
Introduct product Deming orientati	ction - N and server, Juran a ion, Custer	eed for quality - Evolution of quality - Definitions of quality vice quality - Basic concepts of TQM - TQM Framework nd Crosby - Barriers to TQM - Quality statements - Custome omersatisfaction, Customer complaints, and Customer retention	ty - 1 - Co er foc n - Co	Dime ontrib us - ( osts o	nsio utio Cust f qu	ns of ns of omer ality.
UNIT	II 1	<b>FQM PRINCIPLES</b>				9
Empow	erment, '	Team and Teamwork, Quality circles Recognition and Re	ward,	Per	form	ance
Empowe appraisa Partneri <b>UNIT</b>	erment, ' al- Contin ng,Suppl	Team and Teamwork, Quality circles Recognition and Renuous process improvement - PDCA cycle, 5S, Kaizen - Sujier selection, Supplier Rating.	ward,	Per part	form mers	hip ·
Empowe appraisa Partneri <b>UNIT</b> The sev Methode Reason	erment, ' al- Contin ng,Suppl III 7 ven tradiology, aj to bench	Team and Teamwork, Quality circles Recognition and Re- nuous process improvement - PDCA cycle, 5S, Kaizen - Suj ier selection, Supplier Rating. <b>TQM TOOLS AND TECHNIQUES I</b> itional tools of quality - New management tools - Six pplications to manufacturing, service sector including IT - mark,Bench marking process - FMEA - Stages, Types.	ward, pplien sigr Ben	na: (		hip - <b>9</b> septsing -
Empowe appraisa Partneri UNIT The sev Methode Reason UNIT	erment, ' al- Contin ng,Suppl III 7 ven trad ology, aj to bench IV 7	Team and Teamwork, Quality circles Recognition and Re- nuous process improvement - PDCA cycle, 5S, Kaizen - Suj ier selection, Supplier Rating. <b>TQM TOOLS AND TECHNIQUES I</b> itional tools of quality - New management tools - Six pplications to manufacturing, service sector including IT - mark,Bench marking process - FMEA - Stages, Types. <b>TQM TOOLS AND TECHNIQUES II</b>	ward, pplier sigr Ben	na: (		9 9 cepts ing -
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Empower appraisa Partneri UNIT The sev Methode Reason UNIT Control (QFD) measure UNIT Need fo -QS 90 inmanuf OUTC 1. 2. 3. 4.	erment, ' al- Contin ng,Suppl III 7 ven tradiology, aj to bench IV 7 Charts - -Taguchi es. V 0 or ISO 900 00 - IS facturing COMES Understa Learn th Analysin Evaluati	Team and Teamwork, Quality coulens - Employee involve Team and Teamwork, Quality circles Recognition and Re- nuous process improvement - PDCA cycle, 5S, Kaizen - Su- ier selection, Supplier Rating. <b>FQM TOOLS AND TECHNIQUES I</b> itional tools of quality - New management tools - Six pplications to manufacturing, service sector including IT - mark,Bench marking process - FMEA - Stages, Types. <b>FQM TOOLS AND TECHNIQUES II</b> • Process Capability - Concepts of Six Sigma - Quality Fun quality loss function - TPM - Concepts, improvement ne <b>QUALITY SYSTEMS</b> 00 - ISO 9001-2008 Quality System - Elements, Documentatio O 14000 - Concepts, Requirements and Benefits - TQ and service sectors. <b>TOTAL :</b> 4 <b>:</b> On completion of this course, students will be able to and the various philosophies of TQM. e various types TQM principles. ng the quality of seven tools and types of FMEA. ng about control chart, TPM and QFD.	sigr sigr Ben ection eds on, Qu M In 45 P	Per part na: ( ch n Dev Per ality npler ERI	form ners Conc nark: elop form Auc ment	9 septs ing 9 men nance 9 liting ation

TEXT	BOOKS:					
1.	Dale H. Besterfiled, Et At., <b>"Total Quality Management",</b> Third Edition, Pearso Education Asia, Indian Reprint, 2006.					
2.	Poornima M. Charantimath, <b>"Total Quality Management"</b> , 2 <sup>nd</sup> Edition, Pearson Publications, 2003					
3.	L. Suganthi, A New Delhi, 202	nand A. Samuel, <b>"Total Quality Management",</b> PHI Learning Pvt. Ltd. 11.				
REFE	<b>RENCES:</b>					
1.	James R. Evan 8 <sup>th</sup> Edition, Firs	as and William M. Lindsay, <b>"The Management and Control of Quality",</b> Indian Edition, Cengage Learning, 2012.				
2.	Suganthi.L and	Anand Samuel, "Total Quality Management", Prentice Hall. Ltd.,2006.				
3.	Janakiraman. Prentice Hall(I	B and Gopal .R.K., "Total Quality Management - Text and Cases", India) Pvt. Ltd., 2006.				
4.	R. S. Naagaraz	an, <b>"Total Quality Management",</b> New Age International, 2005.				
5.	Jens J. Dahlga Management",	aard, Ghopal K. Khanji, Kai Kristensen <b>"Fundamentals of Total Quality</b> , Taylor and Francis, 2002.				

17MPE020

## NANO MATERIALS AND TECHNOLOGY

С L Т Ρ 0 0 3

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### **OBJECTIVES:**

<ul> <li>To study the applications of Nano material</li> <li>To understand the techniques used in Nano</li> </ul>	) sensors.			
• To study the applications of Nano material				
	To study the applications of Nano materials.			
• To acquire the principles of characterisation	To acquire the principles of characterisation techniques.			
• To understand the different types of Nano	To understand the different types of Nano materials.			
• To make the students learn about basis of the students learn about basis learn about basis of the students	To make the students learn about basis of nano material science and preparation methods			

Nano-scale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nano-structured materials - Nano-particles- quantum dots, nano wires-ultra-thin films multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study(qualitative only).

#### **GENERAL METHODS OF PREPARATION** UNIT II

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Bottom-up: Synthesis, Top-down Approach: Co-Precipitation, Ultra-sonication, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

### **UNIT III** NANOMATERIALS

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Nano forms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arcgrowth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications-Nano metaloxides-ZnO, TiO2,MgO, ZrO2, NiO, Nano alumina, CaO, AgTiO2, Ferrites, Nano clays functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

#### **UNIT IV CHARACTERIZATION TECHNIQUES**

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, TransmissionElectron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nano-indentation.

### UNIT V **APPLICATIONS**

Nano InfoTech: Information storage- Nano computer, molecular switch, super chip, Nano crystal,

Nano-biotechnology: Nano probes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bio-imaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, Nano crystalline silver for bacterial inhibition, Nano р

particles for sun barrier products - In Photostat, printing, solar cell, battery.					
			TOTAL : 45 PERIODS		
OUTO	COMES:	On completion of this course, students will be	e able to		
•	Familiarize about the science of nano materials.				

2.	Demonstrate the various preparation methods of nanomaterials.		
3.	Learn about different nano-functional materials.		
4.	Explore various nano materials characterization techniques.		
5.	Applying the application of MEMS and NEMS		
ТЕХТ	BOOKS:		
1.	Edelstein. A.S. and R.C. Cammearata, "Nanomaterials: Synthesis, Properties and		
	Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.		
2.	John Dinardo. N, <b>"Nanoscale characterisation of surfaces &amp; Interfaces"</b> , 2nd edition, WeinheimCambridge, Wiley-VCH, 2000		
3.	Timp .G, "Nanotechnology", AIP press/Springer, 1999.		
REFE	CRENCES:		
1.	Chris Binns, Introduction to Nanoscience and Nanotechnology, John Wiley & Sons Inc. Publications, 2010.		
2.	Akhlesh Lakhtakia (Editor), <b>"The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations".</b> Prentice-Hall of India (P) Ltd, New Delhi, 2007.		
3.	Chattopadhyay, Chattopadhyay K. K., Banerjee A. N, "Introduction To Nanoscience And Nanotechnology", PHI Learning Private limited, New Delhi, 2009.		
4.	Narendra Kumar, Sunita Kumbhat " <b>Essentials in Nanoscience and Nanotechnology"</b> John Wiley & Sons. 2016.		
5.	Dinesh C.Agrawal, "Introduction to Nanoscience and Nanomaterials", World Scientific, 2013.		

17MPE021		MICRO ELECTRO MECHANICAL SYSTEMS	L	T	Р	C
			3	0	0	3
OBJE	CTIVE	S:				
•	• To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.				EMS	
•	• To educate on the rudiments of Micro fabrication techniques.					
•	• To introduce various sensors and actuators.					
•	• To introduce different materials used for MEMS.					
•	• To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical Engineering.					
UNIT	UNIT I INTRODUCTION 9			9		
Intrinsic Introduc Electrica –Flexura	Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis –Flexural beam bending- Torsional deflection.					
UNIT	II S	SENSORS AND ACTUATORS-I				9
Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermocouples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micro magnetic components – Case studies of MEMS in magnetic actuators-Actuationusing Shape Memory Alloys						
UNIT	UNIT III SENSORS AND ACTUATORS-II 9		9			
Piezo-resistive sensors – Piezo-resistive sensor materials - Stress analysis of mechanical elements –Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia, Acoustic, Tactile and Flowsensors.						
UNIT		MICROMACHINING				9
Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching –Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies -Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS –Foundry process.						
UNIT	V	POLYMER AND OPTICAL MEMS			T	9
Polymer Parylene MEMS	Polymers in MEMS– Polimide - SU8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene –Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS –Lenses and Mirrors – Actuators for Active Optical MEMS.					
		TOTAL :	45 P	ERI	OD	S
OUTC	OMES	: On completion of this course, students will be able to				
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1.	Learn the basic concepts of micro electro mechanical systems.		
2.	Understand working principles of sensors and actuators.		
3.	Analyzing working principles of sensors, actuators and its applications.		
4.	Applying the concepts of surface micro machining methods.		
5.	Evaluating the applications of polymers in MEMS.		
ТЕХТ	BOOKS:		
1.	Chang Liu, "F	oundations of MEMS", Pearson Education Inc., 2006.	
2.	Stephen D Senturia, "Microsystem Design", Springer Publication, 2000		
3.	Tai Ran Hsu, <b>"MEMS &amp; Micro systems Design and Manufacture"</b> , Tata McGraw Hill, NewDelhi, 2002.		
REFE	RENCES:		
1.	Nadim Maluf, House, 2000.	"An Introduction to Micro Electro Mechanical System Design", Artech	
2.	Mohamed Gad	-el-Hak, editor, "The MEMS Handbook", CRC press Baco Raton, 2000	
3.	Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS andSmart Devices", John Wiley & Son Ltd. ,2002		
4.	Ki Bang Lee "	Principles of Microelectromechanical Systems", John Wiley & Sons, 2010	
5.	Sergey Edward Lyshevski, Nano- and Micro-Electromechanical Systems: Fundamentals of Nano- and Micro engineering", 2nd Edition, CRC Press, 2005.		
**17MPE022** 

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### **OBJECTIVES:**

UNIT I FACTORIES ACT – 1948								
• To identify the various types of hazards in workplace and causes of biological hazards in various Industries.								
•	To develop the human behaviour in industries and recommend the ergonomic suggestions in the workplace.							
•	To explain the work permits systems and safety report investigation implemented in an industry							
•	To contrast the representation of various safety theories and principles followed in real time industries							
•	To acquaint with the idea of Safety Rules followed in Industries and recognize the safety legislation, OHS, safety management and Human factors Issues.							

UNIT I

### **FACTORIES ACT – 1948**

Statutory authorities – inspecting staff, health, safety, provisions relating to hazardous processes, welfare, working hours, employment of young persons - special provisions - penalties and procedures-Tamilnadu Factories Rules 1950 under Safety and health chapters of Factories Act 1948

### UNIT II

### **ENVIRONMENT ACT – 1986**

General powers of the central government, prevention, control and abatement of environmental pollution-Biomedical waste (Management and handling Rules, 1989-The noise pollution (Regulation and control) Rules, 2000-The Batteries (Management and Handling Rules) 2001- No Objection certificate from statutory authorities like pollution control board. Air Act 1981 and Water Act 1974: Central and state boards for the prevention and control of air pollution-powers and functions of boards - prevention and control of air pollution and water pollution - fund accounts and audit, penalties and procedures.

#### UNIT III MANUFACTURE, STORAGE AND IMPORT OF **HAZARDOUS CHEMICAL RULES 1989**

Definitions - duties of authorities - responsibilities of occupier - notification of major accidents information to be furnished - preparation of offsite and onsite plans - list of hazardous and toxic chemicals - safety reports - safety data sheets

#### UNIT IV **OTHER ACTS AND RULES**

Indian Boiler Act 1923, static and mobile pressure vessel rules (SMPV), motor vehicle rules, mines act 1952, workman compensation act, rules - electricity act and rules - hazardous wastes (management and handling) rules, 1989, with amendments in 2000- the building and other construction workers act 1996., Petroleum rules, Gas cylinder rules-Explosives Act 1983-Pesticides Act

#### UNIT V **INTERNATIONAL ACTS AND STANDARDS**

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Occupational Safety and Health act of USA (The Williames - Steiger Act of 1970) - Health and safety work act (HASAWA 1974, UK) - OSHAS 18000 - ISO 14000 - American National Standards Institute (ANSI)

**TOTAL : 45 PERIODS** 

OUTO	COMES:	On completion of this course, students will be able to		
1.	List out important legislations related to health, Safety and Environment.			
2.	Creating re	equirements mentioned in factories act for the prevention of accidents.		
3.	Analyzing	the health and welfare provisions given in factories act.		
4.	Evaluating	the statutory requirements for an Industry on registration and license		
5.	Learn the	various international acts and standards.		
ТЕХТ	BOOKS	:		
1.	The Facto	ries Act 1948, Madras Book Agency, Chennai, 2000		
2.	The Envir	conment Act (Protection) 1986, Commercial Law Publishers, Delhi, 1986.		
3.	L. M. Deshmukh, Industrial Safety Management, Tata McGraw Hill, NewDelhi, 2005.			
REFE	REFERENCES:			
1.	1. <b>The manufacture, storage and import of hazardous chemical rules 1989</b> , Madras Book Agency,			
2.	The India	n boilers act 1923, Commercial Law Publishers (India) Pvt.Ltd., Allahabad		
3.	S. N. Dhyani, International Labour Organisation and India: In Pursuit of Social Justice, National, 1977.			
4.	The Mines Act 1952, Commercial Law Publishers (India) Pvt.Ltd., Allahabad.			
5.	Water (Pr pollution)	evention and control of pollution) act 1974, Air (Prevention and control of act 1981, Commercial Law Publishers (India) Pvt.Ltd., New Delhi.		

17MPE023 EN		EN	ERGY AUDITING AND MANAGEMENT	L	Τ	Р	C	
				3	0	0	3	
OBJE	CTIVES	5:						
•	To enable the students to understand the basic concepts of Energy Engineering and Management							
•	To carry	out er	nergy accounting and balancing.					
•	To cond	uct en	ergy audit and suggest methodologies for energy saving	gs.				
•	To utilis	e the	available resources in optimal ways.					
•	To unde	rstand	and analyse the energy data of industries.					
UNIT	T T	NTR	ODUCTION			9	8	
Energy Environ Types,N	- Power mental Iethodolo	- Par aspect gy and	st & Present scenario of World; National Energy c ts associated with energy utilization –Energy d Barriers. Role of Energy Managers. Instruments for er	onsum Aud hergy a	nption liting audit	n Da : N ing.	ita – Jeed,	
UNIT		LEC	TRICAL SYSTEMS	~	~		12	
Composite Capacite Compute LED Li	ors, Pow ation, En-	er Fa ergy E l scop	e ofEnergy conservation(encon.) in Illumination.	Mot of ligh	or E ting,	Effici Effici	ency cacy,	
UNIT	III T	'HEF	RMAL SYSTEMS				12	
Stoichic enconm SteamU	ometry, B easures. tilization,	Steam Steam Insula	, Furnaces and Thermic Fluid Heaters – Efficienc a: Distribution & Usage: Steam Traps, Condensat ators & Refractories.	y con e Red	nputa covei	ry,	and Flash	
UNIT	IV E	NER	<b>RGY CONSERVATION IN MAJOR UTILIT</b>	IES			8	
Pumps, Cooling	Fans, Blo Towers -	owers, - D.G.	Compressed Air Systems, Refrigeration and Air Consets.	ditioni	ing S	yste	ms –	
UNIT	V E	NER	RGY ECONOMICS				5	
Energy LifeCyc	Economic le Costing	cs – D g –ES	Discount Rate, Payback Period, Internal Rate of Return, CO concept.	, Net I	Prese	nt V	alue,	
			TOTAL	.: 45	5 PE	RI	DDS	
OUTC	COMES	On	completion of this course, students will be able to					
1.	Applying	g the e	nergy utilization at national and international levels.		_	_	_	
2.	Analyzin	g vari	ous energy conservation techniques in electrical system	s.				
3.	Learn va	rious e	energy conservation techniques in Thermal systems.					
4.	Creating various energy conservation techniques in major utilities.							
5.	Understand the economics of energy.							
TEXT	BOOK	S:						
1.	Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com, A website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministryof Power, Government of India, 2004.							
2.	Y. P. A Manager	Abbi, ment,	Shashank Jain, <b>Handbook on Energy Audit</b> The Energy and Resources Institute , New Delhi, 2006	and	Envi	iron	ment	
3.	Paul W.	O'Call	aghan, Energy Management, McGraw-Hill Book Con	npany,	1993	3		

REFE	<b>CRENCES:</b>						
1.	Witte. L.C., Utilisation", H	P.S. Schmidt, Iemisphere Publ	D.R. Brown, l, Washington, I	<b>"Industrial</b> 988	Energy	Management	and
2.	Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.						
З.	Dryden. I.G.C.,	, "The Efficien	t Use of Energy	, <b>"</b> ,Butterworth	s, London	e, 1982	
4.	Turner. W.C.,	"Energy Manag	gement Hand b	ook", Wiley, N	ew York,	1982.	
5.	Murphy. W.R. d	and G. Mc KAY	, "Energy Man	<b>agement"</b> , But	tterworths	, London 1987.	

17MPF024	
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### **OBJECTIVES:**

UNIT I		VEHICLE STRUCTURE AND ENGINES	9					
٠	• To familiarize about the wheels, tyres, and braking system.							
٠	To introduce students about the transmission system.							
٠	To broaden the understanding of automotive architecture and performance.							
٠	To ur	To understand assembling and dismantling of engine parts and transmission system.						
٠	To ur	To understand the construction and working principle of various parts of an automobile.						

Types of automobiles, vehicle construction and different layouts, chassis, frame and body, Vehicle aerodynamics (various resistances and moments involved), IC engines –components functions and materials, variable valve timing (VVT).

## UNIT II ENGINE AUXILIARY SYSTEMS

Electronically controlled gasoline injection system for SI engines, Electronically controlled diesel injection system (Unit injector system, Rotary distributor type and common rail direct injection system), Electronic ignition system (Transistorized coil ignition system, capacitive discharge ignition system), Turbo chargers (WGT, VGT), Engine emission control by threeway catalytic converter system, Emission norms (Euro and BS).

## UNIT III

## **TRANSMISSION SYSTEMS**

Clutch-types and construction, gear boxes- manual and automatic, gear shift mechanisms, Over drive, transfer box, fluid flywheel, torque converter, propeller shaft, slip joints, universal joints, Differentialand rear axle, Hotchkiss Drive and Torque Tube Drive.

## UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS

Steering geometry and types of steering gear box-Power Steering, Types of Front Axle, Types of Suspension Systems, Pneumatic and Hydraulic Braking Systems, Antilock Braking System(ABS), electronic brake force distribution (EBD) and Traction Control.

## UNIT V ALTERNATIVE ENERGY SOURCES

Use of Natural Gas, Liquefied Petroleum Gas, Bio-diesel, Bio-ethanol, Gasohol and Hydrogen in Automobiles- Engine modifications required –Performance, Combustion and Emission Characteristics of SI and CI engines with these alternate fuels - Electric and Hybrid Vehicles, Fuel Cell Note: Practical Training in dismantling and assembling of Engine parts and Transmission Systemsshould be given to the students.

			IUIAL: 45 PERIODS	
<b>OUTCOMES:</b>		On completion of this course, students will b	be able to	
1.	Identify the different components invehicle structures and engines.			
2.	Evaluating the various engine auxiliary systems.			
3.	Understand components of transmission systems.			
4.	4. Learn the functions of steering, suspension and braking systems.			

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5.	Analysing performance, combustion and emission characteristics of alternative fuels.			
TEXT	TEXT BOOKS:			
1.	Kirpal Singh, "Automobile Engineering", Vol. 1 & 2, Seventh Edition, Standard Publishers, NewDelhi, 1997.			
2.	Jain K.K. and Asthana .R.B, "Automobile Engineering" Tata McGraw Hill Publishers, NewDelhi, 2002.			
3.	Ramalingam, K. K, "Automobile Engineering", Scitech Publications, 2014.			
REFE	REFERENCES:			
1.	Newton, Steeds	and Garet, "Motor Vehicles", Butterworth Publishers, 1989.		
2.	Joseph Heitner	; "Automotive Mechanics", Second Edition, East-West Press, 1999.		
3.	Martin W, Stockel and Martin T Stockle, "Automotive Mechanics Fundamentals", The Goodheart –Will Cox Company Inc, USA, 1978.			
4.	Heinz Heisler, "Advanced Engine Technology", SAE International Publications USA, 1998			
5.	Ganesan V. "In	nternal Combustion Engines", Third Edition, Tata McGraw-Hill, 2007.		

**17MPE025** 

## **COMPOSITE AND SMART MATERIALS**

3

### **OBJECTIVES:**

•	To understand the fundamentals of composite material strength and its mechanical behaviour.				
•	To learn the combinations of plies with different orientations of the fibre.				
•	To understand the thermo-mechanical behaviour and study of residual stresses in Laminates during processing.				
•	To analyse the characteristics of fibre-reinforced plastics.				
•	• To understand the various manufacturing process of composite materials, stress analysis of composite beams, plates and shells.				

#### UNIT I **INTRODUCTION, LAMINA CONSTITUTIVE EOUATIONS & MANUFACTURING**

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Definition -Need - General Characteristics, Applications. Fibers - Glass, Carbon, Ceramic and Aramid fibers. Matrices – Polymer, Graphite, Ceramic and Metal Matrices – Characteristics of fibers and matrices. Lamina Constitutive Equations: Lamina Assumptions - Macroscopic Viewpoint. Generalized Hooke's Law. Reduction to Homogeneous Orthotropic Lamina - Isotropic limit case, Orthotropic Stiffness matrix, Typical Commercial material properties, Rule of Mixtures. Generally Orthotropic Lamina -Transformation Matrix, Transformed Stiffness. Manufacturing: Bag MouldingCompression Moulding – Pultrusion – Filament Winding – Other Manufacturing Processes

#### UNIT II FLAT PLATE LAMINATE CONSTITUTE EQUATIONS

Definition of stress and Moment Resultants. Strain Displacement relations. Basic Assumptions of Laminated anisotropic plates. Laminate Constitutive Equations - Coupling Interactions, Balanced Laminates, Symmetric Laminates, Angle Ply Laminates, Cross Ply Laminates. Laminate Structural Lamina Evaluation Properties Moduli. of from Laminate Tests. **Ouasi-Isotropic** Laminates. Determination of Lamina stresses within Laminates.

#### UNIT III LAMINA STRENGTH ANALYSIS

Introduction - Maximum Stress and Strain Criteria. Von-Mises Yield criterion for Isotropic Materials. Generalized Hill's Criterion for Anisotropic materials. Tsai-Hill's Failure Criterion for Composites. Tensor Polynomial (Tsai-Wu) Failure criterion. Prediction of laminate Failure

#### UNIT IV **INTRODUCTION TO SMART MATERIALS**

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Principles of Piezoelectricty, Perovskyte Piezoceramic Materials, Single Crystals vs Polycrystalline Systems, Piezoelectric Polymers, Principles of Magnetostriction, Rare earth Magnetostrictive materials, Giant Magnetostriction and Magneto-resistance Effect, Introduction to Electro-active Materials, Electronic Materials, Electro-active Polymers, Ionic Polymer Matrix Composite (IPMC), Shape Memory Effect, Shape Memory Alloys, Shape Memory Polymers, Electro-rheological Fluids, Magneto Rhelological Fluids.

#### UNIT V **SMART ACTUATORS**

Modelling Piezoelectric Actuators- Internal and External Amplifications, Magnetostrictive Actuation, Joule Effect, Wiedemann Effect, Magnetostrictive Mini Actuators, IPMC and Polymeric Actuators, Shape Memory Actuators, Active Vibration Control, Active Shape Control, Passive Vibration Control, Hybrid Vibration Control.

				TOTAL : 45 PERIODS	
OUTO	<b>OUTCOMES:</b> On completion of this course, students will be able to				
1.	Analysing	the f	iber reinforced Laminatefor optimum desig	'n	
2.	Applying c	lass	ical laminate theory to study and analyses the	ne residual stresses in Laminate.	
3.	To gain kno	owle	edge about lamina strength and failure criter	rion.	
4.	Understand	l the	basics of smart materials.		
5.	Explore dif	ffere	nt smart actuators and composites.		
ТЕХТ	BOOKS:				
1.	Gibson, RF, "Principles of Composite Material Mechanics", 2 <sup>nd</sup> Ed., McGraw-Hill, 1994				
2.	Hyer, M. W., "Stress Analysis of Fiber – Reinforced Composite Materials", McGraw Hill, 1998				
3.	Mel Schwartz, Smart Materials, CRC Press, 2009				
REFE	REFERENCES:				
1.	Issac M. D. University P	Danie Press	el and Ori Ishai, <b>"Engineering Mechanics</b> -2006, First Indian Edition – 2007.	of Composite Materials", Oxford	
2.	Mallick, P.K., Fiber, "Reinforced Composites: Materials, Manufacturing and Design", ManeelDekker Inc, 1993.				
3.	Halpin, J.C., "Primer on Composite Materials, Analysis", Technomic Publishing Co., 1984.				
4.	Autar K. Ka	w "I	Aechanics of Composite Materials" CRC Pres.	s – 1997.	
5.	M.V. Gandh	i, B.	D. Thompson, "Smart Materials and Structure	rs", Chapman and Hall, 1992	

				3	0	0	3	
OBJE	CTIV	ES:			<u>.                                    </u>			
•	To gi and p	ve an appreciation of the fundamental principles, design neumatic machines, components and systems.	and op	eratio	on of	hydr	aulic	
٠	To un	derstand the basics of fluid power systems.						
•	To de	sign fluid power circuits for given application.						
٠	To lea	arn the maintenance and troubleshooting of fluid power sy	ystems.					
٠	To stu	ady the applications in recent automation revolution.						
UNIT	[	FLUID POWER PRINCIPLES AND FUNDE	IMEN	TAL	S		3	
Introduc Propertie Torque.I	Introduction to Fluid power- Advantages and Applications- Fluid power systems – Types of fluids- Properties of fluids Basics of Hydraulics – Pascal's Law- Principles of flow – Work, Power and Torque.Properties of air– Perfect Gas Laws.							
UNIT	II	HYDRAULIC SYSTEM AND COMPONENT	ГS				13	
Design, Variable Hydrauli valves- Reservoi Symbol.	Advan displ ic mot Types, irs, Ac	tages, Disadvantages, Performance, Selection criterion of acement pumps, Hydraulic Actuators: Cylinders – ors Control Components: Direction control, Flow con Construction and Operation- Applications – Types o ccumulators, Intensifiers, Pressure Switches- Application	Linear Types ntrol an of actu ions- F	, Rota and d Pre ation. Fluid	ry- H con essure Acc Pow	Fixed struc e co cesso er A	d and ction, ontrol ories: ANSI	
UNIT	III	HYDRAULIC CIRCUITS					9	
Industria Air-over Hydrosta systems.	al hydr -oil, atictrar	aulic circuits- Regenerative, Pump Unloading, Double-p Sequence, Reciprocation, Synchronization, Fail asmission, Accumulators, Electro hydraulic circuits, Me	oump, H l-safe, echanic	Pressu Spe al Hy	re In ed drau	itens כסו lic ו	sifier, ntrol, servo	
UNIT	IV	PNEUMATIC SYSTEM					8	
Compres valves,P	ssors- neuma	Filter, Regulator, Lubricator, Muffler, Air control tic actuators, Servo systems. Introduction to Fluidics, Pne	Valve cumatic	s, Qu logic	uick circu	Exl 1its.	haust	
UNIT	V	DESIGN OF HYDRALIC AND PNEMATIC	CIRC	CUIT	'S		12	
Design of circuits using the components of hydraulic system for Drilling, Planning, Shaping, Punching, Press. – Selection, fault finding and maintenance of hydraulic components- Sequential circuit design for simple application using cascade method, Electro pneumatic circuits. Selection criteria of pneumatic components – Installation fault finding and maintenance of pneumatic components. Microprocessor and PLC- Applications in Hydraulic and Pneumatics- Low cost Automation – Hydraulicand Pneumatic power packs.								
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HYDRAULIC AND PNEUMATIC

CONTROLS

17MPE026

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OUTO	COMES:	On completion of this course, students will be able to			
1.	1. Understanding the basics of fluid power systems and gas laws				
2.	Identify hy	ydraulic systems and its components.			
3.	Applying t	the various hydraulic circuits.			
4.	Learn vari	ous pneumatic systems and its components.			
5.	Design hyd	draulic and pneumatic circuits.			
TEXT	BOOKS	5: C			
1.	Anthony E	Esposito, "Fluid Power with Applications", PHI / Pearson Education, 2005.			
2.	Srinivasan	n. R, <b>"Hydraulic and Pneumatic Control"</b> , 2 <sup>nd</sup> Ed., Tata McGraw - Hill, 2012.			
3.	. Ilango Sivaraman, <b>Introduction to Hydraulics and Pneumatics</b> , 3 <sup>rd</sup> Ed., PHI Learning Pvt. Ltd, New Delhi, 2017.				
REFE	REFERENCES:				
1.	Shanmuga	asundaram. K, "Hydraulic and Pneumatic controls", Chand & Co, 2006			
2.	Majumdar, S.R., "Oil Hydraulics Systems- Principles and Maintenance", Tata McGraw Hill, 2001				
3.	Majumdar, S.R., <b>"Pneumatic Systems – Principles and Maintenance"</b> , Tata McGraw Hill, 2007.				
4.	Micheal J,	, Pinches and Ashby, J.G., "Power Hydraulics", Prentice Hall, 1989.			
5.	Dudelyt, A	Pease and John J Pippenger, "Basic Fluid Power", Prentice Hall, 1987.			

17MPI	E <b>027</b>	MATERIAL CHARACTERIZATION	L	Т	Р	C
	3				0	3
OBJE	CTIVE	S:				
•	To prov	ide students with knowledge the basic understanding of n	naterial ch	aracte	eriza	tion.
•	To unde	erstand the concepts of metallographic techniques x-ray d	iffraction t	echni	iques	5
•	• To analysis of x-ray diffraction					
• To study the theory of electron microscopy						
•	To explore the chemical and advanced thermal analysis of different materials					
UNIT	I N	METALLOGRAPHIC TECHNIQUES				9
Macro working aperture and the contrast	examinat , metallo , resolvin ir remed polarize	ion – applications, Metallurgical microscope – prinographic specimen preparation, optic properties – Mag power, depth of focus, depth of field, different light s ial measures, various illumination techniques-bright field light illuminations, interference microscopy, high t	nciple, con Aagnificati ources len ield , dar cemperatur	nstruc on, 1 ses al k fie e mi	ction nume berra ld, j crose	and erica ations ohase copy

## UNIT II X-RAY DIFFRACTION TECHNIQUES

Crystallography basics, reciprocal lattice, X-ray generation, absorption edges, characteristic spectrum, Bragg's law, Diffraction methods – Laue, rotating crystal and powder methods. Stereographic projection. Intensity of diffracted beams – structure factor calculations and other factors. Cameras - Laue, Debye-Scherer cameras, Seeman – Bohlin focusing cameras. Diffractometer – General feature and optics, proportional, Scintillating and Geiger counters

## UNIT III ANALYSIS OF X-RAY DIFFRACTION

Line broadening, particle size, crystallite size, Precise parameter measurement, Phase identification, phase quantification, Phase diagram determination X-ray diffraction application in the determination of crystal structure, lattice parameter, residual stress – quantitative phase estimation, ASTM catalogue of Materials identification.

### UNIT IV

### **ELECTRON MICROSCOPY**

Construction and operation of Transmission electron microscope – Diffraction effects and image formation, specimen preparation techniques, Selected Area Electron Diffraction, electron-specimen interactions, Construction, modes of operation and application of Scanning electron microscope, Electron probe micro analysis, basics of Field ion microscopy (FIB), Scanning Tunneling Microscope (STM) and Atomic Force Microscope(AFM).

## UNIT V CHEMICAL AND ADVANCED THERMAL ANALYSIS

Surface chemical composition- Mass spectroscopy and X-ray emission spectroscopy (Principle and limitations) – Energy Dispersive Spectroscopy- Wave Dispersive Spectroscopy- Quadrapole mass spectrometer. Electron spectroscopy for chemical analysis (ESCA), Ultraviolet Photo Electron Spectroscopy (UPS), X ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES), Electron Energy Analysers, Secondary ion mass spectrometry – Applications. Unit meshes of five types of surface nets – diffraction from di-periodic structures using electron, Low Energy Electron Diffraction (LEED), Reflection High Energy Electron Diffraction (RHEED)-TGA.

**TOTAL : 45 PERIODS** 

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OUTO	COMES:	On completion of this course, students will be able to		
1.	Understand	d principles of various metallographic techniques.		
2.	Applying X-ray diffraction techniques.			
3.	Analysing	X-ray diffraction techniques.		
4.	Evaluating	the working principles of various electron microscopic techniques.		
5.	Creating th	ne principles of different chemical and advanced thermal analysis methods.		
ТЕХТ	BOOKS	:		
1.	Cullity, B. Inc., New	D., "Elements of X-ray diffraction", 3rd Edition, Addison-Wesley Company York, 2000.		
2.	Phillips V. A, <b>"Modern Metallographic Techniques and their Applications"</b> , Wiley Eastern India Ltd.1971.			
3.	Khangaonl Publishing	kar P. R. <b>"An Introduction to Material Characterization",</b> Penram INTL. (INDIA) Pvt. Ltd., First edition (2008)		
REFE	RENCES	:		
1.	Brandon I 1986.	D. G, "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA,		
2.	Thomas G.	, "Transmission electron microscopy of metals", John Wiley, 1996.		
3.	Weinberg, F., <b>"Tools and Techniques in Physical Metallurgy"</b> , Volume I & II, Marcel and Decker, 1970.			
4.	Haines, P.J., "Principles of Thermal Analysis and Calorimetry", Royal Society of Chemistry (RSC), Cambridge, 2002.			
5.	D. A. Skoc Fifth Editie	og, F. James Leary and T. A. Nieman, <b>"Principles of Instrumental Analysis"</b> , on, Saunders Publishing Co., 1998.		

**17MOE001** 

### **DISASTER MANAGEMENT AND MITIGATION**

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### **OBJECTIVES:**

- To study the various natural disasters •
- To study the various manmade disasters •
- To understand the disaster management principles. •
- To study the modern techniques used in disaster mitigation and management. •

#### **UNIT I INTRODUCTION TO DISASTER**

Meaning, Nature, Importance of Hazard, Risk, Vulnerability and Disaster-Dimensions & Scope of Disaster Management - India's Key Hazards - Vulnerabilities - National disaster management framework - Disaster Management Cycle.

#### UNIT II NATURAL DISASTER

Natural Disasters- Meaning and nature of natural disaster; their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozonedepletion.

#### UNIT III ANTHROPOGENIC DISASTER

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation and industrial waste water pollution.

#### UNIT IV APPROACHES IN DISASTER MANAGEMENT

Pre-disaster stage (preparedness) - Preparing hazard zonation maps, Predictability/ forecasting & warning - Preparing disaster preparedness plan -Land use zoning - Preparedness through Information, education. Emergency Stage - Rescue training for search & operation - Immediate relief - Assessment surveys. Post Disaster stage - Rehabilitation - Social Aspect - Economic Aspect and Environmental Aspect.

#### **DISASTER MITIGATION** UNIT V

Meteorological observatory - Seismological observatory - Hydrology Laboratory and Industrial Safety inspectorate. Technology in Disaster Management -Emergency Management Systems (EMS) in the Disaster Management Cycle -Remote Sensing and Geographic Information Systems (GIS) in Disaster Management.

#### **OUTCOMES:** On completion of this course, students will be able to Explain the basic concepts of disaster and hazards. 1. 2. Understand the various natural disasters. 3. Analyze the various manmade disasters. 4. Explore the disaster management principles. Compare the modern techniques used in disaster mitigation and management. 5.

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**TOTAL : 45 PERIODS** 

TEXT BOOKS:				
1.	Sharma. S. R, '	"Disaster management", A P H Publishers, 2011.		
2.	Gupta. H. K, "	Disaster Management", University Press, India, 2003.		
3.	D. B. N. Moo Publications, 2	rthy, <b>"Disaster Management: Text and Case studies"</b> , Deep and Deep 007.		
REFER	RENCES:			
1.	VenuGopalRao. K, "Geoinformatics for Disaster Management", Manglam Publish and Distributors, 2010.			
2.	Singh. R. B, "Natural Hazards and Disaster Management: Vulnerability a Mitigation", Rawat Publications, 2006.			
3.	Gupta. M. C, " Disaster Mana	Manuals on Natural Disaster management in India", National Centre for gement, IIPA, New Delhi, 2001.		
4.	Rajan Kumar Sahoo, TilotamaSenapati, "Management and Mitigation of Natura Disasters", Regal Publication, 2013.			
5.	Palanivel K. Publishers Pvt.	, Saravanavel J., Gunasekaran S., <b>"Disaster Management"</b> , Allied Ltd., 2015		

17MOE002		ENVIRONMENTAL MANAGEMENT	L	Т	Р	С
			3	0	0	3
OBJE	CTIVE					
• To understand the importance of nature and study about the water, air and soil pollution control as well as solid waste management.		lutic	m			
٠	To understand the importance of nature and study about the water pollution and control			ol.		
•	To und	erstand the importance of nature and study about the air pollutior	1.			
•	To und as solid	erstand the importance of nature and study about the soil pollution waste management.	on con	trol	as w	ell
•	ISO 1 pollution preven	4001 and skills for environmental performance in terms of on ion and continual improvement	legal	con	npli	ance,
UNIT	Ĩ	NATURE AND SCOPE OF ENVIRONM PROBLEMS	<b>MEN</b>	TA]		9
Enviro Global Kyoto	nment a warmin protocol	nd sustainable development – Natural and human environmen g –acid rain – ozone depletion – effects and control - climate ch – India's efforts for Environmental protection – Public policy an	ntal d ange o nd role	istur conv e of l	bano entio NGC	ces – ons – )'s
UNIT	<b>II</b>	WATER POLLUTION AND CONTROL				9
Fresh water and its pollution – Natural processes – sources and pollutants – pollution due industrial, agricultural and municipal wastes – effects on streams - limitations of disposal dilution – BOD consideration in streams – Oxygen Sag Curve – Strategies for sustainable wa management: Water management – Marine environment and its management – Water acts				ue to al by water		
UNIT	T III	AIR AND NOISE POLLUTION				9
Pollutant emissions - sources and sink – effects of air pollution on human health, vegetation and climate– Global effects – prevention and control of air pollution – Control of particulates – Air pollution survey sand sampling – Air quality monitoring - Air Act – Management of air pollution – Sound level – Effect of noise on people – Environmental noise control- noise pollution rules 2000.					1 and – Air ion – 000.	
UNIT	IV	SOLID WASTE MANAGEMENT AND SOIL POLLUTION				9
Sources – Characteristics – Quantities – Collection methods – Processing and disposal techniques – Onsite Handling, storage and processing – sanitary landfill – Incineration and pyrolysis – Composting – aerobic and anaerobic of compositing – Recycling and reuse of solid wastes – Hazardous wastes – Definition – Sources & types only – Integrated system for waste management – The Basel convention Land use and degradation – Management problems – strategies for sustainable land management – soil pollution –wetland conservation.						
UNIT	V	ENVIRONMENTAL MANAGEMENT SYSTEM				9
Termir (Series rules a	nology – b) – basi nd envir	installation and common motives of EMS – Environmental stan c principles – Environmental Audit – Environmental Impact a onmental protection– Practices For Waste Minimisation And Cle	idards assess aner F	– IS men Produ	50 1 t - 7 uctio	4000 Frade on.

### TOTAL: 45 PERIODS

OUT	COMES:	On completion of this course, students will be able to
1.	Explain the	e concept of sustainable development, climate change and roles of NGO's.
2.	Understan	the sources and management of Water pollution.
3.	Discuss the	e causes of Air and Noise pollution and various management techniques.
4.	Analyse so	lid waste and environmental protection legislations.
5.	Explore th	e various Environmental Standards.
ТЕХТ	BOOKS	
1.	N. K. Uber	roi, "Environmental Management", Excel Books, New Delhi(2006).
2.	Mallick A.	, "Environmental Science and Management", 1 <sup>st</sup> Edition, Viva Books, 2014.
3.	PrakashTa	lwar, "Environmental Management", Isha Books,2006.
REFE	RENCES	:
1.	S. Vigne. <b>Managem</b>	ahwaran, M. Sundaravadivel and D. S. Chaudhary, <b>"Environmental</b> ent", SCITECH Publications(India) Pvt. Ltd, Chennai & Hyderabad (2004).
2.	Mackenzie Edition, M	Davis, David Cornwell., "Introduction to Environmental Engineering", 4 <sup>th</sup> cGraw-Hill Companies Incorporated, 2008.
3.	Mary K. Theodore, Louis Theodore, "Introduction to Environmental Management", Edition, CRC Press, 2009.	
4.	P.S. Bhush	anaRao., <b>"Environment Management</b> ", Deep & Deep Publishers, 2007.
5.	T. V. Ram Delhi, 200	achandra, Vijay Kulkarni, <b>"Environmental Management",</b> TERI Press New 9.

<b>17MOE</b>	2003	COMPOSITE MATERIALS L	Т	Р	С
		3	0	0	3
OBJEC	TIVES	S:			
٠	To en	able the students understand the properties and design of composite a	mate	erial	s
•	To fai	miliarize the manufacturing methods for polymer matrix composites			
• To familiarize the students with the manufacturing methods for metal matrix composites					
•	To fai	miliarize the students with the manufacturing methods for ceramic mosites	atrix	X	
•	To un	nderstand practical requirements associated with joining and manufac	cturii	ng	
UNIT I		NTRODUCTION TO REINFORCEMENT AND MAT	RIX	X :	12
Reinforce Properties Matrix m	ement – s – App aterials	Fibres – Glass fibre, Aramid fibre, Carbon fibre, boron fibre – I plications – Comparison of fibres – Particulate and whisker rei – Properties. Wettability – Effect of surface roughness – Interfaci	Fabr infoi ial b	icati rcen ondi	ion - nents ing -
Methods f	for meas	suring bond strength.			8
Methods f	for meas	suring bond strength. POLYMER MATRIX COMPOSITES			8
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1.	Analyse the fiber reinforced Laminate for optimum design.					
2.	Explore the concepts of Polymer Matrix Composites.					
3.	Discuss different Metal Matrix Composites properties and manufacturing process.					
4.	Understand the different Ceramic Matrix Composites properties.					
5.	Apply Fatigue and creep theory to study and analyse the Mechanical behaviour of Composites.					
TEXT	BOOKS:					
1.	Krishnan K Chawla, "Composite Materials Science and Engineering", Springer, 2001.					
2.	Mathews F L and Rawlings R D, "Composite Materials: Engineering and Science", CRC Press and Woodhead Publishing Limited, 2002.					

## **REFERENCES:**

3.

1.	"Handbook of Composites" – American Society of Metals, 1990
2.	Gibson, R.F., " <b>Principles of Composite Material Mechanics</b> ", Second Edition, McGraw- Hill, CRC press in progress, 1994.
3.	Autar K. Kaw, "Mechanics of Composite Materials", Second Edition, CRC Press, 2006
4.	Halpin, J.C., "Primer on Composite Materials, Analysis", Technomic Publishing Co., 1984.
5.	Mallick, P.K. and Newman, S., "Composite Materials Technology: Processes and Properties", Hansen Publisher, Munish, 1990.

Derek Hull, "An introduction to Composite Materials", Cambridge Univ. Press, 1988.

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### **RENEWABLE ENERGY SOURCES AND TECHNOLOGY**

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## **OBJECTIVES:**

- To educate the students scientifically the new developments in renewable energy studies.
- To educate the concepts of various aspects of Solar energy and utilization
- To enable the students understand wind energy
- To understand the various aspects of Biomass energy and utilization
- To emphasize the significance of Green Energy Technologies.

# UNIT I INTRODUCTION

World energy status, Current energy scenario in India, Environmental aspects of energy utilization, Environment - Economy - Energy and Sustainable Development, Energy planning. Reserves of Energy resources, Renewable energy resources - potentials -achievements – applications. Technical and social implications, issuesi n grid integration of power from renewable energy sources, Comparison between different Renewable energy sources.

# UNIT II SOLAR ENERGY

Basic concepts, Solar radiation, Measurement, Solar thermal systems, Flat plate and concentrating collectors, Solar passive space, Solar heating and cooling techniques, Solar desalination, Solar dryers, Solar furnaces, Solar pumping, Solar greenhouse, Solar thermal electric power plant, Photo-voltaics, p-n junctions. Solar cells, PV systems, Standalone, Grid connected solar power satellite, Calculation of energy through photovoltaic power generation, Hybrid systems, Solar Engines: Stirling, Brayton engines.

## UNIT III WIND ENERGY

Energy available from wind, General formula, Lift and drag. Basis of Wind energy conversion, Effect of density, Frequency variances, Angle of attack, Wind speed, Windmill rotors, Horizontal axis and Vertical axis rotors, Determination of torque coefficient, Induction type generators, Working principle of wind power plant and Site selection.

## UNIT V BIOMASS ENERGY

Biomass – usable forms- composition- fuel properties – applications, Biomass resources, Biomass conversion technologies - direction combustion - pyrolysis –gasification -anaerobic digestion, Bioethanol and Biodiesel Production -Economics - Recent developments. Energy farming, Biogas technology – Domestic biogas plants, Community and institutional biogas plants – design consideration –applications.

UNIT V	OTHER RENEWABLE ENERGY SOURCES	9

Tidal energy – Wave energy – Open and closed OTEC Cycles – small hydro –Geothermal energy – Social and environmental aspects. Fuel cell technology -types, principle of operation – applications. Hydrogen energy production – Storage– transportation – utilization.

## **TOTAL : 45 PERIODS**

<b>OUTCOMES:</b> On		On completion of this course, students will be able to	
1.	Emphasis	he current energy status and role of renewable energy sources.	
2.	Explain th	concepts of various aspects of Solar energy and utilization.	
3.	Explore th	e various aspects of Wind energy and utilization.	
4.	Familiariz	with various aspects of Biomass energy and utilization.	
5.	Understan	various other renewable energy sources.	
ТЕХТ	BOOKS		
1.	Ashok Des	ai V, "Non-Conventional Energy", Wiley Eastern Ltd, 1990	
2.	Mittal K.M	, "Non-Conventional Energy Systems", Wheeler Publishing Co. Ltd, 1997.	•
3.	Ramesh R New Delhi	Kurnar K.U, <b>"Renewable Energy Technologies"</b> , Narosa Publishing Hous, 1997.	se,
REFE	RENCES	:	
1.	Freris, L.	, "Wind Energy Conversion systems", Prentice Hall, UK, 1990	
2.	Veziroglu.	T. N, "Alternative Energy Sources", Vol 5 and 6, McGraw-Hill, 1978.	
3.	S. P. Sukho	tme, <b>"Solar Energy"</b> , Tata McGraw Hill, New Delhi, 1997.	
4.	Kothari P, <b>Technolog</b>	K C Singal and RakeshRanjan, " <b>Renewable Energy Sources and Emergi</b> ies", PHI Pvt. Ltd.,New Delhi, 2008.	ng
5. G.D. Rai, "No		Non-Conventional Energy Sources", Khanna Publishers, New Delhi, 1999.	

17MOE005		INTELLECTUAL PROPERTY RIGHTS	L	Т	Р	C
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OBJE	CTIVES:					
٠	To enable	the students have an overall law of Property				
٠	To unders	tand details about of the impacts of IP on industry				
٠	To understand the protecting cumulative innovations					
٠	To unders	tand Litigation and Enforcement				
٠	To teach s	tudents about details current government policy about IPR				
UNI	UNIT I INTRODUCTION					9
Backg Failur Patent	round and es in Know s - Copyrig	Concepts - Brief History of - Institutions - Investing in ledge - IP, Public Sponsorship & Prize - IP Law Basics Mean hts - Trade Secrets - Others - IP and Antitrus Property.	Knov is of l	vledg P Pr	ge-M otec	larke tion
UNI	ГП Т	HE IMPACTS OF IP ON THE PLANT/SEED IN	DUS	TR	Y	9
The lo Plants Design Entry	ogic of IP - : A Puzzle n - Breadth Cost Regim	Patenting vs. Company Secrets - Plant Patent Timeline Em - Optimal Design of IP - Scarce Ideas vs .Non-scarce ideas - - Length - Required Inventive Steps - Optimal Size of Rew he Horizontal Competition Regime- Economic Effects of Exen	pirica Polic ard a ptior	n IEv y Le <sup>,</sup> nd S ns.	viden vers truct	ice in in II ture
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TEXT	BOOKS:			
1.	Christopher M Publishers. 200	May, Susan K. Sell, <b>"Intellectual Property Rights",</b> LynneRienner		
2.	N. K. Acharya,	"Text Book on Intellectual Property Rights" Asia Law House, 2010.		
3.	R Radhakrishr Cases", First E	han and S. Balasubramanian, <b>"Intellectual Property Rights: Text and</b> Edition, Excel books New Delhi, 2008		
REFE	<b>RENCES:</b>			
1.	Subbaram, N. R. "Handbook Of Indian Patent Law And Practice", S. Viswanathan Printers And Publishers Pvt. Ltd., 1998.			
2.	N.S. Gopalakrishnan & T.G. Agitha, "Principles Of Intellectual Property". 2 <sup>nd</sup> Edition, Eastern Book Company, 2014.			
З.	Tanya Frances Aplin, Jennifer Davis, "Intellectual Property Law: Text, Cases and Materials", 3 <sup>rd</sup> Edition, Oxford University Press, 2017.			
4.	NeerajPandey, KhushdeepDharni, "Intellectual Property Rights", PHI Learning, 2014.			
5.	Rachna Singh <b>Rights",</b> I. K. I	Puri, ArvindViswanathan, "Practical Approach to Intellectual Property International Publishing House Pvt. Ltd. Delhi 2009.		

<b>17MOE</b>	006

### ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING

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### **OBJECTIVES:**

- To make the students understand the basic concepts of managerial economics.
- To make the students understand the basics of demand, supply and related concepts.
- To make the students understand various production and cost concepts
- To make the students understand and apply the basic concepts of pricing.
- To make the students understand and apply the basic concepts of capital budgeting.

## UNIT I INTRODUCTION

Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis.

## UNIT II DEMAND & SUPPLY ANALYSIS

Demand - Types of demand - Determinants of demand - Demand function – Demand elasticity –Demand forecasting - Supply – Determinants of supply - Supply function -Supply elasticity.

## UNIT III PRODUCTION AND COST ANALYSIS

Production function - Returns to scale - Production optimization - Least cost input - Isoquants – Managerial uses of production function.

Cost Concepts- Cost function - Determinants of cost - Short run and Long run cost curves Cost Output Decision - Estimation of Cost.

## UNIT IV PRICING

Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice.

## UNIT V CAPITAL BUDGETING

Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

<b>OUTCOMES:</b> On completion of this course, students will be able to	JDS
1. Explain the basics of managerial economics and decisions.	
2. Analyse the concepts of demand and supply.	
3. Discuss various functions of production and cost analysis concepts.	
4. Understand various pricing techniques.	
5. Explore the concept of capital budgeting.	
TEXT BOOKS:	

1. R. Kesavan, C. Elanchezhian, T. Sunder selvin, "Engineering Economics And Financial

	Accounting", laxmi publications (p) Ltd. First edition, 2005.
2.	M. Kasi Reddy, S. Saraswathy, "Managerial Economics and Financial Accounting", Prentice Hall of India Private Limited, 2007.
3.	McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10th Edition, 2005.

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1.	Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson South Western, 4th Edition, 2001.
2.	Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4th edition, 2005.
3.	N. Samuelson. Paul A and Nordhaus W. D. , 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
4.	Paresh Shah, <b>'Basic Financial Accounting for Management'</b> , Oxford University Press, N ew Delhi, 2007.
5.	R. Panneerselvam, "Engineering Economics", PHI Learning PVT. Ltd. Delhi. 2013.

T/MOE007	INDUSTRIAL SAFETY ACTS AND STANDARDS	L	.1.	P	C
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OBJECTIV	ES:				
• To m	ake the students to understand basic concepts of factories act.				
• To un	derstand basic concepts of Environment act.				
• To stu	dy the various hazardous chemical rules				
• To stu	dy the various Indian Boiler , industry and Electricity act				
• To stu	dy the various international acts and standards				
UNIT I	FACTORIES ACT – 1948				9
Statutory author welfare, workin Tamilnadu Fact	rities – inspecting staff, health, safety, provisions relating t g hours, employment of young persons – special provisions – p ories Rules 1950 under Safety and health chapters of Factories A	to haz enalti Act 19	zardo es an 948	us p d pr	orocesses, ocedures-
UNIT II	ENVIRONMENT ACT – 1986				9
and control) R certificate from Central and stat – prevention an	ules, 2000-The Batteries (Management and handling Rules, 1989-The hold statutory authorities like pollution control board. Air Act 198 e boards for the prevention and control of air pollution-powers d control of air pollution and water pollution – fund – accounts	se pol s) 200 31 and and f and a	1utio 01- 1 1 Wa functi 1udit,	n (R No ( ter A lons pen	Objection Objection Act 1974: of boards alties and
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TEXT	BOOKS:		
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3.	L. M. Deshmul	kh, Industrial Safety Management, Tata McGraw Hill, NewDelhi, 2005.	
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2.	The Indian bo	ilers act 1923, Commercial Law Publishers (India) Pvt.Ltd., Allahabad	
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17MOE008		GLOBAL WARMING AND CLIMATE CHANGE	L	T	P	C
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OBJI	ECTIV	ES:				
٠	To mak	te the students to understand basic concepts of disaster and haz	ards if	India	•	
٠	To stud	ly the various natural disasters.				
٠	To study the various manmade disasters.					
٠	To understand the disaster management principles.					
٠	To study the modern techniques used in disaster mitigation and management.					
UNI	UNIT I EARTH'S CLIMATE SYSTEM				9	
Role o Effects – Carb	of ozone s of Gree oon Cycle	in environment-ozone layer-ozone depleting gases - Green H enhouse Gases - The Hydrological Cycle - Green House Gases e.	ouse Ef	fect, lobal	Rad War	iative ming
UNI	ГП	ATMOSPHERE AND ITS COMPONENTS				9
Impor	mportance of Atmosphere-Physical Chemical Characteristics of Atmosphere - Vertical stru of the atmosphere-Composition - Atmospheric stability-Temperature profile of the atmosph appearates – Temperature inversion-effects of inversion on pollution dispersion					
of the Lapse	atmosph rates –Te	nere-Composition - Atmospheric stability-Temperature profil emperature inversion-effects of inversion on pollution dispersi	e of the on.	e atm	ospr	nere ·
of the Lapse UNIT	atmosph rates – Te <b>F III</b>	nere-Composition - Atmospheric stability-Temperature profil emperature inversion-effects of inversion on pollution dispersion IMPACTS OF CLIMATE CHANGE	e of the on.	e atm	ospr	9
of the Lapse UNIT Causes level r Water Projec Chang	atmosph rates –Te <b>F III</b> s of Clim rise-Impa Resourc ted Impa ge – Risk	here-Composition - Atmospheric stability-Temperature profil emperature inversion-effects of inversion on pollution dispersion <b>IMPACTS OF CLIMATE CHANGE</b> hate change : Change of Temperature in the environment - Matter of Climate Change on various sectors –Agriculture, Fore es – Human Health –Industry, Settlement and Society – Metacts for Different Regions– Uncertainties in the Projected of Irreversible Changes.	e of the on. Ielting stry an hods au Impac	of ice of ice d Eco nd Sc cts of	e Pol osyst cenar f Cl	9 9 le-sea tem – rios – imate
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4.	Explore various observed climate changes and its causes.				
5.	Understand the concept of mitigation measures against global warming.				
ТЕХТ	TEXT BOOKS:				
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	Hydrological Regimes", Cambridge University Press, 2003.				
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