

Mohgaon, Wardha Road, Nagpur - 441 108 An Autonomous Institute



# DEPARTMENT OF MECHANICAL ENGINEERING

# **B.Tech.Mechanical Engineering**

# **Teaching Scheme**

Considering

National Education Policy 2020

From

Academic Year 2024-25

## Vision of Institute

"To emerge as a learning center of Excellence in the National Ethos in Domains of Science, Technology and Management"

## **Mission of Institute**

- M1: To strive for rearing standard and stature of the students by practicing high Standards of professional ethics, transparency and accountability.
- M2: To provide facilities and services to meet the challenges of Industry and Society.
- M3: To facilitate socially responsive research, innovation and entrepreneurship.

To ascertain holistic development of the students and staff members by

M4: Inculcating knowledge and profession as work practices.

# Vision of the Department

"To emerge as a premier centre in the field of Mechanical Engineering Education and produce competent Engineers".

# **Mission of the Department**

- To impart quality Technical Education through effective teaching-learning process.
- To provide a better environment to encourage innovation and entrepreneurship.
- To strengthen industry institute interaction to meet the challenges of industry and society.
- To ensure overall development of students and staff members by inculcating knowledge and professional ethics.

# **Programme Education Objectives (PEO)**

**PEO-1:** Demonstrate essential technical skills to identify analyze and solve problems and design issues in mechanical engineering.

**PEO-2**: Analyze the complex problems in the field of mechanical engineering by using modern tools.

**PEO-3**: Apply mechanical engineering concepts for the betterment of society and environment.

**PEO-4:** Develop professionals having administrative and managerial skills for mechanical engineering and allied industries.

**PEO-5**:Demonstrate the attributes of mechanical engineering in lifelong learning to Contribute towards societal needs.

# **Programme Outcomes(PO)**

- **1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **2. Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **4. Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **5.** Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and software tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- **6.** The engineer and society: Apply reasoning in formed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- **8.** Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **9. Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **10. Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **11. Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply the set one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **12. Lifelong learning:** Recognize the need for, and have the preparation and ability to engage inindependentandlifelonglearninginthebroadestcontextoftechnologicalchange.

# **Programme Specific Outcomes(PSO)**

**PSO1:** Apply the knowledge to work professionally and ethically in Thermal, Design, production and Manufacturing areas of Mechanical engineering.

**PSO2:** Analyze and design mechanical components and its processes to meet the societal needs.

**PSO3:** Apply Engineering and Management principles to work professionally in the industry or as an entrepreneur.



Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur441108 Accredited with NAACA+ Grade Approved by AICTE, New

Delhi, Govt. of Maharashtra

(An Autonomous Institution Affiliated to RTM Nagpur University)

#### Scheme of Instruction for First Year of

#### B.Tech.(UG)Programmeme Group-B Semester-IEE/ME/CE/AE/BT

Mandatory03- Weeks Induction Programme in the

#### First Semester for every student

	Sem	Туре	BoS/	Sub .Code		Subject		T/P	(	C nt	act H	urs	Credits	%	ightag	0	ESE
			Deptt	l			FIDSTSEMEST	ED(CDO)		SI	1	Hrs	1	CT/IA	CA	ESE	Duration Hours
1	1	BSC	5&H	BSH31101		Algebra and Co	PIRSTSEMIEST	EK(GKU	<b>ОГ-В</b> ) Л	2	0	6	4	30	10	6(	3
2	1	BSC	S&H	BSH31104	Che	mical Processing	Engineering	T	3	2	0	5	3	30	10	60	) 3
3	1	BSC	S&H	BSH31105	Che	emical Processing -Lab	Engineering	Р	0	0	2	2	1	25	-	25	5 -
4	1	ESC	CE/BT	BCE31101/B BT31101	/Fu	Engineering Me	chanics otechnology	Т	3	2	0	5	3	30	10	60	) 3
5	1	ESC	ME	BEE31101	,	Engineering Wo	orkshop	Р	0	0	2	2	1	25	-	25	5 -
6	1	BSC	S&H	BSH31X08	Intr	oduction to Indiar System	n Knowledge	Т	2	2	0	0	2	14	6	30	) 2
7	1	ESC	ME	BME31X01	Engine	ering and Comput	er Graphics La	b P	0	0	2	2	1	25	-	25	5 -
8	1	РСС	EE/ME /CE/AE /BT	BEE31101/B ME31102/BC E31102/BAE 31101/BBT3 1102	Elea /Comp E Comp	ctrical Wiring and uter Aided Design Engineers/CAD for onent/Biotechnolo	Installations n/CAD for Civi or Aircraft ogical Skill Lab	1 , P	0	0	4	4	2	25	-	25	5 -
9	1	VSEC	CS	BCS31102		Web Design	ning	Р	0	2	4	4	2	25	-	25	5 -
10	1	СС	S&H	BSH31X09		Business Communication				0	4	4	2	25	-	25	5 -
				TOTAL	FIRSTSEN	RST SEM				10	18	34	21				
		-	-				FER (GR	OUP-B	5)	ī	1	-				-	
1	2	BSC	S&H	BSH31201	Differential Equation and Statistics			Т	4	2	0	6	4	30	10	60	) 3
2	2	BSC	S&H	BSH31208	Quantum	Quantum Physics & Optics			3	2	0	5	3	30	10	60	3
3	2	BSC	S&H	BSH31209	Quantum Physics &Optics-Lab			Р	0	0	2	2	1	25	-	25	5 -
4	2	ESC	EE	BEE31202	Principles of Electrical Engineering			Т	3	2	0	5	3	30	10	60	3
5	2	ESC	EE	BEE31203	Principle Engineer	Principles of Electrical Engineering-Lab			0	0	2	2	1	25	-	25	5 -
6	2	ESC	IT	BIT31103	Program 'C'	ming for Problem	Solving using	Т	3	2	0	5	3	30	10	60	) 3
7	2	ESC	IT	BIT31104	Program 'C'-Lab	ming for Problem	Solving using	Р	0	0	2	2	1	25	-	25	5 -
8	2	VSEC	EE/ME /CE/AE /BT	BEE31204/B ME31201/BC E31201/BAE 31201/BBT3 1201	Power S Programm Lab/Bas Environm Lab	IM / CNC Machi ning/Building Main ics of Aircraft De mental Biotechno	ine and ntenance esign/ blogy	Р	0	0	4	4	2	25	-	25	5 -
9	2	AEC	S&H	BSH31X04	Commur Develop	nication for Person ment-Lab	nality	Р	0	1	4	5	2	25	-	25	
10	2	сс	S&H	BSH31X05	Integrated Developme	l Personality ent Course-I		Р	0	0	8	4	2	25	-	25	5 -
				TOTALSEC	ONDSEM				13	0	1	40	22				
L									10	9							
	Course Category		BSC/ESC (Basic Sor rse/Engi cience C	cience Cou neering S ourse.)	PCC Programme ore courses	Multi disciplinar course	VSEC (Skill Course)	AEC (AEC (AEC (AEC))	Social Ability cement rse)	Scio t	ence & IKS ( Know Syste	& Manaş Indian /ledge m)	gement	Experiential Learning Courses		ıg	CC(Co-Curricular Course s)
	Cred	SEM-I         08/05         02          02		2.54				02	2				02				
	Credi	ts SEM-II		08/08			02		02								02
	Cumu	llative Sum		16/13	02		04		02			02					04
	PROGRESSIVE TO		TAL CRI	<u>xDITS:21+22=43</u>	X	Rat	h	ht			A	Aug,20	23	1.00	)	Appli Onwa	cable for AY 2023-24 irds

Γ	Chairperson	Dean Academics	Vice -principal	Principal	Date of	Version
					Release	





Tulsiramji Gaikwad-Patil College of Engineering & Technology, Nagpur

(An Autonomous Institution Affiliated to RTM Nagpur University, Nagpur) SCHEME OF INSTRUCTION & SYLLABI



**Programme: B. Tech Mechanical Engineering (NBA Accredited)** 

Scheme of Instructions: Second Year B. Tech. in Mechanical Engineering (As Per NEP 2020)

Semester – III

SN	Som	Tuno	BoS/	Sub Code	6h	inat	т/р	Con	tact H	ours	Credits	% V	Veighta	ige	ESE	Total
SIN	Sem	Type	Dept	Sub Code	Sub	oject	1/P	L	Р	Hrs		CT/IA	CA	ESE	Duration	Marks
1	Ш	РСС	ME	BME32301	Manufacturin and Pr	Manufacturing Technology and Processes		3	-	3	3	30	10	60	3 Hrs	100
2	III	РСС	ME	BME32302	Material E	Material Engineering		3	-	3	3	30	10	60	3 Hrs	100
3	III	OEC	ME	BME32306	Basics of M Technology a	Basics of Manufacturing Technology and Processes		4	-	4	4	30	10	60	3 Hrs	100
4	III	HSSM	BA	BBA32304	Managerial	Managerial Economics T		2	-	2	2	14	6	30	2 Hrs	50
5	III	VEC	SH	BSH32308	Ethics in Engir	Ethics in Engineering Practice T		2	-	2	2	14	6	30	2 Hrs	50
6	III	MDM	ME	BSH32306	Engineering M	Engineering Mathematics-III		3	-	3	3	30	10	60	3 hrs	100
7	III	РСС	ME	BME32303	Manufacturin and Proc	Manufacturing Technology and Processes lab		-	2	2	1	-	25	25	2 Hrs	50
8	III	РСС	ME	BME32304	Material En	gineering lab	Р	-	2	2	1	-	25	25	2 Hrs	50
9	III	СЕР	ME	BME32305	Community Pro	Engineering	Р	-	4	4	2	-	50	-	2 Hrs	50
				Total				17	08	25	21	148	152	350	22 Hrs	650
Course (	BSC/ ESC (Basic Science Course/ Engineering Science Course.)PCC (Programme Core courses)PEC (Programme Elective courses)Multidisciplinary courses				ry	OE (Open El courses other dise	OEC n Elective SEC (Skill rses from Course)		Huma SocialSc Manag	Humanities SocialScience & Management		Experiential Learning Courses	CC (Libera Learning Courses			
Cre	dits			08		03		04	ŀ			0-	4		02	
umulati	ve Sum	16 / 1	3	10		03		04	1		04	30	3		02	04
PROGR	ESSIVE	TOTAL C	REDITS	: 43+21=64												

'Jay	mX	Rat	habit	June,2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	

## **Programme: Mechanical Engineering**

List of **Program Electives** offered By Mechanical Department (NBA Accredited)

Program Elective- I	Program Elective-II	Program Elective- III	<b>Program Elective- IV</b>	Program Elective- V
Semester V	Semester VI	Semester VI	Semester VII	SemesterVIII
BME33505:	BME33604:	BME33606:	BME34703:	BME24804.
Industrial Economics and	Hydraulic and Pneumatic	Automotive maintenance and	Total Quality Management	Material HandlingSystem
Management	Systems	Industrial Safety		Material HandlingSystem
DME22506	BME33605:	BME33608:	DME24704; EinitaElamont	BME34805:
Divies AidadDasign	Mechanical Measurement and	Advanced Manufacturing	A polygic	Computer Integrated
Computer AldedDesign	Metrology	techniques	Allalysis	Manufacturing
DME22607.	BME33606:		DME24705.	DME24806
BIVIES3007.	Automotive maintenance and	BME33609: AdvanceIC Engine	DNIE34/03.	DME34600.
Automotive System	Industrial Safety		Design of Mechanical drives	Renewable EnergySystem

# **Program: Mechanical Engineering**

List of **Open Electives** offered Mechanical Engineering Department (NBA Accredited if applicable)

Open Elective-I	Open Elective-II	Open Elective-III
Semester-III	Semester-IV	Semester-V
BME32306: Basics of Manufacturing Technology and Processes	BME32408: Total Quality Management	BME33510:Hydraulic and Pneumatic System

Course Category	BSC (Basic Science Course)	ESC (Engineering Science Course.)	PCC (Programme Core courses	PEC (Programme Elective courses)	Multidisciplin ary courses	OEC (OpenElective courses from other discipline	VSEC (Skill Course)	Humanities Social Science & Management	Experiential Learning Courses	CC (Liberal Learning Courses	Semester Wise Credits
Semester -I	08	05	02				02	02		02	21
Semester -II	08	08					02	02		02	22
Semester -III			08		03	04		04	02		21
Semester -IV			11		02	02	02	06			23
Semester -V			11	04	04	02					21
Semester -VI			09	08	02		02				21
Semester -VII			04	02	02				12		20
Semester -VIII			04	06	02				08		20
Cumulative Sum	16	13	49	20	15	08	08	14	22	04	169

1at	m	Ret	hhi	June,2024	1.00	Applicable for AY 2024-25 Onwards
Chairperson	Dean Academics	Vice Principal	Principal	Date of Release	Version	



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#### Second Year (Semester-III) B.Tech. Mechanical Engineering

#### **BME32301: Manufacturing Technology and Processes**

Г	eaching	g Scheme		Examina	eme			
Lectu	ires	3 Hr / Week		СТ	3	0		
Tuto	rials	-		CA	1	0		
Total C	redits	3		ESE	6	i0		
				Total	100 N	Marks		
				Duration of E	SE: 03 H	Irs		
Course	Objectiv	ves:						
1	Toem	phasize the impor	rtance manufacturing sciences in the day-to-	day life.				
2	To stu	dy the basic man	afacturing processes and tools used.					
3	To und proce	lerstand the manu sses.	facturing processes like casting, welding pro-	ocess & mach	ining			
			<b>Course Contents</b>			Hours		
Unit I	Joinin Gas V Electr Solde	ng Processes: - In Velding Processe rodes, weldability ring & Brazing.P	ntroduction to metal Joining- Types of Welders, Thermit Welding, Defects & Inspection of Metals, TIG Welding, MIG Welding, I lasma Arc welding, Electron Laser Beam we	ling. Arc Wel of Welding Resistance W elding.	lding & Joints, Telding.	(9)		
Unit II	Pattern Making& Moulding:- Pattern making: Types, materials used, Pattern making allowances, color codes. Master Pattern, Core making: - Types, core material & its properties. Moulding: Types of sand moulds, moulding sand composition. moulding sand properties, sand preparation technique for casting.(9)							
Unit III	Gating System & Casting Processes: - Gating design -Elements of gating systems, pouring equipments, riser design Melting furnaces -Types, Electric furnace, Cupola construction& operation. Casting defects. Foundry mechanizing, Foundryequipments, Special casting processes such as investment Casting, Centrifugal Casting, Slush Casting. Advances in Gating system. (9)							
Unit IV	Introduction to Machining Parameters in Lathe Machine: Introduction to machining, Tool materials, nomenclature and tool materials properties, classification, HSS, carbide tool, coated tools, diamond coated tool. Theory of Metal Cutting: Introduction. Orthogonal and Oblique cutting. Mechanics of Metal Cutting. Introduction, Type, Construction of simple lathe mechanism and attachments for various operations, machine specifications, basis for selection of cutting speed. feed and depth of cut, time estimation for turning operations such as facing, step turning, taper turning, threading, knurling.Introduction of CNC Lathe Machine.							
Unit V	<ul> <li>taper turning, threading, knurling.Introdution of CNC Lathe Machine.</li> <li>Shaper: Introduction, type, specification, description of machines, hydraulic drives in shapers, cutting parameters. Mechanism of shaper: Quick return mechanism, Crank &amp; slotted link mechanism, Table feed mechanism, attachments for shaper, Jigs and fixtures: Introduction, principles of jig and fixture, Principle of location, jig bushes, drilling jigs, type of clamps, classification of fixtures.</li> </ul>							

Text Boo	ks
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication.
Reference	Books
<b>R</b> .1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra, S.K; Choudhury Hajra, A.K; Roy, Nirjhar
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy
R.3	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra, S.K; Choudhury Hajra, A.K; Roy, Nirjhar

Us	Useful Links						
1	https://www.digimat.in/nptel/courses/video/112105233/L01.html						
2	https://nptel.ac.in/courses/112/103/112103250/						

	Course Outcomes	CL
BME32301.1	Apply the sand moldings technique for the castings.	3
BME32301.2	<b>Prepare</b> the gating and riser system needed for casting and requirements to achieve defect free casting.	3
BME32301.3	<b>Examine</b> appropriate welding process based on the type of industrial application.	3
BME32301.4	<b>Understand</b> the different processes and machine tools for cylindrical surface Machining.	2
BME32301.5	<b>Differentiate</b> various machining processes and conditions for flat surface machining using Single point cutting tool in a shaper machine.	2

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Mechanical Engineering (NBA Accredited), Tulsiramji Gaikwad Patil College of Engineering

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Dean Academics Fulsiramji Gaikwad-Pati College Of Engineering and Technology, Nagpur



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#### Second Year (Semester-III) B.Tech. Mechanical Engineering

BME32302:Material Engineering				
Т	Teaching Scheme   Examination Sch			eme
Lectu	ires	3 Hr / Week	<b>CT</b> 3	0
Tutorials		-	<b>CA</b> 1	0
Total C	redits	3	ESE 6	<b>50</b>
			Total 100 N	Marks
	Duration of ESE: 03 Hrs			Irs
Course	Objectiv	ves:		
1	To un	derstand materials	s, their classification, properties and, application. Metals alloys,	
1	equilil	brium diagram.		
2	10 UN treatm	uerstand plain car	bon steels, its classification and applications, commercial neat	
3	To une	derstand heat treat	tment processes and its importance	
4	To and To stu	dv Cast Iron. Nor	-Ferrous Allovs. Semiconducting Materials. Battery Materials.	
5	To un	derstand Powder N	Metallurgy.	
				TT
			Course Contents	Hours
	Intro	duction to mate	erials, classification of materials. Properties and applications of	
	mater	ials. Crystalline	nature of metals, specially microscopic and macroscopic	
	examinations of metals. Alloys and solid solutions, types and their formations, modified			
TI-si4 T	Gibbs	s's phase rule, Lev	ver rule for phase mixtures and their application in system.	(9)
Unit I	Study	y of equilibrium	aritical temperatures. Microstructure of slowly cooled steels	
	Estim	nation of carbon fr	om microstructures: structure property relationship	
	Class	ification and an	nlication of plain carbon steels. Examples of allow steel such as	
	Hadfi	ield Manganese	Steel, ball Bearing Steels, etc. Tool Steels – Classification,	
	comp	osition, application	on and commercial heat treatment practice for HSS, Secondary	(0)
Unit II	harde	ning. Stainless St	eels - Classification, composition, application and general heat	(9)
	treatn	nent practice for S	Stainless Steels. Classification and applications of steels. Effect of	
	Alloy	ring elements.		
	Heat	treatment and it	ts importance. Annealing, Normalizing, Hardening, Quench Cracks,	
	Harde	enability test. TTT	diagram and its construction and related Heat Treatment Processes	(0)
Init III	elimi	as Austempering,	austenite Tempering Case / Surface hardening treatments such as	(9)
	Carbi	rizing. Nitriding.	. Cvaniding, Carbonitriding, Flame and Induction hardening.	
	Cast	Iron–Classificati	ion, Whitecast Iron, GrayCast Iron, Nodular Cast Iron, Malleable	
	Cast	Iron, Chilled and	alloy Cast Iron. (Production route, Composition, Microstructure	
	and a	pplications) Effec	ets of various parameters onstructure and properties of Cast Iron,	
	Alloy	cast fron such as	s N1-resist, N1-nard. Non-Ferrous Alloys – Study of non-ferrous (Cu-Zndiagram) Bronzes(Cu-Sndiagram) Aluminum Alloys	
In:4 IV	(e.g.A	-Si&Al-Cudiaors	am). Bearingmaterials. Semiconducting Materials - Intrinsic and	(9)
	extrin	sic semiconducto	ors. Types of semiconductors. Doping of semiconductors. Battery	
	Mater	rials-Introduction	to battery materials, Types of battery materials- Lithium, Lead,	
	Coba	lt, Nickel, Charact	eristics of battery materials.	

	<b>Powder Metallurgy</b> :	Powder manufac	acture and C	Conditioning,	Production	of	
Unit V	Sintered Structural	Components, Se	elf lubrication	ng bearing,	Cemented	Carbides,	(9)
	Ceramics, Sintered Carbide cutting tools						

Text Boo	Text Books			
T.1	Material Science & Engineering, An Introduction,6 <sup>th</sup> Edition, Donald Askeland,1984.			
T.2	Material Science & Engineering, V.R.Raghavan, 1974.			
Т.3	Material Science & Engineering, WilliamCallister, 1985.			
T.4	Material Science Engineering ,R.K.Rajput,2009			
Reference	e Books			
R.1	Modern Physical Metallurgy, R.E.Smallman, Butterworths, 1963			
R.2	Phase transformations in metals and alloys-D.A.Potter and K.E.Easterling,CRCPress, 1992. 2.Transformations in Metals, P.G. Shewmon, Mc-Graw Hill, 1969.			
R.3	Introduction to Physical Metallurgy 29revised edition,2009 Sidney H. AvnerMcGraw- Hill,1964			

U	seful Links
1	https://nptel/2rxbxNem1iI?list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ
2	https://nptel/BJrTZ07bHm4?list=PLfIFNJ1DPG4lENg4VUTWyKxxB911aHuJz

	Course Outcomes	CL	
BME32302.1	Analyze the effect of Crystalline nature of metals and Iron-Iron carbide equilibrium diagram.		
BME32302.2	Interpret the commercial steels.	3	
BME32302.3	Analyze and implement suitable heat treatment processes.	4	
BME32302.4	Analyze the Cast Iron.	4	
BME32302.5	<b>2302.5</b> Apply the basics of powder Metallurgy for powder metallurgical components.		

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Mechanical Engineering (NBA Accredited), Tulsiramji Gaikwad Patil College of Engineering

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## Tulsiramji Gaikwad-Patil College of Engineering and Technology

Wardha Road, Nagpur-441108 NAAC Accredited with A+ Grade





#### Second Year (Semester-III) B.Tech. Mechanical Engineering

BME32306:	<b>Basics of M</b>	anufacturing	Technology	and Processes
DITLOTOUT	Dubles of IVI	anaractaring	i comology	

Teaching Scheme		g Scheme		Examina	tion Sch	ieme	
Lectu	ıres	4 Hr / Week		СТ	3	0	
Tuto	rials	-		СА	1	0	
Total Credits 4		4		ESE	6	0	
				Total	100 N	Marks	
	Duration of ESE: 03 Hrs					Irs	
Course	Course Objectives:						
1	To em	phasize the impor	tance manufacturing sciences in the day-to-da	ıy life			
2	To stu	dy the basic manu	facturing processes and tools used				
3	To und weldir	lerstand the conve ig process.	entional manufacturing processes like casting,	, metal formin	g, and		
			<b>Course Contents</b>			Hours	
Unit I	Joining Processes: - Introduction to metal Joining- Types of Welding. Arc Welding & Gas Welding Processes, Thermit Welding, Defects & Inspection of Welding Joints, Electrodes, weldability of Metals, TIG Welding, MIG Welding, Resistance Welding. Soldering & Brazing. Plasma Arc welding, Electron Laser Beam welding.			(9)			
Unit II	Pattern Making& Moulding:- Pattern making: Types, materials used, Pattern making allowances, color codes. Master Pattern, Core making: - Types, core material & its properties. Moulding: Types of sand moulds, moulding sand composition. moulding sand properties, sand preparation technique for casting.			(9)			
Unit III	Gating System & Casting Processes: - Gating design -Elements of gating systems, pouring equipments, riser design Melting furnaces -Types, Electric furnace, Cupola construction& operation. Casting defects. Foundry mechanizing, Foundry equipments, Special casting processes such as investment Casting, Centrifugal Casting, Slush Casting. Advances in Gating system.			(9)			
Unit IV	Introduction to Plastics: - Difference of thermosetting and thermoplastic compounds, compression moulding, transfer moulding, injection moulding, film and sheet forming, thermoforming and their applications. Introduction to Joining of Plastics- Mechanical Fastening, Spin Welding, Solvent Bonding, Ultrasonic welding, Induction welding, Dielectric welding, Hot Plate welding, Vibration welding, Hot gas welding. Plastic joining			(9)			
Unit V	Wording, Hor gas wording: Flaste Johnig         Hot and cold working of metals:         Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, effect of hot working. Cold working processes, Cold rolling, swaging, forging, extrusion forward, backward and impact roll forming, tube drawing, wire drawing, spinning, sheet metal working, types of presses, drives, different operations and types of dies.			(9)			

Text Books			
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.		
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication		

Reference	Reference Books				
<b>R</b> .1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra, S.K; Choudhury Hajra, A.K; Roy, Nirjhar				
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy				

1	Us	seful Links
	1	https://www.digimat.in/nptel/courses/video/112105233/L01.html
	2	https://nptel.ac.in/courses/112/103/112103250/

	Course Outcomes	CL
BME32306.1	<b>Apply</b> the sand moldings technique for the castings.	3
BME32306.2	<b>Prepare</b> the gating and riser system needed for casting and requirements toachieve defect free casting.	3
BME32306.3	<b>Examine</b> appropriate welding process based on the type of industrial application.	3
BME32306.4	<b>Summarize</b> appropriate type of plastics and plastics processing method.	2
BME32306.5	<b>Analyze</b> effect of parameters influencing metal forming and compare hot working and cold working with applications.	4

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#### Second Year (Semester-III) B.Tech. Mechanical Engineering

<b>BBA32304: Managerial Economics</b>					
Teaching Scheme		g Scheme	Examination Sch	ieme	
Lectures 2 Hr / Week		2 Hr / Week	<b>CT</b> 3	50	
Tutor	rials	-	<b>CA</b> 2	20	
Total C	redits	2	ESE 5	50	
			Total 30 M	1arks	
			Duration of ESE: 02 F	Irs	
Course	Objectiv	ves:	· · · ·		
1	To unc	lerstand concepts	and principles of managerial economics.		
2	To und	lerstand market th	e concepts of Demand and Supply.		
3	To und	lerstand market the	e concepts of Production Function and Cost Analysis.		
Course Contents			Hours		
Unit I	Nature & Scope of Managerial Economics: Managerial Economics - Introduction, Meaning, nature and scope. Fundamental Economics Concepts: Opportunity Cost, Discounting principle, Time perspective, Incremental reasoning, Equi-Marginal concept, Marginal concept in economics. Economies of information: Risk, uncertainty, Theory of firm.			(9)	
Unit II	<b>Demand &amp; Supply analysis:</b> Demand and Supply - Introduction, Market demandand supply functions and curves. Market equilibrium. Consumer behavior and rational choice: cardinal and ordinal approaches of consumer utility-Maximization of consumer utility by the technique of indifference curves and budget lines., Demand Fore casting and its methods and uses.			(9)	
Unit III	<b>Production Function &amp; Cost Analysis:</b> Introduction- Laws of diminishing returns to a factor. Returns to scale, Economies & Diseconomies of scale. Production function- Estimation of production function: Cobb Douglas and CES Production functions. Concepts of cost - Cost analysis, economic & accounting cost, Role of time in cost analysis. Cost Volume profit Analysis.				

Text Boo	Text Books			
T.1	Managerial Economics, Suma Damodran, 2006, Oxford University Press, New Delhi			
T.2	Indian Economy, Mishra & Puri, 2007, Himalaya Publishing House			
T.3	Managerial Economics, Peterson & Levis, Prentice Hall of India			
Reference Books				
R.1	Managerial Economics, P. L. Mehta, Sultan Chand & Sons, New Delhi			
R.2	Managerial Economics, D.N.Dwidevi, Vikas Publishing House Pvt. Ltd.			

Useful Links		
1	https://archive.nptel.ac.in/courses/110/101/110101149/	
2	https://www.youtube.com/watch?v=vLPpF0hunwc	

	Course Outcomes	CL
BBA32304.1	<b>Recognize</b> the knowledge on concepts and principles of Managerial Economics	2
BBA32304.2	<b>Describe</b> and relate to the market the concepts of Demand and Supply	2
<b>BBA32304.3Identify</b> and recognize the Production Function concept and Cost Analysis.		2

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### Second Year (Semester-III) B.Tech. Mechanical Engineering

### BSH32308: Ethics in Engineering Practice

DSH132500. Ethics in Engineering Fractice						
Teaching Scheme		g Scheme		Examination Scheme		ieme
Lectures		2 Hr / Week		СТ	30 N	/larks
Tuto	rials	-		CA	20 N	/larks
Total C	redits	2		ESE	50 N	/larks
				Total	30 N	/larks
-			D	uration of E	SE: 02 H	Irs
Course	Objectiv	ves:				
1	To un	derstand the Huma	n Values, Ethics and Engineering Ethics.			
2	To un	derstand Professio	nal practices in Engineering for Engineers.			
3	To un practio	derstand types of e ce, economy and s	thical violations and consequence of their influ- ociety in general.	ence on busi	iness	
			Course Contents			Hours
Unit I	it I Introduction to Engineer Ethics: Morals, Values, Integrity & Ethics, What is Engineering Ethics, Importance of Engineering Ethics, Code of Ethics, Potential Moral Problems of Engineering Ethics.				(9)	
Unit II	Professional Practices in Engineering: Happiness, Prosperity & Harmony, Professional Ethics, Engineering Ethics, Principles of Engineering Ethics, Environmental Ethics, Public Interest Litigation (PIL), Intellectual property Rights (IPR).			(9)		
Unit III	An O Ethics profes ethics	verview of Engine in Industry, Presional malpractice - Corporate Socia	ering Ethics: fessional Practices in Engineering, Ethical s, Workplace Safety, Responsibility and Rights Responsibility – Issues of Management – Cris	behavior, I s, Basics of b sis Managen	ndustry pusiness nent.	(9)

Text Boo	ks	
T.1	A New Look into Social Science : Shabbir, Sheikh and Dwadashiwar, S. Chand Publisher	
T.2	Constitution of India and Professional Ethics: Reddy, G.B. and Mohd. Suhaib, IK, International Publishing House. 2006.	
Т.3	Introduction to Engineering Ethics : Martin, Mik , Roland Schinzinger, 2 <sup>nd</sup> edition (16 February 2009) McGraw-Hill Education.	
Reference	e Books	
R.1	Human Resource Development and Management : A. M. Sheikh, 3rd Revised Edition, S Chand & Co Ltd.	
R.2 "A Gift of Fire: Social, Legal and Ethical Issues, for Computing and the Internet": Sara Baas Edition PHI Publications.		
R.3	"Case study in Information Technology Ethics" :Richard A. Spinello, 2nd Edition PHI Publications.	

Useful Links		
1 https://nptel.ac.in/courses/110/105/110105079/		https://nptel.ac.in/courses/110/105/110105079/
	2	https:://nptel/courses/video/1101323279/L54.html

	Course Outcomes	CL
<b>BSH32308.1 Describe</b> Basic Human Values, Ethics & Importance of Engineering Ethics.		2
BSH32308.2	<b>Illustrate the</b> Basic Ethics for Engineers, Principles of Engineering Ethics & Fundamental Rights of individuals of society.	2
BSH32308.3	<b>Discuss</b> Ethics for Engineer Professionals, and their Safety, Responsibility & Rights.	2

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#### Second Year (Semester-III) B.Tech. Mechanical Engineering

#### BSH32306: Engineering Mathematics-III

			8 8				
Teaching Scheme		Scheme		Examina	tion Sch	ieme	
Lectures3 Hr / Week		3 Hr / Week		СТ	3	30	
Tutorials -		-		CA	1	0	
Total C	redits	3		ESE	6	50	
				Total	100 N	0 Marks	
				Duration of E	SE: 03 H	Irs	
Course	Objectiv	/es:					
1	To un	derstand numeric	al techniques.				
2	To Le	arn Laplace Tran	sform for Solving differential equation.				
3	To lea	rn Partial Differe	ntial Equation.				
			<b>Course Contents</b>			Hours	
Unit I	Numerical Method I         Solution of Algebraic and Transcendental Equation: False position method, Newton –         Raphson method, Solution of system of simultaneous linear equations: Gauss elimination         method,. Gauss Seidel method, Crout's method				(9)		
Unit II	Nume Nume Taylor metho	rical Method II rical Methods (Diff series method, R d to solve simultan	erential Equations) Numerical solution of ordiunge-Kutta method of 4th order, Euler modeous first order Differential Equation.	inary differential eq dified method. Ru	quation by nge-Kutta	(9)	
Unit III	<b>Laplac</b> & its Transfe	<b>te Transforms</b> : La properties, Convol prm to solve ordina	place transforms and its properties, Inverse L ution Theorem, Unit Step Function, Applic ry differential equations.	Laplace Transform ation for Laplace		(9)	
Unit IV	Partia Lagra separa Equat	<b>I Differential equa</b> nge's form. the Lir ation of variables. S ions)	ations: Partial differential equation of first ord ear homogeneous PDE of nth order with cons Simple Applications to solve Partial Differenti	ler first degree i. e. tant coefficient, me ial Equations (Wav	ethod of e	(9)	
Unit V	Fourie functio transfo	er Series and Four ons, change of inte prms, Application of	<b>trier Transform (FT)</b> : Introduction of Four rval, Half Range Expansions, Fourier transfo of Fourier Transform to solve Integral equation	rier Series, Even a rm, Fourier Sine & 1.	and Odd z Cosine	(9)	

Text Boo	Text Books		
T.1	Higher Engineering Mathematics by B.S. Grewal, 40th Edition, Khanna Publication		
T.2	Advanced Engineering Mathematics by Erwin Kreyszig, 8th Edition, Wiley India		
T.3	Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville.		
Reference Books			

<b>R</b> .1	A Text Book of applied Mathematics, Volume II, by P.N. Wartikar & J.N. Wartikar, Poona Vidyarthi Griha Prakashan
R.2	Introductory methods of Numerical Analysis, by S.S. Sastry, PHI

Useful Links		
1	https://archive.nptel.ac.in/courses/111/107/111107105/	
2	https://archive.nptel.ac.in/courses/111/106/111106139/	

	Course Outcomes	CL
BSH32306.1	<b>Analyze</b> numerical techniques to find the roots of equations different types of equations.	
BSH32306.2	<b>Apply</b> the knowledge of Numerical techniques to solve ordinary differential equations in engineering problems.	3
BSH32306.3	<b>Apply</b> the concept of Laplace Transform for Solving differential equation.	3
BSH32306.4	<b>Solve</b> Partial Differential Equation using appropriate method.	3
BSH32306.5	<b>Apply</b> the knowledge of Fourier series and Transform for understanding periodic signals and solve integral equations.	3

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### Second Year (Semester-III) B.Tech. Mechanical Engineering

#### **BME32303: Manufacturing Technology and Processes Lab**

Teaching Scheme			Examin	ation Scheme
Lectures	2 Hr / Week		СТ	25 Marks
Tutorials	-		CA	25 Marks
<b>Total Credits</b>	1		ESE	50 Marks
			Total	25 Marks

	Duration of ESE	1: UZ HIS
Course	Objectives:	
1	To gain practical knowledge of sand molding processes, including pattern making, mold preparation, and casting techniques.	
2	To develop the ability to create sand molds for casting metal parts and understand the importance of proper mold design and material selection.	
3	To Understand the principles and fundamentals of welding, machining parameters in lath Shaper machine and their applications.	eand
Sr.No.	List of Experiment	СО
1	To analyze Pattern Making process.	CO1
2	To perform job of Pattern Making.	CO1
3	To perform job of Sand Mould.	CO1
4	To analyze Casting Techniques Process.	CO2
5	To perform job of Casting Techniques.	CO2
6	To analyze the design of Gating System in sand mould techniques.	CO2
7	To analyze Joining Techniques Processes.	CO3
8	To perform Job of Welding.	CO3
9	Produce Thread Cutting, Taper Turning job as per given drawing in a Lathe Machine.	CO4
10	Produce key-slot as per given drawing in a Shaper Machine.	CO5
11	To analyze Pattern Making process.	CO1

Text Boo	Text Books		
T.1	A Text Of Book Manufacturing Technolgy by Chand And Co.Publication.		
T.2	A Text Of Book Manufacturing Technolgy II by . Chand And Co.Publication		
Reference Books			
R.1	Elements Of Workshop Technology: Vol.I 1 REVISE Manufacturing Process by Choudhury Hajra, S.K; Choudhury Hajra, A.K; Roy, Nirj har.		
R.2	Elements Of Workshop Technology-II by Choudhary S.K. ;Choudhary A.K. Nirjhar Roy.		

U	Jseful Links
1	https://www.digimat.in/nptel/courses/video/112105233/L01.html
2	https://nptel.ac.in/courses/112/103/112103250/

	Course Outcomes	CL
BME32303.1	Create the sand moldings technique for the castings.	6
BME32303.2	<b>Prepare</b> the gating and riser system needed for casting and requirements to achieved effect free casting.	3
BME32303.3	<b>Examine</b> appropriate welding process based on the type of industrial application.	4
BME32303.4	<b>Develop</b> a job using Lathe Machine.	6
BME32303.5	<b>Develop</b> a job using Shaper Machine	6

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#### Second Year (Semester-III) B.Tech. Mechanical Engineering

#### BME32304: Material Engineering Lab

Teaching Scheme		Ex	Examination Scheme	
Lectures	2 Hr / Week	C	СТ	25 Marks
Tutorials	-	C	CA	25 Marks
<b>Total Credits</b>	1	ES	CSE	50 Marks
		То	otal	25 Marks
Duration of ESE: 02 Hrs				

	Duration of ESE. 02 1113		
Course	Objectives:		
1	To understand the metallurgical microscope.		
2	To learn iron-iron carbon diagram in equilibrium.		
3	To Know effect of alloying element on properties of Steel.		
Sr.No.	List of Experiment	СО	
1	Identifying the construction and working of a metallurgical microscope.	CO1	
2	Interpreting crystal structure of metals.	CO1	
3	Summarizing iron-iron carbon diagram in equilibrium.	CO2	
4	Preparation of specimen for metallurgical microscope.	CO2	
5	To observe and draw microstructure of steel.	CO3	
6	To observe and draw microstructure of cast iron.	CO4	
7	To observe and draw microstructure of non-ferrous metals & alloys.	CO4	
o	Estimating the effect of annealing and normalizing on properties of	CO4	
8	Steel.		
9	Estimating the effect of alloying element on properties of Steel.	CO4	
10	To prepare the case study on powder metallurgy part manufacturing	CO5	
	process.		

Text Boo	Text Books			
T.1	Material Science & Engineering, An Introduction, 6th Edition, Donald Askeland, 1984.			
T.2	Material Science & Engineering, V. R. Raghavan, 1974.			
Reference	e Books			
R.1	1. Phase transformations in metals and alloys- D.A. Potter and K.E. Easterling, CRC			
	Press, 1992.			
	2. Transformations in Metals, P.G. Shewmon, Mc-Graw Hill, 1969.			
R.2	Modern Physical Metallurgy, R. E. Smallman, Butterworths, 1963.			

U	seful Links
1	https://nptel/2rxbxNem1iI?list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ
2	https://nptel/BJrTZ07bHm4?list=PLfIFNJ1DPG4lENg4VUTWyKxxB911aHuJz

	Course Outcomes	CL
BME32304.1	<b>Distinguish</b> different type of materials, its physical and chemical properties withcrystallographic studies.	4
BME32304.2	<b>Analyze</b> the process of metals solidification with phase diagram.	4
BME32304.3	<b>Compare</b> the different heat treatment process and plane carbon steel alloys.	4
BME32304.4	<b>Categories</b> the different types of cast iron and nonferrous alloys with the applications.	4
BME32304.5	<b>Identify</b> the basic of powder Metallurgy with different Hardness testing method and Advance materials.	3

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