

**D.K.T.E. Society's  
Textile and Engineering Institute,  
Rajwada, Ichalkaranji- 416115**

*(An Empowered Autonomous Institute Affiliated to Shivaji University, Kolhapur)*

**NAAC Accredited with A+ Grade, ISO 9001:2015 Certified**



**DEPARTMENT: MECHANICAL ENGINEERING**

**CURRICULUM**

**Second Year B.Tech. Engineering Program**

With effect from 2024-25

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**BOS Chairman**

**Dean Academics**

**Director**

Teaching and Evaluation Scheme for Year 2024-25

Program: B. Tech. Mechanical Engineering

Class.: Second Year, B. Tech.

Semester: SEM-III

NCrF Level : 5.0

W.E.F.: 2024-2025

Sr. No.	Course Code	Course Title	Course Category	Teaching Scheme				Course Credits	Evaluation scheme					
				L	T	P	Contact Hrs/wk		Theory			Practical		Total
									CIE		SEE	CIE	SEE	
									SE-I	SE-II				
01	01MEL201	Engineering Mathematics for ME	ESC	3			3	3	25	25	50			100
02	01MEL202	Analysis of Mechanical Elements	PCC	3			3	3	25	25	50			100
03	01MEL203	Applied Thermodynamics	PCC	3			3	3	25	25	50			100
04	01MEL204	Machine tool and Processes	PCC	3			3	3	25	25	50			100
05	MDM-I	MDM - I	MDM	2			2	2	25	25	50			100
06	01DEL251	Environmental studies	VEC	1	1		2	2	25	25	50			100
07	01MEP205	Community Engagement Project/Field Project	ELC			4	4	2				50		50
08	MDM-I	MDM - I Lab	MDM			2	2	1				50		50
09	01MEP206	Applied Thermodynamics Lab	PCC			2	2	1				50	50	100
10	01MEP207	Analysis of Mechanical Elements Lab	PCC			2	2	1				50		50
11	01MEP208	Machine shop practice	VSEC			2	2	1				50	50	100
12	01MEP209	Machine Drawing Lab	PCC			2	2	1				50		50
13	01MEP210	Computer Aided Drawing	VSEC			2	2	1				50	50	100
Total				15	01	16	32	24	150	150	300	350	150	1100

L- Lecture T-Tutorial P-Practical SE-I: Semester Examination-I SE-II: Semester Examination-II CIE - Continuous in Semester Evaluation SEE- Semester End Examination

Course Category	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	Humanities Social Science and Management (HSSM)			Experiential Learning Courses				Liberal Learning Courses	
	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp / Mgmt	IKS	VEC	RM	CEP/FP	Proj	Int/OJT	CC
Credits	-	3	13	-	3	-	2	-	-	-	2	-	2	-	-	0
Cum. Sum	14	16	16	-	3	-	6	3	-	2	2	-	2	-	-	2

**Open Electives:**

Sr. No.	Course Code	Course Name
1	010E201	Financial Management
2	010E202	Stress Management
3	010E203	Financial & Managerial Accounting
4	010E204	Financial Planning and Control
5	010E205	Supply Chain Management
6	010E206	Production Planning and Control
7	010E207	Quality Management

**Teaching and Evaluation Scheme for Year 2024-25**

**Program: B. Tech. Electronics & Telecommunication Engineering**

**Class.: Second Year, B. Tech.**

**Semester: SEM-IV**

**NCrF Level : 5.0**

**W.E.F.: 2024-2025**

Sr. No.	Course Code	Course Title	Course Category	Teaching scheme				Course Credits	Evaluation scheme					
				L	T	P	Contact Hrs/ wk		Theory			Practical		Total
									CIE		SEE	CIE	SEE	
									SE-I	SE-II				
01	01MEL211	Material Science	BSC	3			3	3	25	25	50			100
02	OE-I	OE-I	OE	3			3	3	25	25	50			100
03	01MEL212	Fluid Mechanics and machinery	PCC	3			3	3	25	25	50			100
04	01MEL213	Measurement and metrology	PCC	3			3	3	25	25	50			100
05	01MEL214	Programming and Computational Methods	PCC	3			3	3	25	25	50			100
06	MDM-II	MDM-II	MDM	2			2	2	25	25	50			100
07	01MEP215	Material Science Lab	BSC			2	2	1				50	50	100
08	MDM-II-P	MDM-II Lab	MDM			2	2	1				50		50
09	01MEP216	Fluid Mechanics and machinery Lab	PCC			2	2	1				50	50	100
10	01MEP217	Measurement and metrology Lab	PCC			2	2	1				50	50	100
11	01MEP218	Programming and Computational Methods Lab	PCC			2	2	1				50		50
12	01MEP219	Pattern making and sand testing	VSEC			2	2	1				50	50	100
13	01MEP220	Software Training	VSEC			2	2	1				50		50
<b>Total</b>				<b>17</b>	<b>0</b>	<b>14</b>	<b>31</b>	<b>24</b>	<b>150</b>	<b>150</b>	<b>300</b>	<b>350</b>	<b>200</b>	<b>1150</b>

**L- Lecture T-Tutorial P-Practical SE-I: Semester Examination-I SE-II: Semester Examination-II**

**CIE - Continuous in Semester Evaluation SEE- Semester End Examination**

Course Category	BSC/ESC		Program Courses		Multidisciplinary Courses		Skill Courses	Humanities Social Science and Management (HSSM)				Experiential Learning Courses				Liberal Learning Courses
	BSC	ESC	PCC	PEC	MDM	OE	VSEC	AEC	Entrp / Mgmt	IKS	VEC	RM	CEP/FP	Proj	Int/OJT	CC
<b>Credits</b>	4	-	12	-	3	3	2	-	-	-	-	-	-	-	-	-
<b>Cum. Sum</b>	18	16	27	-	6	3	8	3	-	2	2	-	2	-	-	2

## Multidisciplinary Minor (MDM)

- Students should select any one minor, excluding those offered by their parent department, from the diverse range of minors available.
- Students should complete all courses within their selected minor in order to earn credits.

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
Fabric Manufacturing Technology	1	01TTMDL1201	General Textile Technology	III	Textile Technology
	2	01TTMDP1202	General Textile Technology - Lab	III	
	3	01TTMDL1203	Woven Fabric Technology	IV	
	4	01TTMDP1204	Woven Fabric Technology - Lab	IV	
	5	01TTMDL1301	Knitted Fabric Technology	V	
	6	01TTMDL1302	Knitted Fabric Technology - Lab	V	
	7	01TTMDL1303	Nonwoven Fabric Technology	VI	
	8	01TTMDL1304	Nonwoven Fabric Technology - Lab	VI	
	9	01TTMDD1401	Capstone Project	VII	
High Performance Textiles	1	01TMMDL1201	Fundamentals of High Performance Textiles	III	Man Made Textile Technology
	2	01TMMDP1202	Fundamentals of High Performance Textiles Lab	III	
	3	01TMMDL1203	High Performance Fibres	IV	
	4	01TMMDP1204	High Performance Fibres Lab	IV	
	5	01TMMDL1301	Manufacturing of High Performance Textiles	V	
	6	01TMMDP1302	Manufacturing of High Performance Textiles Lab	V	
	7	01TMMDL1303	Automotive and Geo Textiles	VI	
	8	01TMMDP1304	Automotive and Geo Textiles Lab	VI	
	9	01TMMDD1401	Capstone Project	VII	
Machine Maintenance	1	01MEMDL1201	Applied Electronics	III	Textile Plant Engineering
	2	01MEMDP1202	Applied Electronics Lab	III	
	3	01MEMDL1203	Computer Programing	IV	
	4	01MEMDP1204	Computer Programing Lab	IV	
	5	01MEMDL1301	Fluid Flow Systems and Control	V	
	6	01MEMDL1302	Fluid Flow Systems and Control Lab	V	
	7	01MEMDL1303	Mechatronics	VI	
	8	01MEMDT1304	Mechatronics Lab	VI	
	9	01MEMDD1401	Capstone Project	VII	
Chemical Processing of Textiles	1	01TCMDL1201	Introduction to Textile Substrates	III	Textile Chemistry
	2	01TCMDP1202	Introduction to Textile Substrates Lab	III	
	3	01TCMDL1203	Pretreatment of Textiles	IV	
	4	01TCMDP1204	Pretreatment of Textiles Lab	IV	
	5	01TCMDL1301	Colouration of Textiles	V	
	6	01TCMDP1302	Colouration of Textiles Lab	V	
	7	01TCMDL1303	Finishing & Care of Textiles	VI	
	8	01TCMDP1304	Finishing & Care Textiles Lab	VI	
	9	01TCMDD1401	Capstone Project	VII	

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
Garment Technology	1	01TFMDL1201	Fundamentals of Clothing Manufacturing	III	Fashion Technology
	2	01TFMDP1202	Fundamentals of Clothing Manufacturing Lab	III	
	3	01TFMDL1203	Garment Manufacturing	IV	
	4	01TFMDP1204	Garment Manufacturing Lab	IV	
	5	01TFMDL1301	Design & Pattern Engineering	V	
	6	01TFMDP1302	Design & Pattern Engineering Lab	V	
	7	01TFMDL1303	Fashion and Garment construction	VI	
	8	01TFMDP1304	Fashion and Garment construction Lab	VI	
	9	01TFMDD1401	Capstone Project	VII	
Embedded Systems	1	01ETMDL1201	Microcontroller	III	Electronics and Telecommunication
	2	01ETMDP1202	Microcontroller Lab	III	
	3	01ETMDL1203	Microcontroller based System	IV	
	4	01ETMDP1204	Microcontroller based System Lab	IV	
	5	01ETMDL1301	Embedded System Design	V	
	6	01ETMDP1302	Embedded System Design Lab	V	
	7	01ETMDL1303	Real Time Embedded System	VI	
	8	01ETMDP1304	Real Time Embedded System Lab	VI	
	9	01ETMDD1401	Capstone Project	VII	
Industrial IOT	1	01ETMDL2201	Sensor and Actuators	III	Electronics and Telecommunication
	2	01ETMDP2202	Sensor and Actuators Lab	III	
	3	01ETMDL2203	Introduction to IOT	IV	
	4	01ETMDP2204	Introduction to IOT Lab	IV	
	5	01ETMDL2301	IOT implementation using Raspberry Pi Boards	V	
	6	01ETMDP2302	IOT implementation using Raspberry Pi Boards Lab	V	
	7	01ETMDL2303	IOT System design	VI	
	8	01ETMDP2304	IOT System design Lab	VI	
	9	01ETMDD2401	Capstone Project	VII	
Industrial Electronics	1	01ETMDL3201	Digital Electronics	III	Electronics and Telecommunication
	2	01ETMDP3202	Digital Electronics Lab	III	
	3	01ETMDL3203	Control System	IV	
	4	01ETMDP3204	Control System Lab	IV	
	5	01ETMDL3301	Microcontroller	V	
	6	01ETMDP3302	Microcontroller Lab	V	
	7	01ETMDL3303	Power Electronics and Drives	VI	
	8	01ETMDP3304	Power Electronics and Drives Lab	VI	
	9	01ETMDD4401	Capstone Project	VII	
Digital System Engineering	1	01ETMDL4201	Basics of Electronics	III	Electronics and Telecommunication
	2	01ETMDP4202	Basics of Electronics Lab	III	
	3	01ETMDL4203	Computer Programming	IV	
	4	01ETMDP4204	Computer Programming Lab	IV	
	5	01ETMDL4301	Applied Electronics and SAP	V	
	6	01ETMDP4302	Applied Electronics and SAP Lab	V	
	7	01ETMDL4303	AI and Data Science	VI	
	8	01ETMDP4304	AI and Data Science Lab	VI	
	9	01ETMDD4401	Capstone Project	VII	
	1	01MEMDL2201	Introduction to Automation	III	Mechanical

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
Industrial Automation	2	01MEMDP2202	Introduction to Automation Lab	III	
	3	01MEMDL2203	Mechatronics	IV	
	4	01MEMDP2204	Mechatronics Lab	IV	
	5	01MEMDL2301	Industrial Robotics	V	
	6	01MEMDP2302	Industrial Robotics Lab	V	
	7	01MEMDL2303	Control Systems	VI	
	8	01MEMDP2304	Control Systems Lab	VI	
	9	01MEMDP2401	Capstone Project	VII	
Product Design and Development	1	01MEMDL1201	Introduction to Product Design	III	Mechanical
	2	01MEMDP1202	Introduction to Product Design Lab	III	
	3	01MEMDL1203	Materials and Manufacturing Processes for Product Design	IV	
	4	01MEMDP1204	Materials and Manufacturing Processes for Product Design Lab	IV	
	5	01MEMDL1301	CAD and Digital Prototyping	V	
	6	01MEMDP1302	CAD and Digital Prototyping Lab	V	
	7	01MEMDL1303	Product Lifecycle Management	VI	
	8	01MEMDP1304	Product Lifecycle Management Lab	VI	
	9	01MEMDP1401	Capstone Project	VII	
Energy Engineering	1	01MEMDL3201	Thermal Science	III	Mechanical
	2	01MEMDP3202	Thermal Science Lab	III	
	3	01MEMDL3203	Heat Transfer	IV	
	4	01MEMDP3204	Heat Transfer Lab	IV	
	5	01MEMDL3301	Chemical Engineering Operations	V	
	6	01MEMDP3302	Chemical Engineering Operations Lab	V	
	7	01MEMDL3303	Fluid Mechanics and Machines	VI	
	8	01MEMDP3304	Fluid Mechanics and Machines Lab	VI	
	9	01MEMDD3401	Capstone Project	VII	
Automation and Robotics	1	01MEMDL4201	Applied Electronics	III	Mechanical
	2	01MEMDP4202	Applied Electronics Lab	III	
	3	01MEMDL4203	Computer Programming	IV	
	4	01MEMDP4204	Computer Programming Lab	IV	
	5	01MEMDL4301	Fluid Flow Systems and Control	V	
	6	01MEMDP4302	Fluid Flow Systems and Control Lab	V	
	7	01MEMDL4303	Mechatronics and Robotics	VI	
	8	01MEMDP4304	Mechatronics and Robotics Lab	VI	
	9	01MEMDD4401	Capstone Project	VII	
Software Engineering	1	01CSMDL1201	Software Engineering Processes	III	Computer Science and Engineering
	2	01CSMDP1202	Object Oriented Programming using Java	IV	
	3	01CSMDL1301	Database Engineering	V	
	4	01CSMDP1302	Database Engineering Lab	V	
	5	01CSMDL1303	Software Testing	VI	
	6	01CSMDP1304	Software Testing Lab	VI	
	7	01CSMDD1401	Capstone Project	VII	
Web Technology	1	01CSMDL2201	Fundamentals of Computer Networks and Database Systems	III	
	2	01CSMDP2202	Computer Networks and Database Systems Lab	III	
	3	01CSMDP2203	Web Page Designing Lab	IV	

MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
	4	01CSMDP2301	Client-Side Programming Lab	V	
	5	01CSMDP2302	Server Side Programming Lab	VI	
	6	01CSMDD2401	Capstone Project	VII	
Digital Design and Manufacturing Systems	1	01CSMDL3201	Basics of Electronic Systems	III	
	2	01CSMDP3202	Basics of Electronic Systems Lab	III	
	3	01CSMDL3203	Digital Illustration Techniques	IV	
	4	01CSMDP3204	Digital Illustration Techniques Lab	IV	
	5	01CSMDL3301	Programming techniques and applications	V	
	6	01CSMDP3302	Programming techniques and applications Lab	V	
	7	01CSMDL3303	CAD CAM Applications	VI	
	8	01CSMDP3304	CAD CAM Applications Lab	VI	
	9	01CSMDD3401	Capstone Project	VII	
Artificial Intelligence and Machine Learning	1	01AMMDL1201	Introduction to AI-ML	III	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
	2	01AMMDP1202	Basics of AI-ML Lab	III	
	3	01AMMDL1203	Programming with Python for Machine Learning	IV	
	4	01AMMDL1301	Machine Learning Foundations	V	
	5	01AMMDP1302	Machine Learning Foundations Lab	V	
	6	01AMMDL1303	Ethics and Applications in AI	VI	
	7	01AMMDP1304	Deep Learning Lab	VI	
	8	01AMMDD1401	Capstone Project on AI-ML	VII	
Augmented Reality and Virtual Reality	1	01AMMDL2201	Foundations of AR-VR	III	
	2	1AMMDP2202	Basic AR-VR Lab	III	
	3	01AMMDL2203	Programming for AR-VR and 3D fundamentals	IV	
	4	01AMMDP2204	Programming for AR-VR and 3D fundamentals	IV	
	5	01AMMDL2301	3D Modeling and Animation	V	
	6	01AMMDL2302	Virtual Reality Development	VI	
	7	01AMMDD2401	Capstone Project	VII	
Data Analytics	1	01ADMDL1201	Foundation of Data Analysis	III	Artificial Intelligence and Data Science
	2	01ADMDP1202	Foundation of Data Analysis Lab	III	
	3	01ADMDL1203	Exploratory Data Analysis	IV	
	4	01ADMDP1204	Exploratory Data Analysis Lab	IV	
	5	01ADMDL1301	Data Analysis Techniques	V	
	6	01ADMDP1302	Data Analysis Techniques Lab	V	
	7	01ADMDL1303	Data Visualization Techniques	VI	
	8	01ADMDP1304	Data Visualization Techniques Lab	VI	
	9	01ADMDP1401	Capstone Project	VII	
Construction Technology	1	01CEMDL1201	Building Materials & Construction	III	Civil
	2	01CEMDP1202	Building Materials & Construction Lab	III	
	3	01CEMDL1203	Metrics in Civil Engineering	IV	
	4	01CEMDP1204	Metrics in Civil Engineering Lab	IV	
	5	01CEMDL1305	Estimation & Valuation	V	
	6	01CEMDP1306	Estimation & Valuation Lab	V	
	7	01CEMDL1307	Project Planning & Management	VI	
	8	01CEMDP1308	Project Planning & Management Lab	VI	
	9	01CEMDD1409	Capstone Project	VII	
	1	01EEMDL12	Electrical Installation System	III	Electrical



MDM Name	Sr. No	Course Code	Course Name	Sem	Offered by Department
Industrial Electrical System	2	01EEMDP1202	Electrical Installation System Lab	III	
	3	01EEMDL1203	Electrical Switchgears and Safety	IV	
	4	01EEMDP1204	Electrical Switchgears and Safety Lab	IV	
	5	01EEMDL1305	Renewable Energy and Cogeneration in Industry	V	
	6	01EEMDP1306	Renewable Energy and Cogeneration in Industry Lab	V	
	7	01EEMDL1307	Electrical Vehicle Technology	VI	
	8	01EEMDP1308	Electrical Vehicle Technology Lab	VI	
	9	01EEMDD1409	Capstone Project	VII	

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEL201	Course Name		Engineering Mathematics For Mechanical Engineering	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	0	0	3	25	25	50
<b>Prerequisites:</b> Calculus , Linear Algebra						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	To introduce students about Linear Differential Equations and its Applications.					
02	To study basic concept of Vector Differential Calculus.					
03	To study properties of Laplace Transform and Transform of Derivative & Integral.					
04	To study need of Fourier series.					
<b>Course Outcomes:</b>						
On completion of the course, student will be able to –						
01	Apply the basic concept of Linear Differential Equations with its application and fourier Series to solve problems related in different engineering field.					
02	Illustrate the formulation and concepts of vector differentiation and vector integral calculus.					
03	Solve the Laplace transform method to solve differential equations and express the given function over the given interval.					
04	Compute the knowledge of Probability Distribution as Poisson, Binomial & Normal distribution in engg. Problems wherever required.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Linear Differential Equation &gt;</b>				<b>6 Hours</b>	
Definition, general form, complete solution, Rules for finding complementary function, Rules for finding particular integral, Application: Mass – spring Mechanical system, Free oscillations, Damped Oscillations, Forced oscillations without damping.						
<b>Unit II</b>	<b>&lt; Vector Differentiation &gt;</b>				<b>8 Hours</b>	
Definition of vector, Components of vector, Differentiation of vectors, Gradient of scalar point function and Directional Derivative, Divergence of Vector point function & Solenoidal vector fields, Curl of a vector point function and Irrotational vector field.						
<b>Unit III</b>	<b>&lt; Vector Integration Calculus &gt;</b>				<b>6 Hours</b>	
The line integral, surface integral, volume integral, Gauss's divergence theorem, Stoke's theorem, Green theorem (without proof), Applicational example of vector integration.						
<b>Unit IV</b>	<b>&lt; Fourier Series Analysis &gt;</b>				<b>6 Hours</b>	
Definition of Fourier Series, Euler's formula, Dirichlet's conditions. Functions having points of discontinuity, Change of interval, Expansion of odd and even periodic functions, Half range Fourier series.						
<b>Unit V</b>	<b>&lt; Laplace Transform Function &gt;</b>				<b>8 Hours</b>	
Definition, transforms of elementary functions, properties of Laplace transform, transforms of derivative and integral, Inverse Laplace transform, Inverse Laplace transforms by using partial fractions, convolution theorem, Solution of linear differential equations with constant coefficients by Laplace transform method.						
<b>Unit VI</b>	<b>&lt; Probability Distributions &gt;</b>				<b>6 Hours</b>	

Introduction to Probability, Random variable, Probability mass function and probability density function , Binomial distribution, Poisson distribution, Normal distribution, Applicational examples.

**Texts Books:**

- |   |  |
|---|--|
| 1 | Higher Engineering Mathematics - Dr. B. S. Grewal ( Khanna Publishers, Delhi )   |
| 2 | A Text Book of Applied Mathematics Vol. II & III - P. N. Wartikar & J. N. Wartikar (Pune Vidyarthi Griha Prakashan, Pune |

**Reference Books:**

- |   |   |
|---|---|
| 1 | Advanced Engineering Mathematics - Erwin Kreyszig (John Wiley & Sons)   |
| 2 | Advanced Engineering Mathematics - H. K. Dass ( S. Chand & Company Pvt. Ltd, New Delhi )                          |
| 3 | A text book of Engineering Mathematics - N. P. Bali, Iyengar ( Laxmi Publications (P) Ltd., New Delhi)            |
| 4 | Engineering Mathematics - Ravish R Singh and Mukul Bhatt (McGraw Hill Education (India) Private Limited, Chennai) |

**Supplementary Readings:**

Useful Links:

1. <https://www.freepdfconvert.com/pdf-to-word#d35661a93c7a69cb0bcd7bf1b9c4c19d>
2. <https://www.dkte.ac.in/admissions/international-students/admission-process>

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code	01MEL202	Course Name	Analysis of Mechanical Elements			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	0	0	3	25	25	50
<b>Prerequisites:</b> Engineering Mechanics						
<b>Course Objectives:</b>						
01	To understand the basics for design of mechanical elements.					
02	To gain knowledge of different types of stresses, Strains and deformation induced in Mechanical Components due to external loads.					
03	To study the distribution of various stresses in Mechanical Elements due to various types of loads.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.					
02	Study & analyze different types of Beams					
03	Will be able to compute the principal stresses and strains by analytical and graphical methods.					
04	Analyze buckling and bending phenomenon in columns.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Stresses and Strains &gt;</b>					<b>7 Hours</b>
Concept of Stress and Strain, (Linear, Lateral, Shear and Volumetric), Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Working stress. Principal of superposition, Composite sections, Stresses of varying section in bars, Bulk Modulus, Interrelationship between elastic constants,						
<b>Unit II</b>	<b>&lt; Torsion, Shear Force and Bending Moment &gt;</b>					<b>7 Hours</b>
A) Torsion: Basic assumptions, Torsion formula, Hollow and solid circular shafts, ASME code for shaft design, Types and Design of Keys. B) Shear Force and Bending Moment: Concept and definition of shear force and bending moment in determinate beams due to concentrated, UDL, uniformly varying load and couples						
<b>Unit III</b>	<b>&lt;Bending Stresses and Shear Stresses in Beams&gt;</b>					<b>6 Hours</b>
Symmetric pure bending of beams, Flexure formula, moment of resistance of cross-sections, Simple built-up section, Distribution of bending and shear stresses in beams of symmetrical and unsymmetrical sections such as I, T, and L						
<b>Unit IV</b>	<b>&lt; Principal Stresses and Strains &gt;</b>					<b>6 Hours</b>
Normal and shear stresses on any oblique planes, Concept of Principal planes, Derivation of expression for Principal stresses and maximum shear stress, Positions of principal planes and planes of maximum shear, Graphical solutions using Mohr's circle of stresses, Combined effect of shear and bending in Beam.						
<b>Unit V</b>	<b>&lt; Columns &gt;</b>					<b>6 Hours</b>
Derivation of Euler's formula for different end connections, its limitation Concept of equivalent length, Eccentric loading, Rankine formula.						
<b>Unit VI</b>	<b>&lt; Fundamentals of Machine Design &gt;</b>					<b>7 Hours</b>

Concept of Machine design, Types of loads, Factor of safety- its selection and significance, Basic procedure of design of machine elements, Factors governing selection of Engineering materials. Theories of elastic failure and their applications

**Reference Books:**

1	"Strength of Materials", S. Ramamruthum, Dhanpat Rai and Sons, New Delhi
2	"Strength of Materials", R. K. Bansal, Laxmi Publication, 4th Edition
3	"Strength of Materials", Khurmi Gupta, S. Chand Publication
4	"Strength of Materials", R.K. Rajput, S. Chad Publication
5	"Mechanics of structure", S.B Junnerkar, Charotar Publication House
6	"Strength of Materials", S. S. Bhavikatti, Vikas Publication House
7	"Strength of Materials", Timoshenko and Young, CBS Publication
8	"Mechanics of Materials", S. S. Ratan, Tata McGraw Hill Publication, 2009
9	"Strength of Materials", B. K. Sarkar, McGraw Hill Publication, 2003
10	"Strength of Materials", L. S. Negi, McGraw Hill Publication, 2008
11	"Design of Machine Elements", V. B. Bhandari, Tata McGraw Hill Publication, 2021

**Supplementary Readings:**

- 1] [www.youtube.com/playlist?list=PLAF9gGmnljKTiHVMhzAhto8xDSflauQJk](http://www.youtube.com/playlist?list=PLAF9gGmnljKTiHVMhzAhto8xDSflauQJk)
- 2] [www.youtube.com/watch?v=La4UEa7hA7Q&list=PLJoALJA\\_KMOARYNi50T6b488kPUBbOIsX](http://www.youtube.com/watch?v=La4UEa7hA7Q&list=PLJoALJA_KMOARYNi50T6b488kPUBbOIsX)
- 3] [www.youtube.com/watch?v=xMCreTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V](http://www.youtube.com/watch?v=xMCreTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V)

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEL203	Course Name		Applied Thermodynamics	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	0	0	3	25	25	50
<b>Prerequisites:</b> Calculus , Physics						
<b>Course Objectives:</b>						
On completion of the course, student will be able to–						
01	To introduce student about basic physics and chemistry behind thermodynamics.					
02	To study basic concepts of thermodynamics and its applications.					
03	To study physical significance of entropy term and its application.					
04	To study application of first and second law of thermodynamics to various thermodynamic devices like Steam generator, Condenser, Nozzles and Turbines.					
05	To study different types of turbines and corresponding velocity diagrams.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Define and describe various laws of Thermodynamics and its corollaries, steam properties.					
02	Formulate and solve problems on various thermodynamic cycles, steam nozzle, turbines and condensers.					
03	Design the steam nozzle and turbines.					
04	Analyze the properties of steam and performance of steam turbines.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Laws of Thermodynamics and Entropy &gt;</b>					<b>6 Hours</b>
Zeroth law, first law and Second law of thermodynamics, Statement of third law of thermodynamics. Equivalence of Kelvin plank and Clausius statement, Numerical treatment on second law, Entropy: Inequality of Clausius, Entropy changes in reversible process and irreversible process, Principal of increase of entropy, Applications, Entropy change of an ideal gas.						
<b>Unit II</b>	<b>&lt; Properties of Pure Substances and Vapour Power Cycles &gt;</b>					<b>5 Hours</b>
Properties of steam, Use of steam table and Mollier chart, Carnot cycle using steam, Limitations of Carnot cycle Rankine cycle, Representation on T-s and H-s planes, Thermal efficiency, Specific steam consumption. Work ratio, Effect of steam supply pressure and temperature, Condenser pressure on the performance. (Numerical Treatment)						
<b>Unit III</b>	<b>&lt; Stream Condensers &gt;</b>					<b>6 Hours</b>
Functions, Elements of condensing plant, Types of steam condensers, surface and jet condensers, Comparison, Vacuum efficiency, Condenser efficiency, Loss of vacuum, Sources of air leakages, Methods of leak detection, Air extraction methods, Estimation of cooling water required, Capacity of air extraction pump, Air ejectors.						
<b>Unit IV</b>	<b>&lt; Stream Nozzles &gt;</b>					<b>8 Hours</b>
Functions, Shapes, Critical pressure ratio, Maximum discharge condition, Effect of faction, Design of throat and exit areas, Nozzle efficiency, Velocity coefficient, Coefficient of discharge, Supersaturated flow, Degree of undercooling and degree of super saturation, Effects of super saturation.						
<b>Unit V</b>	<b>&lt; Impulse Turbines &gt;</b>					<b>8 Hours</b>

Principles of operation, Classification, Impulse and reaction steam turbine, compounding of steam turbines. Flow through impulse turbine blades, Velocity diagrams, Work done, Efficiencies, End thrust, Blade friction, Influence of ratio of blade speed to steam speed on efficiency of single stage turbines and its condition curve and reheat factors

<b>Unit VI</b>	<b>&lt; Reaction Turbines &gt;</b>	<b>8 Hours</b>
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Flow through impulse reaction blades, Velocity diagram, and degree of reaction, Parson's reaction turbine, Back pressure and pass out turbine. Governing of steam turbines. Losses in steam turbines, Performance of steam turbines. Function of diaphragm, Glands, Turbine troubles like Erosion, Corrosion, Vibration, Fouling etc.

**Texts Books:**

1	“Thermal Engineering”, R. K. Rajput, Laxmi Publications, 3rd Edition
2	“Thermal Engineering”, Ballaney P.L, Khanna Publishers, New Delhi, 27th Ed.
3	“Thermal Engineering”, Mathur and Mehta, Jain Bros. Publishers, Delhi, 3rd Ed..

**Reference Books:**

1	“Engineering Thermodynamics”, P.K. Nag., Tata McGraw Hill, New Delhi, 4th Ed.
2	“Fundamentals of Thermodynamics”, Claus Borgnakke, Sonntag R.E., John Wiley & Sons.
3	“Principles of Engineering Thermodynamics”, Moran, Shapiro, Boetner, Wiley, 8th Edition
4	“Applied Thermodynamics”, Estop McConkey, Pearson Education, 5th Edition
5	Engineering Thermodynamics” G. Rogers Yon Mayhew, Pearson Education, 4th Edition
6	“Thermal Engineering”, Kumar and Vasandani, D.S. Publisher Metropolitan Book Co, Delhi, 3rd Ed.
7	“Thermodynamics: an Engineering Approach”, Congel and Boles, Tata McGraw-Hill, New Delhi, 3 <sup>rd</sup> Edition.
8	“Engineering Thermodynamics”, D.P. Mishra, Cengage learning, 1st Edition
9	Principles of Engineering Thermodynamics, Moran, Shapiro, Boetner, Wiley, 8th Ed. 10.
10	“Engineering Thermodynamics”, Gupta and Prakash, Nemichand and Sons, 2nd edition
11	“Steam and Gas Turbines”, R. Yadav, CPH Allahabad, 2nd Edition, 2005.
12	“Thermal Engineering”, M.M Rathod, Tata McGraw Hill, 1st Edition , 2010

**Supplementary Readings:**

1.	<a href="https://www.youtube.com/watch?v=rUB-hpek0NE">https://www.youtube.com/watch?v=rUB-hpek0NE</a>
2.	<a href="https://www.youtube.com/watch?v=9GMBpZZtjXM&amp;list=PLD8E646BAB3366BC8">https://www.youtube.com/watch?v=9GMBpZZtjXM&amp;list=PLD8E646BAB3366BC8</a>
3.	<a href="https://www.youtube.com/watch?v=jkdMtmXo664&amp;list=PL3zvA_WajfGAwLuULH-L0AG9fKDgplyNe">https://www.youtube.com/watch?v=jkdMtmXo664&amp;list=PL3zvA_WajfGAwLuULH-L0AG9fKDgplyNe</a>

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code	01MEL204	Course Name	Machine Tools and Processes			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	0	0	3	25	25	50
<b>Prerequisites:</b> Manufacturing Processes						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	To explain to introduce and demonstrate fundamental of machining process and machine tools.					
02	To develop of knowledge and importance of metal cutting parameter, tool material, cutting fluid and tool wear mechanism.					
03	To apply knowledge of basic mathematics to calculate basic machining parameters for different machining process.					
04	To acquire knowledge of advance machining processes and to study Nonconventional Machining.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Understand Basic working principle, Configuration, Specification and classification of machine tools.					
02	Apply knowledge to generate various shapes using different traditional and advance machine tools.					
03	Understand Working Principle and Applications of nontraditional machining.					
04	Apply knowledge to generate various shapes of nonmetals using different Nontraditional machining process.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Basics of machine tool lathe &gt;</b>					<b>7 Hours</b>
Introduction and classification of machine tool and machining processes, characteristics of tools, single point tool geometry, tool materials, coolants, introduction to cutting speed, feed, depth of cut of tools (single point), orthogonal cutting, oblique cutting, types of chips, Lathe: Introduction, working principle, types, specifications, principal parts, accessories, attachments, and various lathe operations, Calculations of Change gears for thread cutting.						
<b>Unit II</b>	<b>&lt; Traditional machine tools lathes drilling boring &gt;</b>					<b>6 Hours</b>
Capstan, turret lathe- Principal parts, Working, comparison with center lathe, Turret indexing mechanism, Bar feeding mechanism, Turret tool holders. Boring Machines-Horizontal and vertical boring machine, Construction and operation, boring tools and bars. Introduction to Jig boring-machine Drilling Machines - Classification of drilling machines, Construction and working of radial drilling machine, Various accessories and various operations. Introduction.						
<b>Unit III</b>	<b>&lt;Traditional machine tools Milling Machine and Gear Manufacturing&gt;</b>					<b>7 Hours</b>
Milling Machine - Classification of milling machines, construction and working of column and knee type, milling machines, milling operations, Study of standard accessories-dividing head, Rotary table, Gear cutting on milling machine, Change gear calculations, vertical milling attachment for horizontal milling machine Gear Manufacturing Processes -Study of various processes like gear shaping, Gear hobbing. Gear finishing processes –Gear shaving, Gear burnishing and gear rolling.						
<b>Unit IV</b>	<b>&lt; Advanced Machining Processes &gt;</b>					<b>6 Hours</b>
Introduction to Router machine, Laser Engraving Machine, 3D Printing classification (metal/non-metal) FDM, Metal Spraying machine						



Unit V	< Advanced Machining Processes >	6 Hours
Fundamental principle, machining unit, tool material, advantages, limitations and applications of Abrasive Jet Machining, Electrical Discharge machining, Electro- Chemical machining, Laser beam machining, Ultrasonic machining, Water jet machining, Basic of CNC, G -Code, M- code, Insert specification, tool holder specification, introduction to jig and fixture.		
Unit VI	< Forming Processes and Plastic Working >	7 Hours
Various metal forming operations, hot and cold working of metals such as forging, rolling, extrusion, wire drawing, sheet metal working, spinning, swaging, thread rolling, metal forming defects. Plastic Moulding: Blow moulding, compression moulding, transfer moulding, injection moulding, extrusion, thermos-forming, rotational moulding, foam moulding and calendaring etc.		
<b>Texts Books:</b>		
1	"A Textbook of Production Technology (Manufacturing Processes)", P.C. Sharma, S. Chand and Company Pvt. Ltd, New Delhi. 7 <sup>th</sup> Edition, 2010.	
2	"Elements of Workshop Technology vol. II", S.K. Hajra Choudhury and A.K. Hajra Choudhury, Media promoters and Publishers Pvt. Ltd, New Delhi, 13 <sup>th</sup> Edition, 2012.	
3	"Workshop Technology vol. II", B.S. Raghuvanshi, Dhanapat Rai Publications Pvt. Ltd, New Delhi. 10 <sup>th</sup> Edition, 2000.	
<b>Reference Books:</b>		
1	"Workshop Technology", W.A.J. Chapman, CBS Publishing and Distributors, N. Delhi Vol. I [ISBN-13:9788123904016]2001, Vol.II [9788123904115] 2007 and Vol.III [9788123904122] 1995.	
2	"Machine Tools and Manufacturing Technology" , Steve F. Krar, Mario Rapisarda, Albert F. Check	
3	Mfg. Technology- Foundry, Farming and Welding, P. N.Rao, Tata MGH Publi, 2, 2009	
4	Production Technology: Vol.1: Manufacturing Processes, P.C. Sharma, S. Chand, 1, 2006	
5	Production Technology: Vol.2: Machine Tools, P.C. Sharma, S.Chand, 2, 2006	
<b>Supplementary Readings:</b>		
<b>Useful Links:</b>		
<a href="https://www.britannica.com/technology/machine-tool/Modifications-of-basic-machines">https://www.britannica.com/technology/machine-tool/Modifications-of-basic-machines</a>		

Second Year B. Tech. (Mechanical) (Semester-III)							
Course Code		MDM-I		Course Name		MDM-I	
Teaching Scheme				Evaluation Scheme			
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks	
2	0	0	2	25	25	50	
<b>Prerequisites:</b> Engineering Mechanics, Kinematics and Dynamics of Machinery, Manufacturing Processes )							
<b>Separate Syllabus &amp; Contents.</b>							

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		Course Name			Environmental Studies	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
1	1	0	2	25	25	50
<b>Prerequisites:</b> Science						
<b>Course Objectives:</b>						
01	To recall fundamental physical and biological principles those govern natural processes.					
02	To state the importance of ecological balance for sustainable development.					
03	To describe the impacts of developmental activities and mitigation measures and to further understand the environmental policies and regulations.					
04	To identify the complex relationships between scientific approaches to environmental issues and political, social, economic, and ethical perspectives on the environment.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Explain the fundamental concepts of environmental science.					
02	Describe the importance of natural resources, ecosystem and biodiversity for maintaining ecological balance.					
03	Apply the environmental principles to various scenarios in society and industry.					
04	Illustrate the environmental issues and sustainable development.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Nature of Environmental studies &amp; Natural resources &gt;</b>				<b>5 Hours</b>	
Multidisciplinary nature of environmental studies with scope, Need for public awareness. Forest resources, Water resources, Mineral resources, Food resources, Energy resources, Land resources, Role of an individual in conservation of natural resources.						
<b>Unit II</b>	<b>&lt; Ecosystems &gt;</b>				<b>5 Hours</b>	
Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Food chains, food webs and ecological pyramids. Introduction, types, characteristics features, structure and function of the following Ecosystem: - a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems.						
<b>Unit III</b>	<b>&lt; Biodiversity and its Conservation &gt;</b>				<b>5 Hours</b>	
Introduction, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega-diversity nation; Western Ghats as a bio-diversity region; 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.						
<b>Unit IV</b>	<b>&lt; Environmental Pollution &gt;</b>				<b>5 Hours</b>	
Definition: Causes, effects and control measures of: a) Air pollution, b) Water pollution, c) Noise pollution. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. • Role of an individual in prevention of pollution. Disaster management.						
<b>Unit V</b>	<b>&lt; Social Issues and the Environment &gt;</b>				<b>5 Hours</b>	

From Unsustainable to Sustainable development; Water conservation, rain water harvesting, Environmental ethics: Issue and possible solutions; Global warming, ozone layer depletion, Wasteland reclamation; Consumerism and waste products.		
<b>Unit VI</b>	<b>&lt; Environmental Protection &gt;</b>	<b>5 Hours</b>
Environment Protection Act.; Air (Prevention and Control of Pollution) Act.; Water (Prevention and control of Pollution) Act; Wildlife Protection Act; Forest Conservation Act;		
<b>CIE Work :</b>		
Visit to a local area to document environmental assets river / forest / grassland / hill / mountain or Visit to a local polluted site—urban/rural/Industrial/Agricultural or Study of common plants, insects, birds or Study of simple ecosystems-ponds, river, hill slope. Write a practical field work project report based on environmental aspects.		
<b>Reference Books:</b>		
1	Environmental Studies: Handbook by Shivaji University, Kolhapur.	
2	Clark R. S., Marine Pollution, Clarendon Press Oxford (TB) Pg No. 6.	
3	Cunningham, W. P. Cooper, T. H. Gorhani, E. & Hepworth, M. T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.	
4	De A. K., Environmental Chemistry, Wiley Eastern Ltd.	
5	Down to Earth, Centre for Science and Environment ®	
6	Gleick, H., 1993, Water in crisis, Pacific Institute for Studies in Dev., Environment & security. Stockholm Env. Institute. Oxford Univ. Press 473p.	
7	Hawkins R. e., Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay	
<b>Supplementary Readings:</b>		

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEP205		Course Name		Community Engagement Project/Field Project
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		SEE Marks
0	0	4	2	50		--
<b>Prerequisites:</b> Social awareness						
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Define problem statement for selected project topic based on field visit and field survey.					
02	Draft objective of problem.					
03	Analyze the collected data of the selected problem.					
04	Write report for the project and give the presentation.					
05	Develop the technical solution to the selected problem statement.					
<b>Course Content:</b>						
The project should be undertaken preferably by a group of 4-5 students who will jointly work and implement the project. The topic for the project must be based upon societal problem or real-world problem. The group will select a problem with the approval of the guide and carry out requirements gathering and analysis, objective identification, data collection for the selected problem statement. Further the group will write report covering the details of project and give presentation. Students also have to maintain a diary of schedule, cost and other managerial activities. All phases of project along with diary should be considered for evaluation of community engagement project.						

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		MDM-I		Course Name		MDM-I Lab
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		See Marks
0	0	2	1	50		---
<b>Prerequisites:</b> MDM-I						
<b>Separate Syllabus &amp; Contents.</b>						

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEP206	Course Name		Applied Thermodynamics Lab.	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		SEE Marks
--	--	2	1	50		50
<b>Prerequisites:</b> Applied Thermodynamics						
<b>Course Objectives:</b>						
On completion of the course, student will be able -						
01	To study types of boiler and its mountings and accessories.					
02	To understand the steam generation process.					
03	To study various properties of lubricants.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Explain types of boiler and differentiate between water tube and Fire tube Boiler.					
02	Demonstrate the Boiler mountings and accessories.					
03	Describe the steam generation process.					
04	Perform experiments individually or in team to evaluate/analyze properties of lubricants.					
<b>List of Experiments</b>						
1	Study of construction, working and various types of steam boiler.					
2	Study and Demonstration of Water Tube and Fire Tube Boiler.					
3	Study and Demonstration of Boiler Mountings.					
4	Study and Demonstration of Boiler Accessories.					
5	Test on Grease Penetrometer.					
6	Test on Dropping Point apparatus.					
7	Test on Carbon residue apparatus.					
8	Test on Cloud and Pour Point apparatus.					
9	Test on Redwood Viscometer.					
10	Test on Aniline Point Apparatus.					
11	Study/Trial on Steam Generator.					
12	Study of properties of various lubricants.					
13	Report on Industrial Visit to a steam power plant.					
<b>Note:</b> Minimum 8 experiments to be conducted from the above list.						
<b>Texts Books:</b>						
1	"Thermal Engineering", R. K. Rajput, Laxmi Publications, 3rd Edition					
2	"Thermal Engineering", Ballaney P.L, Khanna Publishers, New Delhi, 27th Ed.					
3	"Thermal Engineering", Mathur and Mehta, Jain Bros. Publishers, Delhi, 3rd Ed..					
<b>Reference Books:</b>						
1	"Engineering Thermodynamics", P.K. Nag., Tata McGraw Hill, New Delhi, 4th Ed.					
2	"Fundamentals of Thermodynamics", Claus Borgnakke, Sonntag R.E., John Wiley & Sons.					
3	"Principles of Engineering Thermodynamics", Moran, Shapiro, Boettner, Wiley, 8th Edition					
4	"Applied Thermodynamics", Estop McConkey, Pearson Education, 5th Edition					

5	Engineering Thermodynamics” G. Rogers Yon Mayhew, Pearson Education, 4th Edition
6	“Thermal Engineering”, Kumar and Vasandani, D.S. Publisher Metropolitan Book Co, Delhi, 3rd Ed.
7	“Thermodynamics: an Engineering Approach”, Congel and Boles, Tata McGraw-Hill, New Delhi, 3 <sup>rd</sup> Edition.
8	“Engineering Thermodynamics”, D.P. Mishra, Cengage learning, 1st Edition
9	Principles of Engineering Thermodynamics, Moran, Shapiro, Boetnner, Wiley, 8th Ed. 10.
10	“Engineering Thermodynamics”, Gupta and Prakash, Nemichand and Sons, 2nd edition
11	“Steam and Gas Turbines”, R. Yadav, CPH Allahabad, 2nd Edition, 2005.
12	“Thermal Engineering”, M.M Rathod, Tata McGraw Hill, 1st Edition , 2010

**Supplementary Readings:**

<https://www.youtube.com/watch?v=rUB-hpek0NE>  
<https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8>  
[https://www.youtube.com/watch?v=jkdMtmXo664&list=PL3zvA\\_WajfGAwLuULH-L0AG9fKDgplYne](https://www.youtube.com/watch?v=jkdMtmXo664&list=PL3zvA_WajfGAwLuULH-L0AG9fKDgplYne)



Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEP207		Course Name		Analysis of Mechanical Elements Lab
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		SEE Marks
--	--	2	1	50		---
<b>Prerequisites:</b> Analysis of Mechanical Elements						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	To understand the basics for design of mechanical elements.					
02	To gain knowledge of different types of stresses, Strains and deformation induced in Mechanical Components due to external loads.					
03	To study the distribution of various stresses in Mechanical Elements due to various types of loads					
<b>Course Outcomes:</b> At the end of the course, students will be able to						
01	Student will be able to understand the concepts of various stresses and their significant effects in context with engineering applications.					
02	Study & Analyze different types of Beams					
03	Will be able to compute the principal stresses and strains by analytical and graphical methods.					
04	Analyze buckling and bending phenomenon in columns.					
<b>List of Experiments</b>						
<b>( Students can perform any 8 Assignments out of 10 )</b>						
1	Assignment on Stresses and Strains					
2	Assignment on Torsion					
3	Assignment on Shear Force Diagram and Bending Moment Diagram					
4	Assignment on Bending Stresses in Beams					
5	Assignment on Shear Stresses in Beams					
6	Assignment on Principal Stresses					
7	Assignment on Columns					
8	Find out deflection and stresses induced in cantilever by using either ANSYS or equivalent software					
9	Find out deflection and stresses induced in simply supported beams by using either ANSYS or equivalent software					
10	Assignment on Fundamentals of Machine Design					
<b>Reference Books:</b>						
1	"Strength of Materials", S. Ramamrutham, Dhanpat Rai and Sons, New Delhi					
2	"Strength of Materials", R. K. Bansal, Laxmi Publication, 4th Edition					
3	"Strength of Materials", Khurmi Gupta, S. Chand Publication					
4	"Strength of Materials", R.K. Rajput, S. Chad Publication					
5	"Mechanics of structure", S.B Junnerkar, Charotar Publication House					
6	"Strength of Materials", S. S. Bhavikatti, Vikas Publication House					
7	"Strength of Materials", Timoshenko and Young, CBS Publication					
8	"Mechanics of Materials", S. S. Ratan, Tata McGraw Hill Publication, 2009					
9	"Strength of Materials", B. K. Sarkar, McGraw Hill Publication, 2003					
10	"Strength of Materials", L. S. Negi, McGraw Hill Publication, 2008					
11	"Design of Machine Elements", V. B. Bhandari, Tata McGraw Hill Publication, 2021					
<b>Supplementary Readings:</b>						
1]	<a href="http://www.youtube.com/playlist?list=PLAF9gGmnljKTIHVMhzAhto8xDSflauQJk">www.youtube.com/playlist?list=PLAF9gGmnljKTIHVMhzAhto8xDSflauQJk</a>					

- 2] [www.youtube.com/watch?v=La4UEa7hA7Q&list=PLJoALJA\\_KMOARYNi50T6b488kPUBbOIsX](http://www.youtube.com/watch?v=La4UEa7hA7Q&list=PLJoALJA_KMOARYNi50T6b488kPUBbOIsX)  
 3] [www.youtube.com/watch?v=xMCreTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V](http://www.youtube.com/watch?v=xMCreTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V)

**Second Year B. Tech. (Mechanical) (Semester-III)**

Course Code		01MEP208	Course Name		Machine Shop Practice
Teaching Scheme				Evaluation Scheme	
L	T	P	Credits	CIE Marks	SEE Marks
--	--	2	1	50	50
<b>Prerequisites:</b> Manufacturing Processes					
<b>Course Objectives:</b>					
01	To explain construction and working of conventional machines.				
02	To develop the skills about manufacturing aspects.				
03	To aware students about safety measures while machining on different machines.				
04	To demonstrate different machining operations on machine tools.				
<b>Course Outcomes:</b>					
At the end of the course, students will be able to					
01	Plan the sequence of machining operations and prepare process sheet to manufacture a component and implement the same				
02	Perform various machining operations on different machines.				
03	To produce the component as per given drawing and specification.				
04	Function effectively as individual & as team member for performing experimental task.				
<b>List of Experiments</b>					
1	Description on thread manufacturing processes and gear train calculations.				
2	One job of plain turning, taper tuning, external threading and knurling operation with its process sheet				
3	One job of plain turning, taper tuning/ internal threading.				
4	Assembly of both jobs.				
5	Demonstration of surface grinding machine.				
6	Demonstration of shaper/planer (mechanisms and stroke).				
7	Demonstration of TIG/ MIG welding.				
8	Demonstration of Laser cutting, CNC router and 3D scanner.				
<b>Texts Books:</b>					
1	Manufacturing Technology- Foundry, Forming and Welding, P. N. Rao, Tata Mc-Graw Hill Publi. 2009.				
2	Production Technology: Vol.1, Manufacturing Processes, P.C. Sharma, S. Chand, 2006.				
3	Production Technology Vol. 2, Machine Tools, P.C. Sharma, S.Chand, Second, 2006.				
4	Workshop Technology Vol. 2, S.K. Hajra Choudhary, S.K. Bose, Media Promoters and Publishers Pvt Ltd., Twelfth, 2012.				
5	Foundry Technology, O.P. Khanna, Dhanpat Rai Publication, Fifteenth, 2011.				
6	Workshop Technology Vol. II, B.S. Raghuvanshi, Dhanpat Rai and Sons, Sixth, 2015.				
<b>Reference Books:</b>					
1	Materials and Processes in Manufacturing, E. Paul DeGarmo, J.T. Black, PHI Publication, Eighth, 1997.				
2	Mechanical Metallurgy, George E. Dieter, Tata McGraw Hill Publication, Third, 2013.				
3	Machine Tools and Manufacturing Technology, Steve F. Krar, Mario Rapisarda, Delmar Publisher, Second, 2010				
4	Workshop Technology, Vol. 2001, Vol. II 2007 and Vol. 111 1995, W.A.J. Chapman CBS Publishing and Distributors, N. Delhi, Fifth, 2001				

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEP209	Course Name		Machine Drawing Lab	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites :</b> Machine Drawing						
<b>Course Objectives:</b>						
01	To examine BIS conventions used in machine drawing.					
02	To examine the utilization of industrial production drawings.					
03	To study assembly and detail drawings.					
04	To study the functionality of various machine components.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Apply knowledge of BIS conventions.					
02	Identify and draw different machine components					
03	Read and apply limits, fits, and tolerances to industrial components and assembly.					
04	Demonstrate auxiliary projection, Interpenetration and section solid of drawings.					
<b>List of Experiments</b>						
1	To draw Bureau of Indian Standards (BIS) Conventions					
2	Sketching (Free hand drawing) of various machine components.					
3	To draw Auxiliary projection.					
4	To draw Interpenetration of solids.					
5	To draw sections of solids.					
6	To draw details and assembly drawing of components					
7	To Read and interpret industrial drawing					
<b>Texts Books:</b>						
1	N. D. Bhatt, "Machine Drawing", Charotar Publication House, Bombay.					
2	P.S. Gill, "Machine Drawing", S.K. Kataria and Sons, Delhi.					
3	R. K. Dhawan, "A text book of Engineering Drawing" S. Chand and Co.					
<b>Reference Books:</b>						
1	SP 46 (2003): Engineering Drawing Practice for Schools and Colleges [PGD 24: Drawings]					
2	IS 8000-1 (1985): Geometrical tolerancing on Technical Drawings, Part 1: Tolerances of form orientation, location and Run-out and appropriate geometrical definitions [PGD 24: Drawings].					
3	Ajeet Singh, "Machine Drawing includes AutoCAD", Tata McGraw Hill Education.					
4	Narayana, Kannaiah and Venkatareddy, Production Drawing, New Age International.					
<b>Note:</b> For experiment No.5 take actual measurements of components and enter Limits, Fits, Tolerances, Surface Finish symbols & Geometrical requirements etc. and draw details and assembly on A2 size sheet and on AutoCAD Software.						
<b>Supplementary Readings:</b>						
Useful links:						
1.	<a href="https://drive.google.com/drive/folders/1_xFCkQ4D71g4czf8DXw9PFL4fnxvJ0dW?usp=drive_link">https://drive.google.com/drive/folders/1_xFCkQ4D71g4czf8DXw9PFL4fnxvJ0dW?usp=drive_link</a>					
2.	<a href="https://drive.google.com/drive/folders/1uOGd2-ztUWGjD1cHRew59YE5QvDqXaQS?usp=sharing">https://drive.google.com/drive/folders/1uOGd2-ztUWGjD1cHRew59YE5QvDqXaQS?usp=sharing</a>					

Second Year B. Tech. (Mechanical) (Semester-III)						
Course Code		01MEP210	Course Name		Computer Aided Drawing	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites :</b> Drafting						
<b>Course Objectives:</b>						
On completion of the course, student will be able -						
01	Understand - a) Parametric Modeling Fundamentals and Procedure b) Computer Aided Manufacturing Fundamentals and Procedure					
02	Develop an ability to - a) Create constrained 2-D Sketches b) Create Solid Models of machine components with drafting c) Create assembly model (min. 5 components) with drafting					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Understand 3D modelling commands.					
02	Prepare design intent and apply appropriate command to construct solid model.					
03	Use the techniques, skills, and computer aided tools necessary for advance engineering practice.					
04	Understand and apply geometrical dimensioning and tolerances.					
<b>List of Experiments</b>						
1	Assignment on CAD and GUI.					
2	Assignment on CAD Sketcher (5 Exercises)					
3	Assignment on Solid modelling with drafting (2 Exercises)					
4	Assignment on Surface Modelling (2 Exercises)					
5	Assignment on Details and Assembly with drafting (1 Exercises)					
6	Assignment on G.D.& T (2 Assignments)					
<b>Note:</b> All experiments to be conducted.						
<b>Texts Books:</b>						
1	"CATIA V5 for Engineers and Designers, BY Sham Tikoo, Purdue University Northwest, USA, 13Ed.					
<b>Reference Books:</b>						
1	"Machine Drawing", N. D. Bhatt and V.M. Panchal, Charoter Publications 46Ed.					
2	ASME Y14.5, (2009)					
3	Help, Manuals and Tutorials of Referred Software					
4	"Machine Drawing", N. Siddheshwar, P. Kannaiah, V V S Sastry, Tata McGraw Hill, 2014.					

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		01MEL211	Course Name		Material Science	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	--	--	3	25	25	50
<b>Prerequisites :</b> Chemistry (General & Inorganic), Physics (Mechanics)						
<b>Course Objectives:</b>						
01	To understand the basics for design of mechanical elements.					
02	To gain knowledge of different types of stresses, Strains and deformation induced in Mechanical Components due to external loads.					
03	To study the distribution of various stresses in Mechanical Elements due to various types of loads.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Analyze the structure of materials at different levels					
02	Understand concept of mechanical behavior of materials and calculations of same using appropriate equations					
03	Explain the concept of phase and phase diagram and understand the basic terminologies associated with metallurgy					
04	Understand and suggest the heat treatment process and types					
05	Prepare samples of different materials for metallography					
06	Understand the strengthening mechanisms and suggest appropriate NDT technique					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Structure of Materials and Strengthening Mechanisms &gt;</b>					<b>7 Hours</b>
Crystal structures, indexing of lattice planes, Indexing of lattice directions, Imperfections in crystals-point defects, line defects, surface and bulk defects, Mechanism of plastic deformation, deformation of single crystal by slip, plastic deformation of polycrystalline materials. Refinement of grain size, cold working/ strain hardening, solid solution strengthening, dispersion strengthening, Precipitation hardening.						
<b>Unit II</b>	<b>&lt; Mechanical Properties and Testing &gt;</b>					<b>7 Hours</b>
Tensile test, engineering stress-strain curve, true stress-strain curve, types of stress-strain curves, compression test, bend test, torsion test, formability, hardness testing, different hardness tests-Vickers, Rockwell, Brinell, Impact test, fatigue test, creep test. Magnetic particle inspection, dye penetrant inspection, ultrasonic inspection, radiography, eddy current testing, acoustic emission inspection.						
<b>Unit III</b>	<b>&lt;Equilibrium Diagrams&gt;</b>					<b>6 Hours</b>
Definitions of terms, rules of solid-solubility, Gibb's phase rule, solidification of a pure metal, plotting of equilibrium diagrams, lever rule, Iron-iron carbide equilibrium diagram, critical temperatures, solidification and microstructure of slowly cooled steels, nonequilibrium cooling of steels, property variation with microstructures, classification and application of steels,, specification of steels, transformation products of austenite, TTT diagram, critical cooling rate, CCT diagram.						
<b>Unit IV</b>	<b>&lt; Heat Treatments of Steel &gt;</b>					<b>6 Hours</b>
Heat treatment of steels, cooling media, annealing processes, normalizing, hardening, tempering, quenching and hardenability, surface hardening processes-nitriding, carbonitriding, flame hardening, induction hardening						

Unit V	< Metallurgy and ferrous alloys >	6 Hours
<p>Microscopy, specimen preparation, polishing abrasives and cloths, specimen mounting, electrolytic polishing, etching procedure and reagents, electrolytic etching, optical metallurgical microscope, macroscopy, sulphur printing, flow line observations, examination of fractures, spark test, electron microscope,</p> <p><b>Carbon Steel:</b> Classification, types &amp; their composition, properties and Industrial application</p> <p><b>Alloy Steels:</b> Classification of alloy steels &amp; Effect of alloying elements, alloy steels, (Stainless steel, Tool steel) sensitization of stainless steel</p> <p><b>Designation</b> of carbon steel and alloy steels as per IS, AISI, SAE Standards</p> <p><b>Cast Iron:</b> Classification, types &amp; their composition, properties and Industrial application of (White CI, Gray CI, SG CI, Malleable Cast and alloy Cast Iron)</p>		
Unit VI	< Non Ferrous Materials >	6 Hours
<p>Classification of Non-Ferrous Metals: Study of Non-ferrous alloys with Designation, Mechanical &amp; other properties for Industrial Applications: Composition, Microstructure Microstructure and Property relationship of Copper and its Alloys Gilding Metal, Cartridge Brass, Muntz Metal, Tin Bronze, Beryllium Bronze Microstructure and Property relationship of Aluminium and its Alloy (LM5, Duralumin, Y-Alloy, Hinduminium), Nickel and its Alloys (Invar, Inconel), Titanium and its Alloys (<math>\alpha</math> Alloys, <math>\alpha</math>-<math>\beta</math> Alloys), Cobalt and its Alloys (Stellite Alloys, Alnico), Bearing Alloys (Classification, lead-based alloys, tin-based alloys), Age Hardening</p>		
<b>Texts Books:</b>		
1	V. D. Kodgire, S.V. Kodgire, "Material Science and Metallurgy for Engineers", Everest Publishing House, Pune, 24th edition, 2008	
2	W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, 5th edition, 2001.	
3	V. Raghvan, "Material Science Engineering", Prentice Hall of India Ltd., 1992.	
4	S. H. Avner, "Introduction to Physical Metallurgy", Tata McGraw Hill, 2 nd edition, 1997.	
5	R. A. Higgins, "Engineering Metallurgy: Part I", ELBS, 6th edition, 1996.	
<b>Reference Books:</b>		
1	V. B. John, "Introduction to Engineering Materials", ELBS, 6th edition, 2001.	
2	G. F. Carter, D. E. Paul, "Materials Science and Engineering", ASM International, 3rd edition, 2000.	
3	T. E. Reed-Hill, R. Abbaschian, "Physical Metallurgy Principles", Thomson, 3rd edition, 2003	
<b>Supplementary Readings:</b>		

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		OE-I	Course Name		Open Elective-I	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	--	--	3	25	25	50
<b>Prerequisites :</b>						
<b>Course Contents</b>						
<b>Separate Syllabus &amp; Contents.</b>						

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		01MEL212		Course Name		Fluid Mechanics and Machinery
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	--	--	3	25	25	50
<b>Prerequisites :</b> Engineering Mechanics (Statics), Calculus						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	To identify various properties of fluids and their SI units.					
02	To state and illustrate fundamentals of Fluid Statics, Kinematics and Dynamics.					
03	To identify and explain the fluid properties and concepts of Boundary layer.					
04	To study the use of Bernoulli's Equation for various applications.					
05	To understand the physics of fluid flow and its applications.					
06	To study various hydraulic machines and their characteristics.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Define /describe various properties of fluid, types of flow and working of hydraulic machines.					
02	Formulate and solve variety of simplified problems of fluid flow and hydraulic machines such as turbines and Centrifugal Pumps.					
03	Apply concepts of mass, momentum and energy conversations to design various pipe systems and hydraulic machines.					
04	Analyze performance characteristics of hydraulic machines such as turbines and pumps.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Fluid Properties and Fluid Statics &gt;</b>					<b>7 Hours</b>
Definition of fluid, Fluid as a continuum, Properties of fluid, Viscosity, Types of fluid. Compressibility, Surface tension, Capillarity and vapor pressure, Pascal's law, Hydrostatic law of pressure, Total Pressure, Centre of Pressure, Buoyancy, Meta center, Condition of Equilibrium of floating and submerged bodies. (No Numerical Treatment)						
<b>Unit II</b>	<b>&lt; Fluid Kinematics and Dynamics &gt;</b>					<b>6 Hours</b>
Eulerian and Lagrangian approach of fluid flow, Flow visualization, Total or material derivative for velocity field, Types of flow, Streamline, Path line, streak line, Stream tube, Continuity equation in Cartesian coordinates in three-dimensional form, Velocity and Acceleration of fluid particles, Stream function and velocity potential function. Equation of motion. Integration of Euler's equation as energy equation, Energy correction factor, concept of HGL and THL or TEL, Orifice meter, Venturimeter, Pitot tube, Flow over triangular and rectangular notches, Derivation of momentum equation.						
<b>Unit III</b>	<b>&lt; Pipe Flow and Boundary Layer Theory &gt;</b>					<b>7 Hours</b>
Laminar flow through circular pipes, Darcy's equation, Energy losses in transition, expansion and contraction, series and Parallel pipe, Siphon pipes and equivalent pipes. Moody's Diagram, Boundary layer thickness, its characteristics, Laminar and turbulent boundary layers, Separation, boundary layer control.						
<b>Unit IV</b>	<b>&lt; Impulse Water Turbines &gt;</b>					<b>6 Hours</b>
Impact of Jet, Euler's equation for work done in Rotodynamic Machines, Classification of water turbines, Pelton wheel, its construction and working, velocity Triangles. Types, Pelton wheel design bucket dimensions, Number of buckets, Jet diameter, Wheel Diameter, Jet ratio, Speed ratio, Number of jets,						



Calculation of efficiency, Power, Discharge. Governing of Pelton wheel. Model Testing, Unit quantities, Specific speed of turbine. Performance characteristics of turbine.

<b>Unit V</b>	<b>&lt; Reaction Water Turbines &gt;</b>	<b>6 Hours</b>
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Principle of operation, Construction and working of Francis turbine, Kaplan Turbine, Effect of modification of velocity triangles on runner shape, Draft tube, Cavitation Calculation of various efficiencies, Power, Discharge, Blade angles, Runner dimensions, Governing of Francis and Kaplan turbine, Draft tube-types and analysis. Model Testing, Specific speed of turbine, and Performance characteristics of turbine.

<b>Unit VI</b>	<b>&lt; Centrifugal Pumps &gt;</b>	<b>7 Hours</b>
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Working principles, Construction, Types, Various heads, multistage pumps, Velocity triangles, Minimum starting speed, Cavitation, Maximum permissible suction head (MPSH) and Net positive suction head (NPSH), Priming, calculations of efficiencies, Discharge, Blade angles, Head, Power required, Impeller dimensions, Specific speed and performance characteristics of pumps, Pump selection.

**Texts Books:**

- 1 "Fluid Mechanics", R. K. Bansal, Laxmi publications.
- 2 "Fluid mechanics and Hydraulic Machinery", R. K Rajput, Laxmi Publications.
- 3 "Fluid Mechanics and Hydraulic Machines", Ramamrutham, Dhanpat Rai Publishing Company.

**Reference Books:**

- 1 "Fluid Mechanics", V. L. Streeter and E. B. Wylie, Tata McGraw Hill Pvt Ltd. New Delhi .
- 2 "Introduction to Fluid Mechanics", Edward J. Shaughnessy, Oxford University press
- 3 "Mechanics of Fluid", Merle C. Potter, Prentis Hall of India, New Delhi .
- 4 "Fluid Mechanics", Fox and McDonald, John Wiley and Sons, New York.
- 5 "Fluid Mechanics", Fraizini, Tata McGraw-Hill, New Delhi.
- 6 "Fluid Mechanics", White, Tata McGraw-Hill, New Delhi..
- 7 "Fluid Mechanics", K. L. Kumar, S. Chand Publication. New Delhi.
- 8 "Fluid mechanics and Hydraulic Machines", Modi and Seth, Rajsons publications Pvt. Ltd.

**Supplementary Readings:**

1. <https://www.youtube.com/watch?v=fa0zHI6nLUo&list=PLbMVogVj5nJTZJHsH6uLCO0I-ffGyBEm&index=1>
2. [https://www.youtube.com/watch?v=TKk3Sqbsdbg&list=PLq7jO-L\\_k0yVmqNL4XVB9vOJ47\\_ysGYWn&index=1](https://www.youtube.com/watch?v=TKk3Sqbsdbg&list=PLq7jO-L_k0yVmqNL4XVB9vOJ47_ysGYWn&index=1)
3. <https://www.youtube.com/@rajkumarpatil8422>

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEL213	Course Name	Measurement and Metrology			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	--	--	3	25	25	50
<b>Prerequisites :</b> None						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	understand measuring instrument.					
02	gain the basic knowledge general dimensioning and tolerances.					
03	understand different measuring devices.					
04	understand methods of torque force measurement of various application.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Identify and use various measuring instruments and select appropriate instrument for particular feature measurement.					
02	Prepare and understand drawings with general dimensions, tolerances and surface finish and understand gauging system.					
03	Explain fundamentals of gear and thread measurement, Comparators					
04	Measure pressure, torque, temperature for particular application					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Introduction to Metrology, Linear System of Limits, Fits, Tolerance and Gauging &gt;</b>					<b>7 Hours</b>
Definition, objectives and concept of metrology, Need of inspection, Principles, process, methods of measurement, Classification & selection of measuring instruments and systems. Accuracy, precision & errors in measurement. System of measurement, Material Standard, Wavelength Standards, Line and End standards. Definition of tolerance, Specification in assembly, Principle of interchangeability and selective assembly, limits of size, Indian standards, concept of limits of size and tolerances, definition of fits, hole basis system, shaft basis system, types of fits & their designation, geometric tolerance, position-tolerances. Classification of gauges, brief concept of design of gauges (Taylor's principles), Wear allowance on.						
<b>Unit II</b>	<b>&lt; Comparators and Angular Measurement, Surface finish &gt;</b>					<b>7 Hours</b>
<b>Comparators:</b> Functional requirements, classification, mechanical- Johnson Mikrokator, sigma comparators, dial indicator, electrical- principles, LVDT, Pneumatic- back pressure gauges, Solex comparators and optical comparators- Zeiss ultra-optimeter. Angle measurement, measurement of angles- sine bar, sine center, angle gauges, Auto collimator, Surface finish terminology, Ra, Rz.						
<b>Unit III</b>	<b>&lt; Measurement of screw thread and gear &gt;</b>					<b>7 Hours</b>
Terminology of screw threads, measurement of major diameter, minor diameter, pitch, angle and effective diameter of screw threads by 2-wire and 3- wire methods, best size wire. Screw thread errors. Gear tooth terminology, tooth thickness measurement using constant chord method, base tangent method, measurement of pitch, concentricity, run out, and involute profile. Gear roll tester for composite error.						
<b>Unit IV</b>	<b>&lt; Measurement systems and basic concepts of measurement methods &gt;</b>					<b>6 Hours</b>
Definition, significance of measurement, generalized measurement system, definitions and concept of accuracy, precision, calibration, threshold, sensitivity, hysteresis, repeatability, linearity, loading effect, system response- time delay. Errors in measurement, classification of errors. Transducers, transfer						

efficiency, primary and secondary transducers, electrical, mechanical, electronic transducers, advantages of each type transducers.

<b>Unit V</b>	<b>&lt; Measurement of Force, Torque, Pressure &gt;</b>	<b>6 Hours</b>
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Direct methods and indirect method, force measuring instruments Torque measuring instruments, Types of dynamometers, Absorption dynamometer, Prony brake and rope brake dynamometer, and power measuring instruments. Pressure measurement, principle, pitot tube, pressure gauges, pressure transducers, use of elastic members, Bridgeman gauge, McLeod gauge, Pirani gauge.

<b>Unit VI</b>	<b>&lt; Strain and temperature Measurement &gt;</b>	<b>7 Hours</b>
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Theory of strain gauges, types, electrical resistance strain gauge, preparation and mounting of strain gauges, gauge factor, methods of strain measurement. Temperature Compensation, Wheatstone bridge circuit, orientation of strain gauges for force and torque, Strain gauge-based load cells and torque sensors. Resistance thermometers, thermocouple, law of thermocouple, materials used for construction, pyrometer, optical pyrometer.

**Texts Books:**

- |   |   |
|---|---|
| 1 | "Engineering Metrology", I.C. Gupta, Dhanpat Rai Publications.  |
| 2 | "Engineering Metrology", R.K. Jain, Khanna Publisher.   |
| 3 | "Engineering Metrology", M. Mahajan, Dhanpat Rai and Sons.  |
| 4 | "Engineering Metrology and Measurements", N.V. Raghvendra and L. Krishnamurthy Oxford University Press. |

**Reference Books:**

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|---|---|
| 1 | Engineering Metrology and Measurements, Bentley, Pearson Education  |
| 2 | Metrology and Measurement, Anand Bewoor & Vinay Kulkarni McGraw-Hill  |
| 3 | Mechanical Measurements and Instrumentations, Er. R K Rajput, Kataria Publication (KATSON)  |
| 4 | Mechanical Measurement and Metrology by R K Jain, Khanna Publisher Mechanical Measurement & Control by D.S. Kumar.  |
| 5 | Industrial Instrumentation & Control by S K Singh, McGraw Hill  |
| 6 | IS 8000-1 (1985): Geometrical tolerancing on Technical Drawings, Part 1: Tolerances of form orientation, location and Run-out and appropriate geometrical definitions [PGD 24: Drawings]. |

**Supplementary Readings:**

**Useful Links:**

[https://darshan.ac.in/gtu-study-material/3141901-Mechanical-Measurement-and-Metrology#navTab\\_Study\\_Material](https://darshan.ac.in/gtu-study-material/3141901-Mechanical-Measurement-and-Metrology#navTab_Study_Material)

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEL214	Course Name	Programming and Computational Methods			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
3	--	--	3	25	25	50
<b>Prerequisites:</b> Mathematics (up to Calculus )						
<b>Course Objectives:</b>						
01	To introduce numerical methods for solving engineering problems.					
02	To utilize the computer programming knowledge and prepare computer code for numerical methods.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Define the basic mathematical techniques, errors and approximations.					
02	Study the mathematical problem and select appropriate numerical method to solve the problem.					
03	Use modern tool such as Scilab, C, C++ and Excel to solve numerical problems.					
04	Understand the importance of Numerical methods for lifelong use.					
<b>Course Contents</b>						
<b>Unit I</b>	<b>&lt; Roots of Equation &gt;</b>					<b>7 Hours</b>
1 Errors: Introduction, Types of errors, Rules for estimate errors, Error propagation, Error in the approximation of function.						
2 Roots of Equation: Bracketing Method: Bisection Method, False position method. Open method: Newton Raphson's, Multiple Roots, Iteration system of nonlinear Equations.						
3 Roots of polynomial: Muller's Method. Problems based on engineering						
<b>Unit II</b>	<b>&lt; Linear Algebraic Equation &gt;</b>					<b>5 Hours</b>
Gauss Elimination Method- Naïve Gauss Elimination, Pitfalls of Elimination, Techniques of improving solutions, Gauss-Jordan method. Matrix Invention- LU decomposition, Gauss Seidel, Jacobi Iteration method. Problems based on engineering application.						
<b>Unit III</b>	<b>&lt; Curve Fitting &gt;</b>					<b>8 Hours</b>
Least Square Regression– Linear regression, Polynomial Regression. Interpolation – Newton's divided difference, Interpolating polynomial, Languages interpolating polynomial, with considering mechanical engineering application. Statistics: Mean and standard deviation, Addition and multiplication laws probabilities, Binomial, Poisson and normal distribution.						
<b>Unit IV</b>	<b>&lt; Numerical Differentiation and Integration &gt;</b>					<b>7 Hours</b>
Newton's cote's Integration of equation: Trapezoidal rule, Simpson's rules, Integration unequal segments. Integration of Equation: Romberg's Integration and Gauss Quadrature. Numerical differentiation, Differentiation formulae, Richardson extrapolation, Derivation of unequally spaced data, Forward difference, Central difference, backward difference, Problems based on engineering application.						
<b>Unit V</b>	<b>&lt; Ordinary Differential Equation &gt;</b>					<b>6 Hours</b>
Taylor's series method, Picard's Method, Runge-Kutta method, Euler's Method, Improved polygon method, System of equation. Boundary value and Eigen value problem, Shooting Method, Finite Difference Method,						

Eigen value problem based on polynomial method, Power method. Problems based on engineering application.

<b>Unit VI</b>	<b>&lt; Partial Differential Equation &gt;</b>	<b>6 Hours</b>
Finite Difference– Elliptical equation, Laplace's equation, Liebmen's Method, Secondary variables, Boundary condition. Finite Difference- Parabolic Equation, Explicit Method- Bender- Schmidt method, implicit method- Crank Nicolson Method. Problems based on engineering application.		

**Texts Books:**

1	Numerical Methods by Dr. B.S. Grewal.
2	Numerical Methods by Dr. Kandasamy.
3	Numerical Methods for Engineers by S.C. Chapra

**Reference Books:**

1	Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publication.
2	Numerical Methods by E Balguruswamy Tata McGraw Hill Publication
3	Introductory Method of Numerical Analysis by S.S. Sastry.
4	Numerical Methods by Dr. V.N. Vedamurthy. Vikas Publication.
5	Numerical Mathematics and Computing. Ward Cheney, CENGAGE 7th Edition.
6	Principles Analysis and Algorithms by Shrimanta Pal, OXFORD University Press.
7	Spreadsheet Tools for Engineers using Excel, Bryan S. Gottfield, McGraw Hill Pub

**Supplementary Readings:**

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Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		MDM-II		Course Name		MDM-II
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	SE-I Marks	SE-II Marks	SEE Marks
2	--	--	2	25	25	50
<b>Prerequisites:</b> MDM-I						
<b>Separate Syllabus &amp; Contents.</b>						

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEP215		Course Name	Material Science Lab		
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites:</b> Material Science						
<b>Course Objectives:</b> On completion of the course, student will be able –						
01	Suggest different mechanical tests					
02	Prepare specimen and analyze microstructure in the specimen					
03	Suggest heat treatment process for altering properties in steel samples					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Student will be able to understand the concepts of heat treatment process and types					
02	Prepare samples of different materials for metallography					
03	Student will be able to suggest and conduct mechanical testing					
04	Student will be able to detect defects using NDT methods					
05	Student will be able to predict the microstructure in ferrous materials					
<b>List of Experiments</b>						
<b>(Students can perform any 8 experiments)</b>						
1	Measurement of Tensile strength and ductility of mild steel					
2	Measurement of Hardness by Brinell and Rockwell Method					
3	Measurement of toughness of specimens by Izod and Charpy Impact test					
4	Demonstration of NDT methods. (Dye penetrant / magnetic particle / Ultrasonic testing)					
5	Study of crystal structure models for SC, BCC, FCC, HCP					
6	Preparation of specimen Microstructure study of alloys					
7	Study of Microstructure of Steels					
8	Study of the Microstructure of Cast Irons					
9	Conduct Heat Treatment on steel specimens (Annealing, Normalizing and Hardening)					
10	Conduct of Jominy end-quench test for hardenability					
<b>Submission:</b> Completed journal.						
<b>SEE:</b> Oral Examination at the end of semester based on experiments conducted						
<b>Texts Books:</b>						
1	V. D. Kodgire, S.V. Kodgire, "Material Science and Metallurgy for Engineers", Everest Publishing House, Pune, 24th edition, 2008					
2	W. D. Callister, "Materials Science and Engineering: An Introduction", John Wiley and Sons, 5th edition, 2001.					
3	V. Raghvan, "Material Science Engineering", Prentice Hall of India Ltd., 1992.					
4	S. H. Avner, "Introduction to Physical Metallurgy", Tata McGraw Hill, 2 nd edition, 1997.					
5	R. A. Higgins, "Engineering Metallurgy: Part I", ELBS, 6th edition, 1996.					
<b>Reference Books:</b>						
1	V. B. John, "Introduction to Engineering Materials", ELBS, 6th edition, 2001.					
2	G. F. Carter, D. E. Paul, "Materials Science and Engineering", ASM International, 3rd edition, 2000.					

3	T. E. Reed-Hill, R. Abbaschian, "Physical Metallurgy Principles", Thomson, 3rd edition, 2003
<b>Supplementary Readings:</b>	

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		MDM-II-P		Course Name		MDM-II Lab
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		SEE Marks
--	--	2	1	50		--
<b>Prerequisites:</b> MDM-II						
<b>Separate Syllabus &amp; Contents.</b>						



Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEP216		Course Name	Fluid Mechanics and Machinery Lab		
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites:</b> Fluid Mechanics and Machinery						
<b>Course Objectives:</b> On completion of the course, student will be able –						
01	To study flow measuring devices and working of turbines and pumps.					
02	To calibrate venturimeter and V notch minor and major losses in flow through pipes.					
03	To verify the Bernoulli's Theorem.					
04	To study minor and major losses in flow through pipes.					
05	To analyze performance characteristics of fluid and turbo machines.					
<b>Course Outcomes:</b> At the end of the course, students will be able to						
01	Explain working of flow measuring devices and fluid and turbo machines.					
02	Determine coefficient of discharge, friction factor and efficiencies of fluid and turbo machines.					
03	Verify and apply Bernoulli's equation in flow measuring devices and hydraulic machines.					
04	Perform experiments individually or in team to evaluate / analyze performance of fluid and turbo machines.					
<b>List of Experiments</b>						
<b>(Students can perform any 10 experiments)</b>						
1	Flow visualization by plotting of streamlines (Halshaw's apparatus).					
2	Calibration of Venturimeter.					
3	Calibration of V Notch.					
4	Verification of Bernoulli's Theorem.					
5	Determination of minor losses in pips-fittings.					
6	Determination of coefficient of friction in G. I. Pipe.					
7	Determination of coefficient of friction in P.V.C. Pipe.					
8	Study and trial on Pelton wheel.					
9	Study and Trial on Francis/ Kaplan turbine.					
10	Trial on Centrifugal Pump.					
11	Study and Trial on reciprocating compressor.					
12	Study and Trial on centrifugal blower.					
13	Study and demonstration of reciprocating pump and hydraulic ram.					
14	Study of other types of pumps- Gear pump, Jet pump, Submersible pump, Air lift pump.					
15	Industrial visit to Pump manufacturing Industry or Hydro Power Plant.					
<b>Note:</b> Minimum 8 Experiments to be conducted from above list.						
<b>Submission:</b> completed journal.						
<b>SEE:</b> Practical/Oral Examination at the end of semester based on experiments conducted						
<b>Texts Books:</b>						
1	"Fluid Mechanics", R. K. Bansal, Laxmi publications.					

2	"Fluid mechanics and Hydraulic Machinery", R. K Rajput, Laxmi Publications.
3	"Fluid Mechanics and Hydraulic Machines", Ramamrutham, Dhanpat Rai Publishing Company.
<b>Reference Books:</b>	
1	"Fluid Mechanics", V. L. Streeter and E. B. Wylie, Tata McGraw Hill Pvt Ltd. New Delhi .
2	"Introduction to Fluid Mechanics", Edward J. Shaughnessy, Oxford University press
3	"Mechanics of Fluid", Merle C. Potter, Prentis Hall of India, New Delhi .
4	"Fluid Mechanics", Fox and McDonald, John Wiley and Sons, New York.
5	"Fluid Mechanics", Fraizini, Tata McGraw-Hill, New Delhi.
6	"Fluid Mechanics", White, Tata McGraw-Hill, New Delhi..
7	"Fluid Mechanics", K. L. Kumar, S. Chand Publication. New Delhi.
8	"Fluid mechanics and Hydraulic Machines", Modi and Seth, Rajsons publications Pvt. Ltd.
<b>Supplementary Readings:</b>	
1.	<a href="https://www.youtube.com/watch?v=fa0zHI6nLUo&amp;list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm&amp;index=1">https://www.youtube.com/watch?v=fa0zHI6nLUo&amp;list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm&amp;index=1</a>
2.	<a href="https://www.youtube.com/watch?v=TKk3Sqbsdbg&amp;list=PLq7jO-L_k0yVmqNL4XVB9vOJ47_ysGYWn&amp;index=1">https://www.youtube.com/watch?v=TKk3Sqbsdbg&amp;list=PLq7jO-L_k0yVmqNL4XVB9vOJ47_ysGYWn&amp;index=1</a>
3.	<a href="https://www.youtube.com/@rajkumarpatil8422">https://www.youtube.com/@rajkumarpatil8422</a>

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEP217	Course Name	Measurement & Metrology Lab			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites:</b> Measurement and Metrology						
<b>Course Objectives:</b> On completion of the course, student will be able to –						
01	To understand measuring instrument					
02	To gain the basic knowledge general dimensioning and tolerances					
03	To understand different measuring devices.					
04	To understand methods of torque force measurement of various application.					
<b>Course Outcomes:</b> At the end of the course, students will be able to –						
01	Identify and use various measuring instruments and select appropriate instrument for particular feature measurement.					
02	Prepare and understand drawings with general dimensions, tolerances and surface finish and understand gauging system.					
03	Explain fundamentals of gear and thread measurement, Comparators					
04	Measure pressure, torque, temperature for particular application					
<b>List of Experiments</b>						
1	Study and use of Linear Measuring Instruments					
2	Study and use of Comparators.					
3	Study and use of angular Measuring Instruments.					
4	Screw Thread Measurement					
5	Spur Gear Measurement					
6	Study of surface finish measurement methods.					
7	Use of Optical Profile Projector					
8	Testing of Mechanical pressure gauge using Dead weight pressure gauge tester.					
9	Angular speed measurement using Stroboscope, Photo-electric pick up & magnetic pickup					
10	Measurement of temperature using Thermocouple, RTD, Thermistors and pyrometers					
11	Force and torque measurement using strain gauges					
12	Industrial Visit to Metrology laboratory or quality control department. Visit report on it.					
<b>Texts Books:</b>						
1	"Engineering Metrology", I.C. Gupta, Dhanpat Rai Publications.					
2	"Engineering Metrology", R.K. Jain, Khanna Publisher.					
3	"Engineering Metrology", M. Mahajan, Dhanpat Rai and Sons.					
4	"Engineering Metrology and Measurements", N.V. Raghvendra and L. Krishnamurthy Oxford University Press.					
<b>Reference Books:</b>						
1	Engineering Metrology and Measurements, Bentley, Pearson Education					
2	Metrology and Measurement, Anand Bewoor & Vinay Kulkarni McGraw-Hill					
3	Mechanical Measurements and Instrumentations, Er. R K Rajput, Kataria Publication (KATSON)					

4	Mechanical Measurement and Metrology by R K Jain, Khanna Publisher Mechanical Measurement & Control by D.S. Kumar.
5	Industrial Instrumentation & Control by S K Singh, McGraw Hill
6	IS 8000-1 (1985): Geometrical tolerancing on Technical Drawings, Part 1: Tolerances of form orientation, location and Run-out and appropriate geometrical definitions [PGD 24: Drawings].
<b>Supplementary Readings:</b>	
<a href="https://darshan.ac.in/gtu-study-material/3141901-Mechanical-Measurement-and-Metrology#navTab_Study_Material">https://darshan.ac.in/gtu-study-material/3141901-Mechanical-Measurement-and-Metrology#navTab_Study_Material</a>	

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		01MEP218		Course Name		Programming and Computational Methods Lab
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks		SEE Marks
--	--	2	1	50		---
<b>Prerequisites:</b> Programming and Computational Methods						
<b>Course Objectives:</b> On completion of the course, student will be able to–						
01	To introduce numerical methods for solving engineering problems.					
02	To utilize the computer programming knowledge and prepare computer code for numerical methods.					
<b>Course Outcomes:</b> At the end of the course, students will be able to–						
01	Define the basic mathematical techniques, errors and approximations.					
02	Study the mathematical problem and select appropriate numerical method to solve the problem.					
03	Use modern tool such as Scilab, C, C++ and Excel to solve numerical problems.					
04	Understand the importance of Numerical methods for lifelong use.					
<b>List of Experiments</b>						
1	Assignment on Roots of equation (Bracketing Method)					
2	Assignment on Roots of equation (Open Method)					
3	Assignment on Gauss-Jordan method					
4	Assignment on Gauss-Seidal method					
5	Assignment on Languages interpolating polynomial					
6	Assignment on Least squares curve fitting method					
7	Assignment on Newton's cote's Integration of equation: Trapezoidal rule, Simpson's rules					
8	Assignment on Gauss Quadrature					
9	Assignment on Runge-Kutta method, Euler's method					
10	Assignment on Eigen value problem (Power method)					
11	Assignment on Elliptical equation, Laplace's equation, Liebman's Method					
<b>Submission:</b> Completed journal.						
<b>Texts Books:</b>						
1	Numerical Methods by Dr. B.S. Grewal.					
2	Numerical Methods by Dr. Kandasamy.					
3	Numerical Methods for Engineers by S.C. Chapra					
<b>Reference Books:</b>						
1	Higher Engineering Mathematics by Dr. B.S. Grewal, Khanna Publication.					
2	Numerical Methods by E Balguruswamy Tata McGraw Hill Publication					
3	Introductory Method of Numerical Analysis by S.S. Sastry.					
4	Numerical Methods by Dr. V.N. Vedamurthy. Vikas Publication.					
5	Numerical Mathematics and Computing. Ward Cheney, CENGAGE 7th Edition.					
6	Principles Analysis and Algorithms by Shrimanta Pal, OXFORD University Press.					
7	Spreadsheet Tools for Engineers using Excel, Bryan S. Gottfield, McGraw Hill Pub					
<b>Supplementary Readings:</b>						

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code	01MEP219	Course Name	Pattern Making and Sand Testing Lab			
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	50	
<b>Prerequisites:</b> Manufacturing process						
<b>Course Objectives:</b>						
01	To explain pattern and its types, material used allowances.					
02	To provide basic knowledge of sand testing, size analysis, moisture percentage, permeability test.					
03	To explain different manufacturing processes and machine tools during industrial visit.					
<b>Course Outcomes:</b>						
At the end of the course, students will be able to						
01	Explain different manufacturing processes and machine tools useful in industries.					
02	Prepare a pattern as per drawing.					
03	Conduct a test on grain size, moisture content, permeability, compressive strength, clay content of a given sand.					
04	Function effectively as an individual, and as a team member for performing experimental task.					
<b>List of Experiments</b>						
1	Grain Size analysis and Clay content testing of given molding sand.					
2	Preparation of green sand mold and Hardness testing.					
3	Moisture percentage and Permeability testing of given green sand.					
4	Preparation and testing of standard Specimen for Green Compressive strength.					
5	Preparation of Pattern Drawing.					
6	Preparation of Pattern for solid casting with allowances.					
7	Marking of dimensions on wooden pattern.					
8	Preparation of wooden Pattern with allowances.					
9	Preparation of Mold from Pattern prepared.					
10	Melting and pouring of casting in lab or Industrial visit to foundry shop.					
<b>Texts Books:</b>						
1	Manufacturing Technology- Foundry, Forming and Welding, P. N.Rao, Tata Mc-Graw Hill Publication, Second. 2009.					
2	Production Technology: Vol.1, Manufacturing Processes, P.C. Sharma, S. Chand, 2006.					
3	Production Technology Vol. 2, Machine Tools, P.C.Sharma, S.Chand, Second, 2006.					
4	Workshop Technology Vol.2, S.K.Hajra Choudhary, S.K.Bose, Media Promoters & Publishers, 2012.					
5	Foundry Technology, O.P.Khanna, Dhanpat Rai Publication, Fifteenth, 2011.					
6	Workshop Technology Vol.II, B.S. Raghuvanshi, Dhanpat Rai and Sons, Sixth, 2015.					
<b>Supplementary Readings:</b>						
1.	Materials and Processes in Manufacturing, E.Paul DeGarmo, J.T. Black, PHI Publication, Eighth, 1997.					
2.	Mechanical Metallurgy, George E.Dieter, Tata McGraw Hill Publication, Third, 2013.					
3.	Machine Tools & Manufacturing Technology, Steve F.Krar, Mario Rapisarda, Delmar Publisher, 2 <sup>nd</sup> , 2010.					
4.	Workshop Technology, Vol. 2001, Vol. II 2007 & III, 1995, W.A.J. Chapman CBS Publishing and Distributors, N.Delhi, Fifth, 2001.					

Second Year B. Tech. (Mechanical) (Semester-IV)						
Course Code		01MEP220	Course Name		Software Training	
Teaching Scheme				Evaluation Scheme		
L	T	P	Credits	CIE Marks	SEE Marks	
--	--	2	1	50	--	
<b>Prerequisites:</b> C Language						
<b>Course Objectives:</b> On completion of the course, student will be able -						
01	To learn and understand Python programming basics and relevant concepts.					
02	To acquire programming skills in Python language.					
03	To practice various computing strategies for Python-based solutions to real world problems.					
<b>Course Outcomes:</b> At the end of the course, students will be able to						
01	Understand the basic concepts related to python programming language.					
02	Design and implement python programs using various programming commands.					
03	Familiarize with types and applications python libraries.					
List of Experiments						
1	Introduction to python programming.					
2	Python programming using variables and numbers.					
3	Python programming using strings.					
4	Python programming using lists.					
5	Python programming using tuples.					
6	Python programming using conditionals structures.					
7	Python programming using functions.					
8	Simple python programming using any one of the python library.					
9	Applications of python programming in engineering domains.					
10	Assignment on use of python programming in AI and ML applications.					
<b>(Minimum 8 assignments from above list to be conducted)</b>						
Texts Books:						
1	Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372.					
2	R. Nageswara Rao, —Core Python Programming, Dreamtech.					
3	Python Programming - Using Problem Solving Approach, Reema Thareja, Oxford University Press (ISBN-0-19-948017-6).					
Reference Books:						
1	Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist, 2nd edition, Updated for Python 3, O'Reilly Media, Inc., 2016.					
2	Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365.					
3	Python Programming: A Modern Approach, Vamsi Kurama, Pearson.					
4	Introduction to Python, Kenneth A. Lambert, Cengage.					
5	Learning Python, Mark Lutz, Orielly.					
Supplementary Readings:						
<a href="https://www.w3schools.com/python/">https://www.w3schools.com/python/</a> <a href="https://www.tutorialspoint.com/python/index.htm">https://www.tutorialspoint.com/python/index.htm</a> Dictionaries: <a href="https://www.youtube.com/watch?v=daefaLgNkw0">https://www.youtube.com/watch?v=daefaLgNkw0</a>						