

# Government College of Engineering, Karad

## Second Year (Sem – III) B. Tech. Mechanical Engineering

### ME 2301: Engineering Economics

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	02	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

#### Course Outcomes (CO)

Students will be able to

1. Use EXCEL spreadsheets and financial functions to model and solve engineering economic analysis problems.
2. Define and provide examples of the time value of money.
3. Demonstrate the effects of depreciation, taxes, inflation and price changes in engineering economic analysis problems.
4. Solve economic problems involving comparison and selection of alternatives by using variety of analytical techniques

#### Course Contents

	Hours
<b>Unit 1</b> <b>Fundamentals of Economics</b> Definition of Economics, Relation between Science, Engineering, Technology and Economics, Scarcity and efficiency market, Command and mixed Economics. Basic elements of supply and demand, Law of demand –Elasticity of demand	( 6 )
<b>Unit 2</b> <b>Demand and Supply Analysis</b> Demand and supply analysis, Methods of demand forecasting,	( 6 )
<b>Unit 3</b> <b>Cost Analysis</b> Cost concepts and its types, Determinants of cost, Short and long run cost curves, Cost output decision, Cost estimation,	( 8 )
<b>Unit 4</b> <b>Price Analysis</b> Pricing determinants, Price determination under different market structures, Pricing policy and strategic pricing, Pricing methods in practice,	( 8 )
<b>Unit 5</b> Significance of cost in managerial decisions, Time value of money, Variable and Fixed over heads Break-even analysis, Profit-volume analysis, Concept of ROI	( 8 )
<b>Unit 6</b> Determinants of supply, Supply elasticity, Unusual supply curves Recent trends in economics	( 6 )

#### Text Books

1. Economics – Paul A. Samuelson and William D. Nordhaus, Tata McgrawHill Publishing Ltd, 20<sup>th</sup> edition 2019.
2. Engineering Economics – Vol. 1 – Tara Chand. NEM CHAND & BROS Publication 15<sup>th</sup> Edition, 2019
3. Financial Management – S. N. Maheswari, Sultan Chand And Sons publication 15<sup>th</sup> Edition, 2016
4. Essentials of Management – Koontz and O’ Donnel, McGraw Hill Higher Education; 4<sup>th</sup> Revised edition edition (1 March 1986).

#### Reference Books

1. Basic Financial Accounting for Management- Paresh Shah, Oxford University Press, New Delhi, 2007.
2. Managerial Economics in a global economy- Salvatore Dominick, Thomson South Western, 4<sup>th</sup> Edition, 2001.
3. Engineering Economic Analysis. - Newman, Donald G., Eschenbach, Ted G., and Lavelle, Jerome P. (2012). New York: Oxford University Press
4. Managerial Economics- Applications, Strategy and Tactics- Mc Guigan, Moyer and Harris, Thomson South Western, 10<sup>th</sup> Edition, 2005.
5. Fundamentals of Financial Management- Prasanna Chandra. Tata McgrawHill Publishing Ltd, 4<sup>th</sup> edition, 2005.

#### Useful Links

1. <https://msande.stanford.edu/>
2. <https://uwaterloo.ca/management-sciences/>

3.	<a href="https://www.crcpress.com/Economic-and-Financial-Analysis-for-Engineering-and-Project-Management/Ardalan/p/book/9781566768320">https://www.crcpress.com/Economic-and-Financial-Analysis-for-Engineering- and-Project Management/Ardalan/p/book/9781566768320</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	1				1						1	1	
CO 2		2		3										1	
CO 3				1		2							1		1
CO 4	2		2											1	

### Assessment Pattern(with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	4	4	2	15
Understand	4	4	3	15
Apply	3	3	2	10
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create				
TOTAL	15	15	10	60

# Government College of Engineering, Karad

## Second Year (Sem – III) B. Tech. Mechanical Engineering

### ME 2302: Mathematics for Mechanical Engineering

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

#### Course Outcomes (CO)

Students will be able to

1. Understand and apply the concepts of calculus and calculus of Variations in the domain of mechanical engineering.
2. Solve differential and Integro-differential equations using Laplace transform techniques
3. Understand application of Fourier transform technique in mechanical engineering domain
4. Understand use Matrix methods to solve engineering problems leading differential equations.

#### Course Contents

	Hours
<b>Unit 1</b> <b>Laplace Transform:</b> Definition, Properties of Laplace Transform, Evaluation of integrals by Laplace Transform, Inverse Laplace Transform and its Properties, Convolution theorem (without proof), Laplace Transform of Special functions - Heaviside's Unit Step Function, Unit Impulse Function and Periodic Functions.	( 8 )
<b>Unit 2</b> <b>Application of Laplace Transform:</b> Applications of Laplace Transform to solve Ordinary Differential Equations, Integro-Differential Equations and Simultaneous Ordinary Differential Equations.	( 6 )
<b>Unit 3</b> <b>Fourier Transform:</b> Fourier Integral Theorem (without proof), Fourier Sine and Cosine Integral, Fourier Transforms, Fourier Sine and Cosine Transforms, Inverse Fourier Transforms, Inverse Fourier Sine and Cosine Transforms, Mechanical applications of Fourier Transform to Solve Integral Equation.	( 8 )
<b>Unit 4</b> <b>Partial Differential Equations:</b> Linear Homogeneous partial differential equations of $n^{\text{th}}$ order with constant coefficients, Non-Homogeneous Linear Equations, Method of Separation of variables, Solution of Wave equation by D'Almbert's Method, Mechanical Applications: One and Two-Dimensional Heat flow Problems	( 8 )
<b>Unit 5</b> <b>Calculus of Variations:</b> Functionals, Definition, Euler's Equation, Extremal, Isoperimetric problems.	( 6 )
<b>Unit 6</b> <b>Matrices:</b> Powers of Matrix by Sylvester's theorem, Quadratic Forms, Reduction of Quadratic form to Canonical form using Orthogonal transformation, Classification of Definiteness of Quadratic Forms, Solution of Second Order Linear Differential Equation with Constant Coefficients by Matrix method.	( 6 )

#### Assignments

1. Assignment on Laplace Transform: solution of differential equations related to mechanical domain
2. Assignment on Fourier Transform: conversion of time domain data to frequency domain data
3. Assignment on Linear Homogeneous and Non-Homogeneous Partial Differential Equations: theoretical treatment of mechanical engineering problems
4. Assignment on Calculus of Variations: Determination of extremal
5. Assignment on Matrices: Solution of linear differential equations, conversion from quadratic to canonical form etc.

#### Text Books

1. Advanced Engineering Mathematics by Erwin Kreyszig, 8<sup>th</sup> Edition, Wiley India
2. Advance Engineering Mathematics by H.K.Dass, 22ed S.Chand publications.
3. Higher Engineering Mathematics by B.S. Grewal, 40<sup>th</sup> Edition, Khanna Publication
4. Applied Mathematics for Engineers & Physicist by L.R. Pipes and Harville

#### Reference Books

1. Dennis Zill and Warren Wright, Advanced Engineering Mathematics, Fourth Edition, Jones and Bartlett Student Edition, 2011 (Indian Edition).
2. Peter O'Neil, Advanced Engineering Mathematics, Seventh Edition, Cengage Learning, 2012 (Indian Edition).

3.	William Boyce and Richard DiPrima, Elementary Differential Equations and Boundary Value Problems, Ninth Edition, Wiley Student Edition, 2012 (Indian Edition).
4.	Michael Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson Education, 2002 (Indian Edition).
<b>Useful Links</b>	
1.	<a href="http://nptel.iitm.ac.in">http://nptel.iitm.ac.in</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	2	1				1						1	1	
CO 2		2		3										1	
CO 3				1		2							1		1
CO 4	2		2											1	

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	4	4	2	15
Understand	4	3	2	13
Apply	3	4	2	12
Analyse	2	2	2	10
Evaluate	2	2	2	10
Create				
TOTAL	15	15	10	60

**Government College of Engineering, Karad****Second Year (Sem – III) B. Tech. Mechanical Engineering****ME 2303: Engineering Thermodynamics**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

After successful completion student will be able to -

- Remember the concepts of entropy, available and unavailable energy.
- Analyse steam generation and different types of boilers.
- Analyse vapor processes and Thermodynamic vapor cycles
- Understand steam nozzle, steam turbine and air compressor.

**Course Contents**

		Hours
<b>Unit 1</b>	<b>Recapitulation of Fundamentals</b> The Clausius Inequality, Entropy, increase in entropy principle, Entropy balance, Entropy generation, Evaluation of the entropy change, T-ds relation, entropy change of solid and liquids, entropy change of ideal gases, Third law of thermodynamics, Available and Unavailable energy.	<b>(06)</b>
<b>Unit 2</b>	<b>Pure Substances</b> Properties of pure substance like refrigerants, steam; Formation of steam, Phase changes, Use of Steam Tables, Study of P-V, T-S and Mollier diagram for steam, Dryness fraction and its determination, P-H diagram of refrigerant, vapour compression refrigeration cycles, Boiler specifications and performance.	<b>(08)</b>
<b>Unit 3</b>	<b>Vapour Power Cycles</b> Carnot cycle, Rankine cycle, Comparison of Carnot cycle and Rankine cycle, Efficiency of Rankine cycle, Relative efficiency, Effect of superheat, boiler and condenser pressure on performance of Rankine cycle, Reheat & Regenerative cycle.	<b>(06)</b>
<b>Unit 4</b>	<b>Steam Nozzle and Steam Turbine</b> Steam nozzle: 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 under-cooling and degree of super saturation, Effects of super saturation. Steam turbine: Introduction, Classification of turbine Difference between Impulse and reaction steam turbine, Velocity diagrams, Flow through impulse reaction blades, Velocity diagram, and degree of reaction, Parson's reaction turbine.	<b>(10)</b>
<b>Unit 5</b>	<b>Air Compressors</b> Uses of compressed air, Classification of compressor. Air compressor terminology, Reciprocating compressors, Ideal single stage air compressor, Effect of clearance volume and expression for volumetric efficiency, Expression for work done having clearance, Power and efficiency of compressor, Ratio of cylinder diameters, Rotary compressors – Centrifugal and axial type.	<b>(06)</b>
<b>Unit 6</b>	<b>Gas turbine and Jet propulsion</b> Introduction, Classification – Constant pressure gas turbine, Constant volume gas turbine, Jet propulsion. Theoretical treatment.	<b>(04)</b>

**Text Books**

- P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications 3<sup>rd</sup> edition, 2006
- Thermodynamics and Thermal Engineering J. Rajadurai New age international, 1<sup>st</sup> edition 2003
- Thermal Engineering, Mahesh M. Rathore Tata McGraw Hill Publications First edition, 2010

**Reference Books**

- Engineering Thermodynamics, J.B. Jones and Dugan, Prentice –Hall Of India, 1<sup>st</sup> edition, Reprint in India 2006
- Y. Cengel & Boles: Thermodynamics – An Engineering Approach 1<sup>st</sup> edition Reprint 2000
- Fundamental of Engineering Thermodynamics, Rathakrishnan, Prentice –Hall Of India, 2<sup>nd</sup> edition, 2005
- S. Domkundwar, C. P. Kothandaraman, Anand Domkundwar, Thermal Engineering, Dhanpat Rai Publishers 3<sup>rd</sup> edition, 2001

**Useful Links**

- <https://nptel.ac.in/courses/112106133/>
- [https://swayam.gov.in/nd1\\_noc19\\_me57/preview](https://swayam.gov.in/nd1_noc19_me57/preview)

**Mapping of COs and POs**

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1	1	1		1									1	
CO 2	3	3	2	1	1	1	1						1		
CO 3	2	2													
CO 4		2	1										1		

**Assessment Pattern (with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	3	3	10
Understand	4	4	3	12
Apply	4	4	2	14
Analyse	2			12
Evaluate		4	2	12
Create				
TOTAL	15	15	10	60

<b>Government College of Engineering, Karad</b>			
<b>Second Year (Sem – III) B. Tech. Mechanical Engineering</b>			
<b>ME 2304: Fluid Mechanics &amp; Machines</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		<b>Duration of ESE</b>	<b>02 Hrs 30 Min</b>
<b>Course Outcomes (CO)</b>			
After successful completion of this course student will be able to -			
1.	Understand and apply mathematical knowledge to predict the properties and characteristics of a fluid.		
2.	Evaluate and major and minor losses associated with pipe flow in piping networks.		
3.	Understand the concept of dimensionless parameters.		
4.	Analyse the performance of pumps and turbines.		
		<b>Course Contents</b>	
<b>Unit 1</b>	<b>Fluid Properties</b> Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapour pressure, surface tension and capillarity. Pascal’s law, Hydrostatic law of pressure.	<b>(05)</b>	
<b>Unit 2</b>	<b>Fluid Kinematics and Dynamics</b> Eulerian and Lagrangian approach of fluid flow Continuity equation in Cartesian coordinates in three dimensional forms. Velocity and Acceleration of fluid particles, Stream function and velocity potential function. Equation of motion, Integration of Euler’s equation as energy equation. Bernoulli’s theorem, Application of Bernoulli’s theorem such as venturi-meter, orifice-meter, pitot tube, Derivation of momentum equation, Applications of momentum equation.	<b>(09)</b>	
<b>Unit 3</b>	<b>Flow through Circular Conduits</b> Hydraulic and energy gradient - Laminar flow through circular pipes, Laminar flow through parallel plates, Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation – Chezy’s equation - minor losses – Flow through pipes in series and parallel.	<b>(07)</b>	
<b>Unit 4</b>	<b>Dimensional Analysis</b> Need for dimensional analysis – methods of dimensional analysis – Similitude–types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis (Theoretical treatment only)	<b>(05)</b>	
<b>Unit 5</b>	<b>Pumps</b> Impact of jets - Euler’s equation - Theory of roto-dynamic machines– various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle - work done by the impeller - performance curves - Reciprocating pump- working principle	<b>(07)</b>	
<b>Unit 6</b>	<b>Turbines</b> Classification of turbines– heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner– draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.	<b>(09)</b>	
<b>Text Books</b>			
1.	Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.		
2.	S. Ramamrutham, “Hydraulic Fluid Mechanics and Fluid Machines”, Dhanpat Rai Publishing Company Ltd., 9 <sup>th</sup> edition, 2003		
3.	Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016		
<b>Reference Books</b>			
1.	Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011		
2.	White, “Fluid Mechanics”, McGraw Hill Publication, 8 <sup>th</sup> edition, 2010		
3.	Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010		
4.	Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011		
<b>Useful Links</b>			
1.	<a href="https://www.youtube.com/watch?v=fa0zHI6nLUo&amp;list=PLbMVogVj5nJTZJHsH6uLCO00l-ffGyBEM">https://www.youtube.com/watch?v=fa0zHI6nLUo&amp;list=PLbMVogVj5nJTZJHsH6uLCO00l-ffGyBEM</a>		

2.	<a href="https://www.youtube.com/watch?v=dafjkTM2nlg&amp;list=PLbMVogVj5nJSXjTminozHEFZJkN_ojx_e">https://www.youtube.com/watch?v=dafjkTM2nlg&amp;list=PLbMVogVj5nJSXjTminozHEFZJkN_ojx_e</a>
3.	<a href="https://www.youtube.com/watch?v=TKk3Sqbsdbg&amp;list=PLq7jO-L_k0yVmqNL4XVB9vOJ47_ysGYWn">https://www.youtube.com/watch?v=TKk3Sqbsdbg&amp;list=PLq7jO-L_k0yVmqNL4XVB9vOJ47_ysGYWn</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1					2						3	1	
CO 2	3	3	3	2									3	2	
CO 3	3	3	3	3									3	2	
CO 4	3	3	3	3									3	2	

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5		2	10
Understand	5		2	10
Apply	5	5	2	10
Analyse		5	2	15
Evaluate		5	2	15
Create				
TOTAL	15	15	10	60



**Government College of Engineering, Karad**

**Second Year (Sem – III) B. Tech. Mechanical Engineering**

**ME 2305 : Machine Tools & Processes**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	--	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Student will be able to

1. Apply the knowledge to produce simple components by casting process.
2. Classify different types of forming, Plastic Shaping and welding processes.
3. Identify basic working principle, Configuration, Specification and classification of machine tools.
4. Evaluate various non-traditional machining processes.

**Course Contents**

**Hours**

<b>Unit 1</b>	<p><b>Casting Processes</b>                      Importance of casting as manufacturing process, advantages and limitations of casting processes, foundry layouts and mechanization.                      Types of moulding and core making sands and their properties, Green sand, CO<sub>2</sub> sand, oil sand. cores and moulds.                      Gating: Functions, Components Design of gating systems-Elementary theory and simple calculations, gating systems.                      Introduction to permanent mould casting process: Gravity and pressure die-casting; Centrifugal casting.                      Melting and Pouring: Melting practices and Metallurgical control in Cupola furnace, Induction and Arc Furnace. Metal pouring equipments.                      Cleaning-fettling and inspection of casting.</p>	<b>(9)</b>
<b>Unit 2</b>	<p><b>Forming Processes</b>                      Rolling: Introduction, Hot and cold Rolling, Rolling Mill Classification, Defects in Rolling,                      Forging: Introduction, Hand Forging Operations, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer) Open and Closed Die Forging, Defects in Forging                      Extrusion: Introduction, Direct, Indirect, Tube, Defects in Extrusion                      Drawing: Introduction and Types of Wire, rod and pipe drawing, Defects in Drawing.</p>	<b>(6)</b>
<b>Unit 3</b>	<p><b>Joining Processes</b>                      Surface preparation and various joints.                      Arc Welding- TIG, MIG, Resistance welding, Soldering and Brazing.</p>	<b>(3)</b>
<b>Unit 4</b>	<p><b>Machine Tools for Metal Cutting</b>                      Lathe: Introduction, Working principle, types, specifications, principle parts, accessories, attachments, and various lathe operations, Numerical treatment of gear calculations.                      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.</p>	<b>(8)</b>
<b>Unit 5</b>	<p><b>Machine Tools for Metal Cutting</b>                      Shaping Machine: Types-crank shaper, hydraulic shaper, Crank and slotted link quick return mechanism, Table feed mechanism, various operations.                      Planing Machine: Types-standard double housing planer, principle parts, table drive and feed mechanism, various operations.                      Milling Machine: Classification of milling machines, construction and working of column and knee type, milling machines, milling operations, Study of standard accessories- dividing head, Gear cutting on milling machine.</p>	<b>(6)</b>

<b>Unit 6</b>	<b>Nonconventional Machining</b> Fundamental principle, machining unit, tool material, advantages, limitations and applications of Abrasive Jet Machining, Electrical Discharge machining, Electro- Chemical machining, Laser beammachining, Ultrasonic machining, Water jet machining.	<b>(6)</b>
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Assignments on above mentioned topics- Casting Processes, Forming Processes, Joining Processes, Machine Tools , Nonconventional Machining.

#### Text Books

1.	P. L. Jain, “Principles of Foundry Technology”, Tata McGraw-Hill, New Delhi, 2 <sup>nd</sup> Edition.2014
2.	P. N. Rao, “Manufacturing Technology- Foundry, Forming and Welding, Vol. I”, Tata-McGraw-Hill, New Delhi, 3 <sup>rd</sup> edition, 2014.
3.	O. P. Khanna, “Foundry technology”, Dhanpat Rai Publications, New Delhi .17 <sup>th</sup> Edition, 2013.
4.	O. P. Khanna, “Welding Technology”. Dhanapat Rai Publications
5.	P. C. Sharma, “A Textbook of Production Technology (Manufacturing Processes)”, S. Chand publications, New Delhi.7 <sup>th</sup> Edition, 2012.
6.	Amitabha Ghosh, Ashok Kumar, Mallik, “Manufacturing Science”, East-West Press Private Limited
7.	S.K. Hajra Choudhury and A.K. Hajra Choudhury, “Elements of Workshop Technology vol. II”, Media promoters and Publishers Pvt. Ltd, New Delhi,13 <sup>th</sup> Edition,2012.

#### Reference Books

1.	Hein and Rosenthal, “Principles of metal casting”, Tata McGraw-Hill Book, Company. New Delhi. 19 <sup>th</sup> Edition 2012
2.	ASTM Volumes on Welding, casting, forming and material selection.
3.	ASM Handbook, Volume- 15
4.	W .A. J. Chapman, “Workshop Technology”, CBS Publishing and Distributors, New Delhi Vol. I [ISBN-13:9788123904016]2001, Vol. II [9788123904115] 2007 and Vol. III [9788123904122] 1995.
5.	Production Technology by Hindustan Machine Tools(HMT),Bangalore-2001

#### Useful Links

1.	<a href="http://nptel.ac.in/video.php.subjectId-112105126">nptel.ac.in/video.php.subjectId-112105126</a>
2.	<a href="http://www.nptelvideos.in/2012/12/manufacturing-processes-ii.html">www.nptelvideos.in/2012/12/manufacturing-processes-ii.html</a>
3.	<a href="https://nptel.ac.in/courses/112/103/112103244/#">https://nptel.ac.in/courses/112/103/112103244/#</a>
4.	<a href="https://nptel.ac.in/courses/112/107/112107083/">https://nptel.ac.in/courses/112/107/112107083/</a>
5.	<a href="https://nptel.ac.in/courses/112/107/112107215/">https://nptel.ac.in/courses/112/107/112107215/</a>

### Mapping of COs and Pos

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3			1			2	1	1		1	2		1	2
CO 2	3			1											2
CO 3				1							1	2	1	2	
CO 4	3	2					2	1			1			2	

### Assessment Pattern(with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	04	04	03	15
Understand	03	03	02	15
Apply	03	03	02	10
Analyse	02	02	02	10
Evaluate	03	03	01	10
Create				
TOTAL	15	15	10	60

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – III) B. Tech. Mechanical Engineering</b>				
<b>ME 2306 Engineering Thermodynamics Lab</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Practical	02 Hrs/week		CT – 1	
Tutorials	--		CT – 2	
Total Credits	01		TA	25
			ESE	25
<b>Lab Outcomes (LO)</b>				
After successful completion students will be able to -				
1.	Understand working of boiler, mountings and accessories.			
2.	Determine quality of steam using steam calorimeter.			
3.	Evaluate performance of reciprocating and rotary compressor.			
4.	Evaluate properties of lubricant.			
<b>List of Experiments (Any Eight)</b>				
1	Demonstration of different types of boilers and its mounting and accessories.			
2	Determination of dryness fraction of steam using Throttling and separating calorimeter.			
3	Study of different types of steam condensers.			
4	Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance			
5	Study of compounding of steam turbines.			
6	Trial on steam power plant.			
7	Trial on reciprocating air compressor.			
8	Trial on air blower.			
9	Determination of flash and fire point of lubricating oil.			
10	Determination of cloud & pour point of lubricating oil.			
11	Determination of viscosity of oil using Redwood viscometer no.1.			
12	Report on industrial visit to a steam generating unit.			

### Mapping of Lo and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1	1				1			1	2				1		
LO 2	2	1							2						
LO 3	2				1	1			2				1		
LO 4	1	1	1		1				2				1	1	

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	07	8
Understand	-	-	07	6
Apply	-	-	07	6
Analyse	-	-	4	4
Evaluate	-	-	0	1
Create	-	-	-	-
TOTAL			25	25

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – III) B. Tech. Mechanical Engineering</b>				
<b>ME 2307: Fluid Mechanics and Machines Lab</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Practical	02 Hrs/week		CA	25
Tutorials	--		ESE	25
Total Credits	01			
<b>Lab Outcomes (LO)</b>				
Students will be able to do				
1.	Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks			
2.	Apply the basic concepts of fluid mechanics to carry out professional engineering activities in the field of fluid			
3.	Conduct trial and calculate performance parameters of different turbo machinery.			
4.	Obtain performance characteristics curves with their theoretical nature of different turbo machinery			
	<b>Course Contents</b>			<b>Hours</b>
	<b>Note: Any eight experiments with at least 5 trials</b>			
Experiment 1	Demonstration of Pressure Measuring Devices			(02)
Experiment 2	Verification of Bernoulli's equation.			(02)
Experiment 3	Calibration of venturimeter /Orifice-meter.			(02)
Experiment 4	Calibration of notches.			(02)
Experiment 5	Determination of coefficient of friction in pipes of different materials.			(02)
Experiment 6	Determination of minor losses in pipe-fittings.			(02)
Experiment 7	Trial on impulse turbine and plotting of Main/operating characteristics.			(02)
Experiment 8	Trial on any one reaction turbine and plotting of main/operating characteristics.			(02)
Experiment 9	Trial on centrifugal pump and plotting of operating characteristics			(02)
Experiment 10	Industrial visit to Pump/Turbine Manufacturing Industry or Hydro Power Plant.			
<b>List of Submission:</b>	1. Total number of Experiments: 8 2. Industrial Visit Report			

### Mapping of LOs and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1						3			3		2				
LO 2	2			2											
LO 3	2			3											
LO 4				2		2	2								

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	07	8
Understand	-	-	07	6
Apply	-	-	07	6
Analyse	-	-	4	4
Evaluate	-	-	0	1
Create	-	-	-	-
<b>TOTAL</b>			<b>25</b>	<b>25</b>

**Government College of Engineering, Karad****Second Year (Semester – III) B. Tech. Mechanical Engineering****ME 2308: Machine Drawing lab**

Teaching Scheme		Examination Scheme	
Lectures	02 Hrs/week	CT – 1	--
Tutorials	--	CT – 2	--
Practical	02 Hrs/week	CA	50
Total Credits	02	ESE	25*

**Lab Outcomes (LO)**

Students will be able to

1. Use BIS conventions in part drawings and assembly machine drawing.
2. Interpret given production drawings having surface roughness and tolerances.
3. Understand function of various machine components
4. Draw assembly drawing from given detail drawing and vice versa with tolerances and fits.

**Course Contents****Hours**

<b>Unit 1</b>	<b>Study of B.I.S. (Bureau of Indian Standards) Conventions</b> Significance and importance of various BIS Conventions as per IS SP 46, Conventional representation of engineering materials, BIS conventions for sectioning, conventional representation of screw threads and threaded parts, Internal and external threads, conventional representation of springs, conventional representation of gears and gearings, conventional representation of common machine elements (splined shaft, serrated shaft, Knurling, bearings, <i>etc</i> ). Symbolic representation of Welds as per BIS conventions.	<b>(06)</b>
<b>Unit 2</b>	<b>Surface Roughness, Limits, Fits and Tolerances</b> Terminology for surface roughness, Representation of surface roughness on drawing (Machining symbol), Relation between surface finish & Manufacturing processes. Significance of limit systems, terminology, Dimensional Tolerances, types of fits, Recommendations and selections, Geometric Tolerances, form and position, Representation of geometric tolerances on drawing, giving Tolerances for individual dimensions on a detail drawing.	<b>(06)</b>
<b>Unit 3</b>	<b>Sketching of Machine Component:</b> Importance of sketching and entering proportionate dimensions on sketches. Sketches of nuts (square and Hexagonal), Flanged nuts, Lock nuts, Dome nut, Capstan nut, Wing nut, Castle nut, Split pin, <i>etc</i> . Sketches of bolt (square and hexagonal), Cup headed or round headed bolt, T-headed bolt, countersunk headed bolt, Hook bolt, Headless tapered bolt, Types of foundation bolts, Studs, Washer, Set screws, Cap screws. Muff coupling, Protected and unprotected Flanged coupling, Universal coupling, Students should know the applications of above machine components.	<b>(06)</b>
<b>Unit 4</b>	<b>Detail Drawings</b> To prepare detail drawing from given assembly drawing of details. The number of parts is limited to ten to twelve. Preparation of details drawing from the following assemblies such as: Machine tool parts: Tool post, Tailstock, Machine vice, Chucks <i>etc</i> . Engine parts: Stuffing box, Crosshead assembly, Piston and connecting rod, <i>etc</i> . Miscellaneous parts: Valve assembly, Screw jack, Jigs and fixtures, Pipe vice <i>etc</i> . Assembly selected may include different types of sections.	<b>(06)</b>
<b>Unit 5</b>	<b>Assembly Drawing:</b> To prepare assembly drawing from given drawing of details. The number of parts is limited to ten to twelve. Machine tool parts: Tool post, Tailstock, Machine vice, Chucks <i>etc</i> . Engine parts: Stuffing box, Crosshead assembly, Piston and connecting rod, <i>etc</i> .	<b>(06)</b>

	Miscellaneous parts: Valve assembly, Screw jack, Jigs and fixtures, Pipe vice etc. Assembly selected may include different types of sections.		
<b>Term work</b>			
	Draw sheets (preferably on A2 drawing sheets) <b>Sheet No.1:</b> Sheet Based on BIS conventions		
	<b>Sheet No.2:</b> Sheet Based on limits, Fits and tolerances (Production drawing)		
	<b>Sheet No.3:</b> Sketching of various machine components (may be done separately on sketch book)		
	<b>Sheet No.5:</b> To draw details drawing from given assembly drawing		
	<b>Sheet No.6:</b> To draw assembly drawing from given details drawing		
<b>*ESE exam:</b>			
	Oral examination based on Drawing sheets submitted and any theory questions related to this course.		
<b>Text Books</b>			
1.	Dr. K. L. Narayana, Dr. P. Kannaiah, and K. Venkata Reddy, "Machine Drawing", New Age International Publishers, New Delhi 4 <sup>th</sup> edition, 2016		
2.	N. D. Bhatt & V. M. Panchal, "Machine Drawing by," Charotar Pub, Anand, Gujarat, 53 <sup>rd</sup> edition, 2016		
3.	P. S. Gill, "A Textbook of Machine Drawing", S. K. Kataria & sons, New Delhi, 18 <sup>th</sup> edition, 2014		
4.	N. D. Junnarkar, "Machine Drawing", Pearson Education, 2 <sup>nd</sup> edition, 2006		
<b>Reference Books</b>			
1.	SP 46: 2003 Engineering Drawing Practice for Schools & Colleges, Published by Bureau of Indian Standards, Manak Bhavan, 9 Bhadur Shah Zafarmarg, New Delhi 2		
2.	IS: 696 Code of Practice for General Engineering Drawings B.I.S. Publications		
3.	IS : 2709 Guide for Selection of Fits, B.I.S. Publications		
4.	IS:919 Recommendation for Limits and Fits for Engineering, B.I.S. Publications		
5.	IS: 8000 Part I, II. III. TV, Geometrical Tolerancing of Technical Drawings B.I.S. Publications.		
6.	Cecil Jenson, Jay D. Hesel & Dennis R. Short, "Engineering Drawing & Design", Tata McGraw Hill Publication, New Delhi, 7 <sup>th</sup> edition, 2012		
7.	"Design Data Book", P.S.G. College of Technology, Coimbatore, 2017		
8.	"Machine Tool Design handbook", CMTI, Tata McGraw Hill Publication, 2017		
<b>Useful Links</b>			
1.	<a href="https://www.slideshare.net/gunabalans1/machine-drawing-18283689">https://www.slideshare.net/gunabalans1/machine-drawing-18283689</a>		

### Mapping of COs and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1	2	2			1	2		2		2		1	2		1
LO 2	1	1				1		1		1		1	2		1
LO 3	1	1			3			2		1		1	2		1
LO 4	2	1			3			2		2		1	2		1

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	14	8
Understand	-	-	14	6
Apply	-	-	14	6
Analyse	-	-	8	4
Evaluate	-	-	0	1
Create	-	-	-	-
TOTAL			50	25

**Government College of Engineering, Karad**

**Second Year (Sem – III) B. Tech. Mechanical Engineering**

**ME 2309 :Workshop Practice -II**

Teaching Scheme		Examination Scheme	
Practical	02Hrs/week	CT – 1	-
Tutorials	--	CT – 2	-
Total Credits	01	CA	25
		ESE	-

**Laboratory Outcomes (CO)**

**Able to**

1. Prepare suitable pattern for particular application
2. Produce plastic jobs on moulding machine
3. Select and operate appropriate welding process
4. Identify and practice safety in industrial environment

Course Contents		Hours
<b>Unit 1</b>	Job preparation on pattern making.	( 6 )
<b>Unit 2</b>	Job preparation on plastic moulding.	( 6 )
<b>Unit 3</b>	Job preparation using various welding techniques.	( 6 )
<b>Unit 4</b>	Demonstration on safety in workshop.	( 4 )
<b>Unit 5</b>	Industrial visit to foundry.	( 4 )

**Text Books**

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., “Elements of Workshop Technology”, Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Richard Little, “Welding and Welding Technology.” TMH
3. Rao P.N., “Manufacturing Technology”, Vol. I and Vol. II, Tata McGrawHill House, 2017

**Reference Books**

1. Chapman series on Workshop Technology ,A Butterworth-Heinemann
2. Cnnur L.P., “Welding Handbook Vol I & II”, American Welding Society, 1989.
3. Schwartz M.M., “Metal Joining Manual”, McGraw Hill, NY 1979.

**Useful Links**

1. NPTL online courses

**Mapping of LOs and POs**

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
<b>LO 1</b>		1	1	1	1	1	1	1	1						1
<b>LO 2</b>	1	2													1
<b>LO 3</b>			1										1	2	
<b>LO 4</b>	1			1	1				3	1			1	1	

**Assessment Pattern (with revised Bloom’s Taxonomy)**

Knowledge Level	TA	ESE
Remember	10	-
Understand	08	-
Apply	05	-
Analyse	02	-
Evaluate		-
Create		-
<b>TOTAL</b>	<b>25</b>	<b>-</b>

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – III) B. Tech. Mechanical Engineering</b>				
<b>ME 2310: Industrial Training</b>				
<b>Teaching Scheme</b>		<b>Examination Scheme</b>		
Lectures	--		CT – 1	-
Tutorials	--		CT – 2	-
Total Credits	01		TA	25
			ESE	25
			<b>Duration of ESE</b>	-
<b>Course Outcomes (CO)</b>				
The students will be able to				
1.	Comprehend the knowledge gained during course work.			
2.	Learn and apply appropriate techniques, resources and modern engineering tools.			
3.	Accustomed with industrial environment			
4.	Understand functions of maintenance, purchase, R & D, materials management, Scheduling & dispatch, TQM and housekeeping particularly post COVID era.			
<b>Course Contents</b>				<b>Hours</b>
<p>The students have to undergo an industrial training of minimum two weeks in an industry preferably dealing with mechanical engineering and allied discipline after completion of first year during the summer vacation. He / she will work under supervision of institute guide and industrial guide. The students have to submit a report of the training undergone and make presentation before evaluation committee constituted by the department. An internal evaluation will be conducted for examining the quality and authenticity of contents of the report and award the marks. Report is based on compilation of work carried out related to machineries, measuring instruments, state-of-art technologies, plant layout, Industry organization chart, Management functions, Safety, rules and regulations, documentation work, Industry standards, processes and tools used, fixtures and gauges used, Industrial automation, Computerization and software used in various departments, product flow, testing and quality control checks, painting and packing procedures, housekeeping practices as identified etc. Quantum and quality of work will be monitored by industrial and academic guide both.</p>				
<p><b>Industrial Training Report Format:</b>  Each student should have different industrial training and its presentation.  The report should be of 20 to 30 pages.  For standardization of the report the following format should be strictly followed.</p> <ol style="list-style-type: none"> <li>1. Page Size: Trimmed A<sub>4</sub></li> <li>2. Top Margin: 1.00 Inch</li> <li>3. Bottom Margin: 1.32 Inches</li> <li>4. Left Margin: 1.5 Inches</li> <li>5. Right Margin: 1.0 Inch</li> <li>6. Para Text: Times New Roman 12 Point. Font</li> <li>7. Line Spacing: 1.5 Lines</li> <li>8. Page Numbers: Right Aligned at Footer. Font 12 Point. Times New Roman</li> <li>9. Headings: Times New Roman, 14 Point., Bold Face</li> <li>10. Certificate:  All students should attach standard format of Certificate as described by the department. Certificate should be awarded to batch and not to individual student. Certificate should have signatures of Guide, Head of Department and Principal.</li> <li>11. The entire report should be documented as one chapter with details like a. “Name of Industry with address along with completed training certificate” b. Area in which Industrial training is completed  All Students have to present their reports individually.</li> </ol>				



### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3		1			1		1	2	2		2			2
CO 2	2										1		1		
CO 3	3		1			2		2	1	3		1	1	1	2
CO 4	3								2	3	2				2

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	08	-
Understand	-	-	10	-
Apply	-	-	07	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL			25	

**Government College of Engineering, Karad****Second Year (Sem – IV) B. Tech. Mechanical Engineering****ME 2401: Industrial Instrumentation**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

At the end of this course, student will be able to:

- Describe the generalized measurement systems and instruments in order to understand the basic principles and applications in the process industries.
- Understand the performance characteristics, calibration of transducers/instruments and identify application-wise components of measurement systems.
- Select the most appropriate measurement system for a given application with important principles relevant to installing instrumentation systems and their proper commissioning.
- Interpret error analysis, measurement of miscellaneous variables and major aspects of control with elaboration on futuristic developments in the area.

**Course Contents****Hours**

<b>Unit 1</b>	<b>Introduction to Instrumentation System:</b> Typical applications on Instrument systems, Methods of measurements, functional elements of a measurement system, functional elements of instruments, classification of instruments, static and dynamic performance characteristics of instruments, standards and calibration, sensors and transducer elements, Types of errors and uncertainty analysis.	<b>(06)</b>
<b>Unit 2</b>	<b>Temperature and Pressure Measurement:</b> Temperature scales, Mechanical thermometers-types, Electrical thermometers- types, Mechanical pressure instruments- manometers, elastic type pressure gauges, Electrical methods of pressure measurement, Special pressure measurement, Vacuum sensors- types. Calibration of temperature and pressure measurement instruments.	<b>(06)</b>
<b>Unit 3</b>	<b>Force, Torque and Velocity Measurement</b> Force (Weight) measurement, Mechanical balances-types, Accelerometer type force measurement, Electromagnetic balance, Mechanical load cells- types, Elastic deflection force transducers- types, Torque Measurement- sensors-types, Speed and Velocity Measurements- Tachometers- types, Contact & noncontact type, Tachometer generator, Speed measuring sensors & pickups.	<b>(08)</b>
<b>Unit 4</b>	<b>Acceleration and Vibration Measurement:</b> Seismic- acceleration pick-ups-types, LVDT accelerometer, Electrical-resistance strain gauge accelerometer, Piezoelectric accelerometer, Capacitive accelerometer, Servo type accelerometer, angular accelerometer, vibration pick-ups, Mechanical vibration sensors, Calibration of vibration pick-ups.	<b>(07)</b>
<b>Unit 5</b>	<b>Flow and Level measurement:</b> Mechanical flow meters-types, Mass flow meters-types, Electrical flow meters, Ultrasonic flow meters, Anemometers- principle, types, Mechanical anemometer-types, Flow meter calibration, Flow meter selection. Level measurement- types, Float type level indication, magnetic flow device, Level measurement-electrical methods, Ultrasonic level sensors, Optical level sensors, Laser level devices, Level switches.	<b>(07)</b>
<b>Unit 6</b>	<b>Viscosity, Humidity and Moisture measurement:</b> Viscosity measurement types, selection of viscometers, Humidity measurement- types, Measurement of moisture in gases and liquids- types of Hygrometers, Measurement of moisture in solids- types of gauges.	<b>(06)</b>

**Tutorials-** -- Assignments on each Unit- 6 Nos.

**Text Books**

- “Mechanical Measurement and Control” D.S. Kumar, Metropolitan Book Co. Pvt. Ltd., New Delhi, 4<sup>th</sup> Edition, 2007.

2.	“Instrumentation Measurement and Analysis”, B. C. Nakra, K. K. Chaudhry, McGraw Hill, New Delhi, 3 <sup>rd</sup> Edition, 20012.
3.	“Industrial Control & Instrumentation”, W. Bolton, Orient Logman Limited Prentice Hall Publication, 3 <sup>rd</sup> Edition.
4.	“Industrial Instrumentation and Control”, S. K. Singh, Tata McGraw Hill, 2 <sup>nd</sup> Edition, 2005.

#### Reference Books

1.	“Mechanical Measurement”, Beckwith and Buck, Pearson Education Asia, 5 <sup>th</sup> Edition, 2001.
2.	“Measurement Systems”, Doebelin Emesto, McGraw Hill International Publication Co. New York, 4 <sup>th</sup> Edition, 1990.
3.	“Industrial Instrumentation”, K. Krishnaswamy, S. Vijayachitra, New Age International Publishers, 2 <sup>nd</sup> Edition, 2010.
4.	“Theory and Design for Mechanical Measurements”, Richard S. Figliola, Donald E. Beasley, Wiley India, 1 <sup>st</sup> Edition.

#### Useful Links

1.	<a href="https://instrumentationtools.com/">https://instrumentationtools.com/</a>
2.	<a href="https://en.wikipedia.org/wiki/Instrumentation">https://en.wikipedia.org/wiki/Instrumentation</a>
3.	<a href="https://www.nature.com/articles/181073a0">https://www.nature.com/articles/181073a0</a>
4.	<a href="https://control.com/technical-articles/industrial-instrumentation-and-control-an-introduction-to-the-basic-principles/">https://control.com/technical-articles/industrial-instrumentation-and-control-an-introduction-to-the-basic-principles/</a>

#### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1	1	-	-	-	-	-	-	-	-	2	2	2	3
CO 2	3	2	2	-	1	1	-	-	1	-	1	2	3	2	3
CO 3	3	2	2	-	2	-	-	-	-	-	-	2	3	2	3
CO 4	3	2	1	1	2	-	-	-	-	-	-	2	3	2	3

#### Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	4	2	10
Understand	5	5	3	20
Apply	5	3	4	15
Analyse	0	2	1	10
Evaluate	0	1	0	5
Create	0	0	0	0
TOTAL	15	15	10	60

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – IV) B. Tech. Mechanical Engineering</b>				
<b>ME2402: Programming for Problem solving</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Lectures	03Hrs/week		CT – 1	15
Tutorials	01Hrs/week		CT – 2	15
Total Credits	04		TA	10
			ESE	60
			<b>Duration of ESE</b>	<b>02 Hrs 30 Min</b>
<b>Course Outcomes (CO)</b>				
The students will be able to				
<b>1.</b>	Understand and remember basic concepts of Numerical Methods.			
<b>2.</b>	Apply introductory engineering problems using Numerical Methods.			
<b>3.</b>	Analyze basic functions and advantages of different Numerical Methods.			
<b>4.</b>	Evaluate numerical results and approximations with field problems.			
	<b>Course Contents</b>			<b>Hours</b>
<b>Unit 1</b>	<p>Brief review of analytical/exact methods for solving algebraic and differential equations; imitations of exact methods and role of numerical methods to find approximate solutions; Advent of computers and use of numerical methods. <b>Errors:</b> Introduction, Types of errors, Rules for estimate errors, Error propagation, Error in the approximation of function</p> <p><b>Roots of Equation:</b> Bracketing Method: Bisection Method, False position method Open method: Newton Raphson's, Multiple Roots, Secant method. Roots of polynomial: Muller's Method</p>			<b>9</b>
<b>Unit 2</b>	<p><b>Solutions to linear simultaneous equations</b></p> <p>1. Elimination approach: Gauss Elimination Method- Naïve Gauss Elimination, Pitfalls of Elimination, Techniques of improving solutions, Gauss- Jordan method, LU decomposition 2. Iterative approach Gauss Seidal, Jacobi Iteration method</p>			<b>7</b>
<b>Unit 3</b>	<p><b>Curve Fitting</b></p> <p>Least Square Regression – Linear regression, Polynomial Regression</p> <p>Interpolation –Newton's divided difference, Interpolating polynomial, Languages interpolating polynomial</p>			<b>6</b>
<b>Unit 4</b>	<p><b>Numerical Differentiation and Integration</b></p> <p>Newton's cotes Integration of equation: Trapezoidal rule, Simpson's rules, Integration unequal segments. b. 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, backward difference.</p>			<b>6</b>
<b>Unit 5</b>	<p><b>Ordinary Differential Equation</b></p> <p>a. Taylor's series method, Picard's Method, Runge-Kutta method, Euler's Method, Improved polygon method, System of equation b. Boundary value and Eigen value problem, Shooting Method, Finite Difference Method, Eigen value problem based on polynomial method, Power method</p>			<b>6</b>
<b>Unit 6</b>	<p><b>Partial Differential Equation</b></p> <p>a. Finite Difference – Elliptical equation, Laplace's equation, Liebmen's Method, Secondary variables, Boundary condition. b. Finite Difference- Parabolic Equation</p>			<b>6</b>
<b>Tutorials</b>				
	Tutorials based Numerical methods applied Root finding, simultaneous equations, numerical differentiation, numerical integration and Laplace equation problems hand calculations as well as C program, excel program and Mat Lab program depending on problem			

<b>Text Books</b>	
1.	S.C. Chapra, “Applied Numerical Methods with MATLAB for Engineers and Scientists”, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3 <sup>rd</sup> Edition, 2012.
2.	E. Balguruswamy, “Numerical Methods”, Tata McGraw Hill Publication Company Ltd., 8 <sup>th</sup> Edition, 2012.
3.	S.S. Shastri “Numerical Methods”, Prentice Hall India Learning Private Limited; Fifth edition 2012.
<b>Reference Books</b>	Dr. B. S. Grewal, “Numerical Methods”, Khanna Publishers, New Delhi, 11 <sup>th</sup> Edition, 2013.
1.	R. L. Burden and J. D. Faires, “Numerical Analysis Theory and Applications”, Cengage Learning India Pvt. Ltd., New Delhi, 1 <sup>st</sup> Edition.
2.	W. Y. Yang, W. Cao and J. Morris, “Applied Numerical Methods Using MATLAB”, Wiley India Pvt. Ltd., New Delhi, 1 <sup>st</sup> Edition, 2005
<b>Useful Links</b>	
1.	<a href="http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf">http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf</a>
2.	<a href="http://nm.mathforcollege.com/topics/ppt_index.html">http://nm.mathforcollege.com/topics/ppt_index.html</a>
3.	<a href="http://www3.nd.edu/~b1hu/math40750-09S/">http://www3.nd.edu/~b1hu/math40750-09S/</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	3	1		1				3		2	1	1		1
CO 2	2	2	3		3				2		2	1		2	
CO 3		1	2		1				3		1	1			
CO 4			1	2		2	2					1	1		3

### Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	1	1	02	10
Understand	2	2	02	10
Apply	5	5	2	20
Analyse	2	2	2	10
Evaluate	5	5	2	10
Create	0	0		0
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Second Year (Sem – IV) B. Tech. Mechanical Engineering**

**ME 2403: Strength of Materials**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	01 Hr/week	CT – 2	15
Total Credits	02	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

After end of this course students will be able to

- Remember basic concepts to arise stresses for various types of loads applied on machine components of simple geometry, Hooke's law, relation between elastic constants, Mohr's circle, flexure relation, torsion formula, etc.
- Understand the nature of internal stresses that will develop within the mechanical components for different types of loading.
- Apply mathematics and basic engineering principle to evaluate the stress, strains and deformation.
- Evaluate and analyse stress, strains and deformations in various machine elements such as simple machine components, beams, shafts, pressure vessels etc.

**Course Contents**

		Hours
<b>Unit 1</b>	<b>Deformation in Solids and Principal Stresses</b> Concept of stress and strain- tension, compression and shear stresses, Hooke's law, Poisson's ratio, elastic constants and their relations- volumetric, linear and shear strains- principal stresses and principal planes- Mohr's circle.	<b>(08)</b>
<b>Unit 2</b>	<b>Shear Force and Bending Moments in Beam</b> Beams and types, transverse loading on beams- shear force and bending moment diagrams, Types of beam supports, simply supported and over-hanging beams, cantilevers.	<b>(06)</b>
<b>Unit 3</b>	<b>Theory of bending</b> Bending of beams, bending stress distribution and neutral axis, shear stress distribution, point and distributed loads.	<b>(06)</b>
<b>Unit 4</b>	<b>Deflection in Beams</b> Moment of inertia about an axis and polar moment of inertia, deflection of a beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorems.	<b>(08)</b>
<b>Unit 5</b>	<b>Torsion</b> Stresses and deformation in circular and hollow shafts, stepped shafts, deflection of shafts fixed at both ends.	<b>(06)</b>
<b>Unit 6</b>	<b>Stresses in Thick and Thin Cylinders and Spheres</b> Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure	<b>(06)</b>

**Tutorials**

Based on above units write assignments & solve various numerical on each topic.

**Text Books**

- Gere and Timoshenko, "Mechanics of Materials", CBS Publications, 2<sup>nd</sup> edition, 2008.
- Ferdinand L. Singer & Andrew Pytel - Strength of Materials, 4<sup>th</sup> Edition, 2000
- S. S. Rattan - Strength of Materials, Tata Mcgraw Hill, 2<sup>nd</sup> edition, 2011.
- Ramamurtham, "Strength of Materials", Dhanpatrai Publications, 5<sup>th</sup> edition, 2017
- Dr. B. C. Punmia, Mechanics of Materials, Laxmi Publications (P) Ltd., New Delhi, 2<sup>nd</sup> edition, 2017
- S. K. Mondal, "Strength of Materials", GATE notes, 2016

**Reference Books**

- Ferdinand Beer, Jr., E. Russell Johnston, John DeWolf, David Mazurek - Mechanics of Materials-McGraw-Hill Education, 9<sup>th</sup> edition, 2014
- Strength of Materials Parts I & II - S. Timoshenko, D Van Nostrand Company, NY, 2<sup>nd</sup> edition 1948
- William A. Nash - Schaum's Outline of Strength of Materials 5<sup>th</sup> edition, 2010, McGraw-Hill
- E.J. Hearn - Mechanics of materials: An introduction to the mechanics of elastic and plastic deformation of solids and structural materials. Volume 1 - Butterworth-Heinemann, 3<sup>rd</sup> edition, 2000
- E.J. Hearn - Mechanics of materials: An introduction to the mechanics of elastic and plastic deformation of solids and structural materials. Volume 2 - Butterworth-Heinemann 3<sup>rd</sup> edition, 2000

**Useful Links**

1.	<a href="https://nptel.ac.in/courses/112107146/">https://nptel.ac.in/courses/112107146/</a>
2.	<a href="https://en.wikipedia.org/wiki/Strength_of_materials">https://en.wikipedia.org/wiki/Strength_of_materials</a>
3.	

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1	2			2			2			1	1		1
CO 2	2	2	2			1			2			2	1		1
CO 3	1	2	1			1			2			1	1		1
CO 4	2	1	2						2			1	1		1

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	2	8
Understand	4	4	2	12
Apply	2	2	2	14
Analyse	3	3	2	14
Evaluate	3	3	2	12
Create				
TOTAL	15	15	10	60

<b>Government College of Engineering, Karad</b>			
<b>Final Year (Sem – IV) B. Tech. Mechanical Engineering</b>			
<b>ME 2404: Kinematics of Machines</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	01 Hrs/week	CT – 2	15
Total Credits	03	TA	10
		ESE	60
		<b>Duration of ESE</b>	<b>03 Hrs</b>
<b>Course Outcomes (CO)</b>			
1.	Explain the principles of kinematics of machines.		
2.	Apply fundamental principles of kinematics of machines.		
3.	Analyse the given mechanism for velocity & Acceleration of different links		
4.	Evaluate mechanical elements (like cam, brakes, belt, rope, chain etc.) of mechanisms.		
<b>Course Contents</b>			<b>Hours</b>
<b>Unit 1</b>	<b>Fundamentals of Mechanisms</b> Links, kinematic pair , Kinematic chain, Mechanism, inversion, Types of constraints, Grubler's criterion, Grashof's Criterion for mobility, Inversions of slider crank chain, Double slider crank chain, Four bar, Steering gear mechanisms.		<b>(4)</b>
<b>Unit 2</b>	<b>Velocity and Acceleration</b> Graphical analysis of Velocity and acceleration for different mechanisms using relative velocity and acceleration method, Coriolis's component of acceleration, Klein's construction for slider crank mechanism, , Instantaneous centre and analytical method.		<b>(10)</b>
<b>Unit 3</b>	<b>Friction</b> Laws of friction, Inclined plane, screw threads, pivots and collars. <b>Belts, Ropes and Chain</b> Belt and rope drives, Slip, creep, pulleys, power transmitted, centrifugal effect, initial tension, chains.		<b>(7)</b>
<b>Unit 4</b>	<b>Cams</b> Types of cams and followers, Profiles of cams for specified motion of different followers, Spring load on the follower, Jumping of follower.		<b>(9)</b>
<b>Unit 5</b>	<b>Brakes and Dynamometer</b> Types of brake, band, block, band and block, Internal expanding, Types of dynamometers, prony brake, rope brake dynamometer and belt transmission dynamometer		<b>(5)</b>
<b>Unit 6</b>	<b>Governors</b> Types of governors, Porter, Proell and Hartnell governor, Controlling force and stability of governor, Hunting, Sensitivity, Isochronism, Governor effort and power, Insensitiveness of governors		<b>(5)</b>
<b>Tutorials</b>			
	Ten assignments based on above syllabus.		
<b>Text Books</b>			
1.	Thomas Bevan, Theory of Machines, 3 <sup>rd</sup> edition, CBS Publishers & Distributors, 2009		
2.	Ratan S.S, "Theory of Machines", Tata McGraw Hill, New Delhi, 2017		
3.	Sadhu Singh, "Theory of Machines", Pearson Education India, 2011		
4.	V. P. Singh, "Theory of Machines", Dhanpat Rai Publications, 2017		
<b>Reference Books</b>			
1.	Norton, "Kinematics & Dynamics of Machinery", McGraw Hill, New York, 2017		
2.	Walidron, "Kinematics, Dynamics and Design of Machinery", Wiley India Publication, 2007		
<b>Useful Links</b>			
1.	<a href="https://nptel.ac.in/courses/112104114/">https://nptel.ac.in/courses/112104114/</a>		
2.	<a href="https://nptel.ac.in/courses/112/104/112104121/">https://nptel.ac.in/courses/112/104/112104121/</a>		
3.	<a href="https://nptel.ac.in/courses/112/106/112106270/">https://nptel.ac.in/courses/112/106/112106270/</a>		

### Mapping of COs and POs



PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	2	1										2	2	1	2
CO 2	2	2	1	2								2	1		1
CO 3	2	2	1	2	1							2	1	1	1
CO 4	2	2	2	2								1	2		1

**Assessment Pattern (with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	3	3	1	8
Understand	4	4	2	12
Apply	2	2	2	14
Analyse	3	3	2	14
Evaluate	3	3	2	12
Create			1	
TOTAL	15	15	10	60

**Government College of Engineering, Karad**

**Second Year (Sem – IV) B. Tech. Mechanical Engineering**

**ME 2405: Materials Engineering**

Teaching Scheme		Examination Scheme	
Lectures	03 Hrs/week	CT – 1	15
Tutorials	-	CT – 2	15
Total Credits	02	TA	10
		ESE	60
		Duration of ESE	02 Hrs 30 Min

**Course Outcomes (CO)**

Students will be able to

1. Understand mechanical behaviour of materials.
2. Understand equilibrium diagrams and heat treatments for ferrous and non-ferrous materials.
3. Analyse and select various class of materials for specific applications.
4. Evaluate the mechanical properties of different materials.

**Course Contents**

	Course Contents	Hours
<b>Unit 1</b>	<b>Plastic deformation of materials</b> Mechanism of plastic deformation, deformation of single crystal by slip & twinning. Work hardening, plastic deformation of polycrystalline materials Effect of cold working and annealing	<b>(5)</b>
<b>Unit 2</b>	<b>Equilibrium diagrams</b> a) Solid solutions and intermediate phases b) Gibbs phase rule c) Alloy formation by crystallization, Nucleation and growth, Cooling curves, Dendritic structure and coring. d) Construction of equilibrium diagrams from cooling curves, Isomorphs system (Solid Solution), Eutectic, Partial solubility Peritectic and Intermetallic Compounds Lever arm principles, Long and short-range freezing.	<b>(6)</b>
<b>Unit 3</b>	<b>Engineering Materials</b> <b>Alloy steels &amp; cast irons-</b> a) Free cutting steels, HSLA high carbon low alloy steels, Maraging steels, Creep resisting steels, Stainless steels-different types. Tool steels-types, b) Specifications based on -IS, BS, SAE, AISI. c) Cast Irons-Classification, properties and production process.  <b>Non-ferrous materials</b> a) Copper based alloys brasses Cu-Zn, Bronzes Cu-Sn, Cu-Be, and Cu-Ni. b) Aluminium based alloys Al-Cu (Duralumin)Al-Si (Modification). c) Pb-Sn (Solders and fusible alloys) d) Sn-Sb alloys (Babbits) e) Ti (Ti-6Al-4V)	<b>(6)</b>
<b>Unit 4</b>	<b>Principles of heat treatment</b> a) Fe-Fe <sub>3</sub> C equilibrium diagram -Ferrous alloys (Plain carbon steels, cast iron) b) Transformation of austenite into Pearlite, Bainite and Martensite on cooling. c) TTT –Diagram and CCT -Diagrams -significance, Effect of alloying elements on TTT diagram and its significance. d) Heat treatment furnaces and equipment, controlled atmosphere.  <b>Heat treatment of steels</b> I. Annealing –Types-Full, Partial and Sub critical annealing (Various types) and purposes II. Normalizing-Purposes III. Hardening (Hardening types), Purposes, Austempering and Martempering, Mechanism of quenching and Quenching media, Hardenability-Concept and methods of determination of hardenability-Grossmans critical diameter method and Jominy end quench test. IV. Tempering Types, Structural transformations during tempering, purposes sub-zero treatment V. Surface hardening -Flame and Induction VI. Chemical heat treatments for case hardening -Carburising, Nitriding, Cyaniding, Carbonitriding,  <b>b) Heat treatment of Non-ferrous Alloys</b> I. Annealing-Stress relief, Recrystallization and Process annealing	<b>(6)</b>

	II. Precipitation hardening -Basic requirements, Stages, Common alloys, Variables, theories c) Heat treatment defects and remedies.	
<b>Unit 5</b>	<b>Destructive and Non-destructive Testing</b> Destructive Testing Hardness tests-Vickers, Rockwell, Brinell, Impact test: Ductile brittle transition, Erichsen cupping test, Concept of fracture toughness testing, Fatigue test: Cyclic stresses, the S-N curve, Crack initiation and propagation, Crack propagation rate, Creep: Generalized creep behaviour, Creep test, Stress and temperature effects Non-Destructive Testing (NDT) Magnetic particle inspection, dye penetrates inspection, ultrasonic inspection, radiography, eddy current testing, and acoustic emission inspection. Examples of selection of NDT and mechanical testing methods for selected components like crankshafts, gears, razor blades, welded joints, steel and C.I. casting, rolled products	<b>(6)</b>
<b>Unit 6</b>	<b>Powder metallurgical components:</b> Introduction to Powder Metallurgy, Powder manufacturing types-Mechanical, Physical, Chemical and Electro-Chemical, Mixing/ Blending, Compactiontypes, Sinteringtypes, Finishing operations: Sizing, Machining, Infiltration and Impregnation	<b>(5)</b>

**Text Books**

1.	S.H. Avner, "Introduction to physical metallurgy", Mcgraw Hill Book Company Inc, Edition, 2 <sup>nd</sup> , 1974.
2.	V.D. Kodgire, "Material science and metallurgy for engineers", Everest Publishers Pune, 12 <sup>th</sup> Edition
3.	W. D Callister, "Material science and engineering", Wiley India Pvt. Ltd., 5 <sup>th</sup> Edition.
4.	Vijendrasingh, "Physical metallurgy", Standard Publishers Delhi
5	T.V. Rajan / C.P. Sharma, "Heat Treatments Principles and Practices", Prentice Hall of India Pvt Ltd, New Delhi
6	V Raghwan, "Material Science and Engineering", Prentice Hall of India Pvt. Ltd., New Delhi ,3 <sup>rd</sup> Edition, 1995.
7.	Kenneth G. Budinski, "Surface Engineering for wear resistance", Prentice Hall of India

**Reference Books**

1.	R.A. Higgins, "Engineering Metallurgy", Viva Books Pvt. Ltd., New Delhi, 1 <sup>st</sup> Edition,
2.	D. S. Clark, W. R. Varney, "Physical Metallurgy for Engineers", AN East West Press Pvt. Ltd., New Delhi, 2 <sup>nd</sup> Edition, 1962
3.	J L Smith and SC Bhatia, "Heat Treatment of Metals", CBS Publishers and distributors, New Delhi, 1 <sup>st</sup> edition, 2008.

**Useful Links**

1.	<a href="http://ocw.mit.edu">ocw.mit.edu</a> > ... >Physical Metallurgy
2.	<a href="http://www.learnerstv.com/Free-engineering-Video-lectures-ltv642-Page1.htm">www.learnerstv.com/Free-engineering-Video-lectures-ltv642-Page1.htm</a>

**Mapping of COs and POs**

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	1		1	1	2	1				1	1	2	1	1
CO 2					2										
CO 3						2	2								1
CO 4	3	3	1	1		1	2			1	1		2	2	

**Assessment Pattern (with revised Bloom's Taxonomy)**

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	5	5	3	15
Understand	4	4	3	15
Apply	4	4	3	20
Analyse				
Evaluate	2	2	1	10
Create				
TOTAL	15	15	10	60

**Government College of Engineering, Karad****Second Year (Sem – IV) B. Tech. Mechanical Engineering****ME 2406: Industrial Instrumentation Lab**

Teaching Scheme		Examination Scheme	
Practicals	02 Hrs/week	CT – 1	-
Tutorials	-	CT – 2	-
Total Credits	01	TA	50
		ESE	-
		Duration of ESE	-

**Course Outcomes (CO)**

At the end of this course, student will be able to:

1. Select best suitable sensor/transducers in design of measurement systems and controllers in design and analysis of Control Engineering applications.
2. Identify best suitable calibration methods to obtain the static and dynamic performance characteristics of an instrument.
3. Construct and develop a measurement system for any physical process parameters used in industrial applications.
4. Apply experimental methods in multi-disciplinary engineering applications.

**Course Contents**

**Term work should consist of any 09 experiments from the following.**

<b>Experiment 1</b>	Study and calibration of temperature measuring sensors and transducers.
<b>Experiment 2</b>	Study and calibration of pressure and vacuum measuring sensors and instruments.
<b>Experiment 3</b>	Study and calibration force and torque measuring sensors and instruments.
<b>Experiment 4</b>	Study and calibration of fluid level measuring sensors and instruments.
<b>Experiment 5</b>	Study and calibration of speed measuring sensors and instruments.
<b>Experiment 6</b>	Study and calibration of acceleration and vibration measuring sensors and instruments.
<b>Experiment 7</b>	Study and calibration of fluid flow measuring sensors and instruments.
<b>Experiment 8</b>	Study and calibration of fluid level measuring sensors and instruments.
<b>Experiment 9</b>	Study and calibration of viscosity measuring sensors and instruments.
<b>Experiment 10</b>	Study and calibration of humidity measuring sensors and instruments.
<b>Experiment 11</b>	Study and calibration of moisture measuring sensors and instruments.

**Group Activity-**

Maximum 3 to 4 students in one group.

Detailed survey of collection literature/case studies related to any one of the Measurement/ Instrumentation system in mechanical, thermal, fluid, electrical, electronic application for parameters like temperature, pressure, vacuum, fluid flow, level, displacement, speed, force, torque, strain etc. Survey/case studies includes following points-

1. Introduction/Relevance
2. Objectives
3. Physical layout
4. Block diagram representation
5. Selection of sensors/transducers and display element
6. Theory/Description and specifications of System Components
7. Principle of working operation
8. Design calculations/theoretical analysis
9. Concluding remarks/comments

**Text Books**

1. “Mechanical Measurement and Control” D.S. Kumar, Metropolitan Book Co. Pvt. Ltd., New Delhi, 4<sup>th</sup> Edition, 2007.
2. “Instrumentation Measurement and Analysis”, B. C. Nakra, K. K. Chaudhry, McGraw Hill, New Delhi, 3<sup>rd</sup> Edition, 20012.
3. “Industrial Control & Instrumentation”, W. Bolton, Orient Logman Limited Prentice Hall Publication, 3<sup>rd</sup> Edition.

4.	“Industrial Instrumentation and Control”, S. K. Singh, Tata McGraw Hill, 2 <sup>nd</sup> Edition, 2005.
<b>Reference Books</b>	
1.	“Mechanical Measurement”, Beckwith and Buck, Pearson Education Asia, 5 <sup>th</sup> Edition, 2001.
2.	“Measurement Systems”, Doebelin Emesto, McGraw Hill International Publication Co. New York, 4 <sup>th</sup> Edition, 1990.
3.	“Industrial Instrumentation”, K. Krishnaswamy, S. Vijayachitra, New Age International Publishers, 2 <sup>nd</sup> Edition, 2010.
4.	“Theory and Design for Mechanical Measurements”, Richard S. Figliola, Donald E. Beasley, Wiley India, 1 <sup>st</sup> Edition.
<b>Useful Links</b>	
1.	<a href="http://www.controlandinstrumentation.com/">http://www.controlandinstrumentation.com/</a>
2.	<a href="https://instrumentationtools.com/">https://instrumentationtools.com/</a>
3.	<a href="https://instrumentationandcontrol.net/">https://instrumentationandcontrol.net/</a>
4.	<a href="https://ieeexplore.ieee.org">https://ieeexplore.ieee.org</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	1	2	-	-	-	2	-	1	2	3	2	3
CO 2	3	2	1	1	2	1	-	-	2	-	1	2	2	2	3
CO 3	3	2	1	1	2	-	-	-	1	-	-	2	2	2	3
CO 4	2	2	1	1	3	-	-	-	1	-	-	2	2	2	3

### Assessment Pattern(with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	TA	ESE
Remember	-	-	8	-
Understand	-	-	10	-
Apply	-	-	10	-
Analyse	-	-	12	-
Evaluate	-	-	10	-
Create	-	-	0	-
TOTAL	-	-	50	-

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – IV) B. Tech. Mechanical Engineering</b>				
<b>ME2407 Materials Engineering Laboratory</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Lectures	02 Hrs/week		CT – 1	-
Tutorials	00 Hrs/week		CT – 2	-
Total Credits	01		TA/CA	25
			ESE	25
<b>Lab Outcomes (LO)</b>				
The students will be able to				
1.	Evaluate mechanical properties through destructive testing.			
2.	Understand micro structural details of ferrous and non-ferrous materials.			
3.	Understand different heat treatment processes and hardenability test.			
4.	Apply the basics of selection of materials and failure analysis.			
	<b>Course Contents</b>			<b>Hours</b>
<b>Term work should consist of any 10 experiments from the following</b>				
<b>Experiment NO. 01</b>	To conduct tensile test on standard samples of M.S./ Aluminium/ C.I., Plotting of stress-strain curves and comparison of test results.			
<b>Experiment NO. 02</b>	Hardness testing of various metals – Brinell hardness, Vickers hardness and study of Rockwell and Micro-hardness tester.			
<b>Experiment NO. 03</b>	To plot cooling curve by Thermo gravimetric analysis (TGA) and differential thermal analysis equipment (DTA).			
<b>Experiment NO. 04</b>	Conducting impact test on samples of various materials/with different notches and interpretations of result.			
<b>Experiment NO. 05</b>	Study of Non-destructive testing such as Dye penetrant test, Magnetic particle test, Eddy current test, Radiography test and Ultrasonic methods.			
<b>Experiment NO. 06</b>	Analysis of micro structural details of ferrous and non-ferrous - Phase analysis, Grain size for steel, Inclusion for steel.			
<b>Experiment NO. 07</b>	Performing annealing, normalizing and hardening heat treatment of steel samples; observation of microstructures and hardness.			
<b>Experiment NO. 08</b>	Hardenability determination by Jominy End Quench test as per ASTM standard.			
<b>Experiment NO. 09</b>	Study of Ericsson Cupping test			
<b>Experiment NO. 10</b>	Selection of materials and failure analysis of components.			

### Mapping of LOs and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1	3	3	1	2	1	1			1		1	1		2	
LO 2	3	3		2					1			1		1	
LO 3	3	2	1	1			1		1	1			1		
LO 4	3	1	1	1	1	1			1	1	1	1	2	2	1

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	07	8
Understand	-	-	07	6
Apply	-	-	07	6
Analyse	-	-	4	4
Evaluate	-	-	0	1
Create	-	-	-	-
TOTAL			25	25

<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – IV) B. Tech. Mechanical Engineering</b>				
<b>ME 2408: Computer Aided Drafting lab</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Lectures	-- Hrs/week		CT – 1	--
-Tutorials	-- Hrs/week		CT – 2	--
Practical	02 Hrs/week		CA	50
Total Credits	02		ESE	--
<b>Lab Outcomes (LO)</b>				
Students will be able to				
1.	Draw 2D and 3-D models of machine components.			
2.	Draw and edit Parametric Drawings.			
3.	Draw 3-D modeling of assemblies of machine components.			
4.	Generate 2-D drawings from a 3-D model.			
	<b>Course Contents</b>			<b>Hours</b>
<b>Unit 1</b>	<b>Profile, Operation commands</b> Profile Commands: Point, Line, Circle, Arc, Ellipse, Profile, Spline. Operation Commands: Erase, Trim, Extend, Scale, Break, Fillet, Chamfer, Offset, Copy, Move, Mirror, Rotate etc.			<b>(04)</b>
<b>Unit 2</b>	<b>Viewing Commands:</b> Zoom, Pan, Rotate, Normal View, Isometric View, Multi View etc. Other Commands: Line type, Text, Text style, Dimensioning, Dimension style, Leader, Layers etc.			<b>(04)</b>
<b>Unit 3</b>	<b>Introduction to 3D Modeling</b> Apply/modify constraints and dimensions, transform the parametric 2 D sketch into a 3D solid			<b>(06)</b>
<b>Unit 4</b>	<b>Feature operations</b> Pad, Pocket, Shaft, Groove, Hole, Rib, Slot, Multi-section solid, Fillet, Chamfer, Thread, Shell, Pattern etc.			<b>(06)</b>
<b>Unit 5</b>	<b>Assembly Modelling and Production Drawing</b> Assembly modelling – Defining relationship between various parts of machine, creation of constraints, and generation of exploded view			<b>(06)</b>
<b>Unit 6</b>	<b>Drafting</b> Generation of 2-D sketches from parts and assembly 3-D model, appropriate dimensioning and tolerance			<b>(04)</b>
<b>Assignments</b>				
	1. 2-D sketching with geometrical and dimensional constraints using any commercially used solid modeling software			
	2. 3-D drawing of four simple components and plotting its 2-D views along with 3-D object drawing. Print out of the same on A4 size sheet			
	3. 3-D drawing of two components based on orthographic views. Print out of the same on A4 size sheet			
	4. Assembly drawing of any two machine components			
	5. Obtain 2-D sketch from a given 3-D model of a assemblies mentioning different views and print on A4 size sheet			
<b>Text Books</b>				
1.	Michele Chambers, “Catia V5R10: For Engineers and Designers”, Wiley India Pvt. Ltd.			
2.	N. D. Bhatt & V. M. Panchal, “Machine Drawing by,” Charotar Pub, Anand, Gujarat, 52 <sup>nd</sup> edition, 2014.			
3.	P. S. Gill, “A Textbook of Machine Drawing”, S. K. Kataria& sons, New Delhi			
4.	N. D. Junnarkar, “Machine Drawing”, Pearson Education			
<b>Reference Books</b>				
1.	Ibrahim Zeid, “Mastering CAD-CAM”, McGraw-Hill.			
<b>Useful Links</b>				
1.	<a href="https://www.lynda.com/CATIA-tutorials/Learning-CATIA-v5/606059-2.html">https://www.lynda.com/CATIA-tutorials/Learning-CATIA-v5/606059-2.html</a>			
2.	<a href="https://grabcad.com/tutorials/catia-v5-basic-tutorial--1">https://grabcad.com/tutorials/catia-v5-basic-tutorial--1</a>			

## Mapping of LOs and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1	2	1			3			1	2	2		1	2	1	1
LO 2	2	1			3			1	2	2		1	2	1	1
LO 3	2	1			3			1	2	2		1	2	1	1
LO 4	2	1			3			1	2	2		1	2	1	1

## Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	16	-
Understand	-	-	20	-
Apply	-	-	14	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL			50	



<b>Government College of Engineering, Karad</b>				
<b>Second Year (Sem – IV) B. Tech. Mechanical Engineering</b>				
<b>ME 2409: Workshop Practice -III</b>				
<b>Teaching Scheme</b>			<b>Examination Scheme</b>	
Practical	02Hrs/week		CT – 1	-
Tutorials	--		CT – 2	-
Total Credits	01		TA	25
			ESE	
			<b>Duration of ESE</b>	-
<b>Lab Outcomes (LO)</b>				
The students will be able to				
1.	Understand machining operations.			
2.	Conduct various machining operations.			
3.	Develop manufacturing skills.			
4.	Practice industrial maintenance.			
<b>Course Contents</b>				<b>Hours</b>
<b>Unit 1</b>	Job preparation on lathe having operations like straight, step, taper turning, boring, knurling etc.			<b>( 6 )</b>
<b>Unit 2</b>	Job preparation on milling machine such as gear cutting etc.			<b>( 6 )</b>
<b>Unit 3</b>	Job preparation on shaper/planer machine.			<b>( 4 )</b>
<b>Unit 4</b>	Job preparation on nonconventional machine such as EDM etc.			<b>( 6 )</b>
<b>Unit 5</b>	Hands on machine maintenance and overhauling			<b>( 4 )</b>
<b>Tutorials</b>				
<b>Text Books</b>				
1.	N.K Mehta, (2005), Machine Tool Design & Numerical Control- TMH.			
2.	Chapman series on Workshop Technology ,A Butterworth-Heinemann			
3.	Sen & Bhattacharya, (2005), Principles of Machine Tools, - New Central Book Agencies			
<b>Reference Books</b>				
1.	Machine Tool Design Handbook – CMTI, TMH			
2.	Machinery’s Handbook, (24/e) Ed. Henry H. Ryfeel, Industrial Press Inc.			
3.	P. H. Joshi, (2007) Machine Tools Handbook: Design and Operation - McGraw Hill			
<b>Useful Links</b>				
1.	NPTL online courses			

### Mapping of COs and POs

PO → LO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
LO 1	3	1	3				3				1		1	1	1
LO 2	2				3				2						
LO 3		2	1	2		2	1					3		2	1
LO 4	2		1								1	3	2		3

### Assessment Pattern (with revised Bloom’s Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	08	-
Understand	-	-	10	-
Apply	-	-	07	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
<b>TOTAL</b>			<b>25</b>	

**Government College of Engineering, Karad**

**Second Year (Sem – IV) B. Tech. Mechanical Engineering**

**ME 2410: Environmental Science**

Teaching Scheme		Examination Scheme	
Lectures	02Hrs/week	CT – 1	-
Tutorials	--	CT – 2	-
Total Credits	Audit	TA	-
		ESE	-
		Duration of ESE	-

**Course Outcomes (CO)**

The students will be able to

- Analyze economic and social concepts to evaluate environmental policies and institutions
- Apply methods of ecological and physical sciences in environmental problem solving.
- Analyze ethical and historical context of environmental issues and the links between human and natural systems.
- Identify the roles and identities of environmental actors in a complex and interconnected world.

**Course Contents**

		Hours
<b>Unit 1</b>	<b>Natural Resources and Associated Problems:</b> Nature of Environmental Studies: Definition, scope and importance, Multidisciplinary nature of environmental studies, Need for public awareness: Environment resources, Water resources, Mineral resources, Food resources, Energy, Solar energy, Biomass energy, Nuclear energy, Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification.	<b>( 8 )</b>
<b>Unit 2</b>	<b>Ecosystems:</b> Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, characteristics features, structure and function of the ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, Rivers, oceans, estuaries).	<b>( 6 )</b>
<b>Unit 3</b>	<b>Biodiversity and its conservation:</b> Introduction, Definition, ecosystem diversity, Bio-geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Threats to biodiversity habitat loss, poaching of wildlife, man- wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity.	<b>( 6 )</b>
<b>Unit 4</b>	<b>Environmental Pollution:</b> Definition, Causes, effects and control measures of Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an Individual in prevention of pollution.	<b>( 6 )</b>
<b>Unit 5</b>	<b>Social Issue and Environment:</b> Disaster management: floods, earthquake, cyclone, tsunami and landslides, Urban problems related to energy Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions, Global warming, acid rain, ozone layer depletion, Social Environment, sustainability nuclear accidents and holocaust, Wasteland Exclamation, Consumerism and waste products.	<b>( 7 )</b>
<b>Unit 6</b>	<b>Environmental Protection:</b> Environmental Protection Act. Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act. Population Growth and Human Health, Human Rights, Environment Impact Assessment, Green Tribunals.	<b>( 6 )</b>

**Tutorials**

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**Text Books**

- Dr. P.D. Raut, "Text Book of Environmental Studies" Shivaji University, 2013.
- Dr. Madhukar Bachulkar, B.V. Kulkarni and Sharvil A. Shah, "Concise Environmental Studies", R.K. Publications, 2014.
- Sen & Bhattacharya, (2005), Principles of Machine Tools, - New Central Book Agencies

**Reference Books**

- Miller T.G. Jr., "Environmental Science", Wadsworth Publications Co., 2007.
- Townsend C., Harper, J. and Michael Begon, "Essentials of Ecology", Blackwell Science, 2012
- Trivedi R.K. and P.K. Goel, "Introduction to air pollution", Techno- Science Publications, 2010

**Useful Links**

- <http://nptel.ac.in/courses/106106134/> Prof. Madhu Matyam, IIT Madras.

2. <https://nptel.ac.in/courses/106/105/106105163/> Prof. Kamalika Datta NIT Meghalaya.

3. <https://nptel.ac.in/courses/106102163/> Prof. Yogesh Sabharwal IIT Delhi.

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		3					3					3			
CO 2	3					3						3			
CO 3		3										3			
CO 4	3											3			

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	08	-
Understand	-	-	10	-
Apply	-	-	07	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL			25	

<b>Government College of Engineering, Karad</b>			
<b>Second Year (Sem – IV) B. Tech. Mechanical Engineering</b>			
<b>ME 2411: Technical Communication</b>			
<b>Teaching Scheme</b>		<b>Examination Scheme</b>	
Lectures	--	CT – 1	-
Tutorials	01 Hrs/week	CT – 2	-
Total Credits	01	TA	25
		ESE	-
		<b>Duration of ESE</b>	-
<b>Course Outcomes (CO)</b>			
<b>The students will be able to</b>			
1.	Understand the nature and objective of Technical Communication relevant for the work place as Engineers.		
2.	Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.		
3.	Develop good presentation skills, report writing skills, synopsis writing skill.		
4.	Imbibe inputs by presentation skills to enhance confidence in face of diverse audience.		
<b>Course Contents</b>			<b>Hours</b>
<b>Unit 1</b>	<b>Fundamentals of Technical Communication</b> Technical Communication: Features; Distinction between General and Technical Communication; Language as a tool of Communication; Dimensions of Communication: Reading & comprehension; Technical writing: sentences; Paragraph; Technical style: Definition, types & Methods; The flow of Communication: Downward; upward, Lateral or Horizontal; Barriers to Communication.		<b>( 6 )</b>
<b>Unit 2</b>	<b>Forms of Technical Communication</b> Technical Report: Definition & importance; Seminar & Conference paper writing; Key-Note Speech: Introduction & Summarization; Expert Technical Lecture: Theme clarity; Analysis & Findings; 7 Cs of effective business writing: concreteness, completeness, clarity, conciseness, courtesy, correctness, consideration		<b>( 8 )</b>
<b>Unit 3</b>	<b>Technical Presentation: Strategies &amp; Techniques</b> Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear: Confident speaking; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections		<b>( 8 )</b>
<b>Unit 4</b>	<b>Technical Communication Skills</b> Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion		<b>( 8 )</b>
<b>Unit 5</b>	<b>Project/thesis writing</b> Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style		<b>( 6 )</b>
<b>Unit 6</b>	<b>Kinesics &amp; Voice Dynamics</b> Kinesics: Definitions; importance; Features of Body Language; Voice Modulation: Quality, Pitch; Rhythm; intonation; Pronunciation; Articulation; stress & accent; Linguistic features of voice control: Vowel & Consonant Sounds		<b>( 6 )</b>
<b>Tutorials</b>			
<b>Text Books</b>			
1.	Technical Communication – Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi		
2.	Business Correspondence and Report Writing - by Prof. R.C. Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd., 2001, New Delhi		
3.	Modern Technical Writing - by Sherman, Theodore A (et.al); Apprentice Hall; New Jersey; U.S.		
4.	A Text Book of Scientific and Technical Writing- by S.D. Sharma; Vikas Publication, Delhi.		
<b>Reference Books</b>			
1.	Skills for Effective Business Communication by Michael Murphy, Harward University, U.S.		
2.	Business Communication for Managers by Payal Mehra, Pearson Publication, Delhi		

3.	Practical Communication: Process and Practice by L.U.B. Pandey; A.I.T.B.S. Publications India Ltd.; Krishan Nagar, 2014, Delhi.
4.	Bansal R.K. & Harrison: A manual of Speech & Phonetics, Orient Black Swan Pvt. Ltd. New Delhi, 2010

Useful Links:	
1.	<a href="https://en.wikipedia.org/wiki/Technical_communication">https://en.wikipedia.org/wiki/Technical_communication</a>
2.	<a href="https://journals.sagepub.com/doi/10.1177/0047281616641927">https://journals.sagepub.com/doi/10.1177/0047281616641927</a>
3.	<a href="https://www.stc.org/about-stc/defining-technical-communication/">https://www.stc.org/about-stc/defining-technical-communication/</a>
4.	<a href="http://competencies.technical-communication.org/overview.html">http://competencies.technical-communication.org/overview.html</a>
5.	<a href="https://www.coursera.org/courses?query=technical%20writing">https://www.coursera.org/courses?query=technical%20writing</a>

### Mapping of COs and POs

PO → CO ↓	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	1		1			1		1	2	2		2			2
CO 2	1										1		1		
CO 3			1			2		2	1	3		1	1	1	2
CO 4	1								2	3	2				2

### Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	CT 1	CT 2	CA	ESE
Remember	-	-	08	-
Understand	-	-	10	-
Apply	-	-	07	-
Analyse	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
TOTAL			25	