Government College of Engineering, Karad
Second Year B. Tech.
ME301: Engineering Mathematics III

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	1 Hrs/week	**CT2**	15
Total Credits	4	**TA**	10
		ESE	60

Course Objectives

1. To introduce student about Linear Differential Equations.
2. To summarize basic concepts of Vector Differential Calculus.
3. To state the Properties of Laplace Transform and Transforms of Derivatives and Integral.
4. To applyFourier Series, Partial Differential Equations and methods to solve engineering problems.

Course Contents

		Hours
Unit I	**Linear Differential Equations** Linear Differential Equations with constant coefficients Definition, Complementary function and Particular integral, method of variation of Parameters; Homogeneous Linear differential equations.	**7**
Unit II	**Applications of Linear Differential Equations with Constant Coefficients** The Whirling of Shafts;Mass – spring Mechanical system; Free oscillations; Damped Oscillations; Forced oscillations without damping.	**7**
Unit III	**Vector Differential Calculus:** Differentiation of vectors; Gradient of scalar point function and Directional derivative; Divergence of vector point function and Solenoidal vector fields; Curl of a vector point function and Irrotational.	**6**
Unit IV	**Laplace Transform:** Definition, Transforms of elementary functions, Properties of Laplace transform; Transforms of derivatives and Integral; Inverse Laplace transforms formulae; Inverse Laplace transforms by using partial fractions and Convolution theorem; Solution of Linear differential equation with constants coefficients by Laplace transforms techniques.	**8**

Unit V **Fourier Series:** **6**

Definition, Euler's Formulae, Dirichlet's Condition; Functions having points of discontinuity; Change of interval; Expansion of odd and even periodic functions; Half range series.

Unit VI **Partial Differential Equations and its applications:** **8**

Linear equation of the first order (Lagrange's linear partial differential equations); Homogeneous linear partial differential equation with constant coefficient; Rules for finding the particular integral.

Applications of PDE:

The method of separation of variables; The Wave Equation; One dimensional heat flow equation; two dimensional heat flow equation (Steady State).

Course Outcome (CO):

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

1. Summarize basic concepts of Linear Differential Equations.
2. Solve Linear Differential Equations with constant coefficients for solving problems in Mechanical engineering fields.
3. Identify Divergence of vector point function and Solenoidal vector fields and Curl of a vector point function and Irrational.
4. Solve Laplace Transform, Fourier series and Partial Differential Equations for problems in Mechanical Engineering.

Text Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley &Sons, Inc., 9th Edition.
2. Merle C. Potter, "Advanced Engineering Mathematics", OXFORD University Press, 3rd Edition.
3. Peter V O'Neil, "Advanced Engineering Mathematics", Cengage Publication, 7^{th} Edition

References:

1. J. N. Wartikar and P. N.Wartikar, "A Text Book of Applied Mathematics",Vol. I, II and III, Vidyarthi Griha Prakashan, Pune.
2. Dr. B. S. Grewal, "Higher Engineering Mathematics", S. Chand & Company ,40^{th} Edition.
3. H. K. Das, "Advanced Engineering Mathematics", S. Chand Publication, 8th Edition.
4. N.P. Bali, N.C. Narayana Iyengar, "A text book of Engineering Mathematics", Laxmi Publications.

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√			√		√		√			√				
CO2	√		√						√		√				
CO3	√	√				√	√				√				
CO4	√				√				√	√		√			

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	5	5	-	20
Understand	5	5	5	20
Apply	5	5	5	20
Analyze	-	-	-	-
Evaluate	-	-	-	-
Create	-	-	-	-
Total	15	15	10	60

Government College of Engineering Karad
Second Year B. Tech.
ME 302: Electrical Technology

Teaching Scheme		Examination Scheme	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1 To explain different electrical measurement techniques
2 To distinguish different electrical motors and its applications
3 To describe concept of electrical heating

Course Contents

		Hours
Unit I	**Electrical Measurement and Tariff** Introduction to types of measuring instruments, Measurement of active and reactive power in three phase balanced loads by using one wattmeter & two wattmeter, CT, PT., Digital Energy Meter Tariff-introduction, objectives & Types of tariff, advantages and improvement of power factor	**6**
Unit II	**Single Phase Induction Motor (IM):** Construction and Working, Advantages & applications, Equivalent circuit, Starting methods and types of single phase IM, Speed Control of single phase IM.	**6**
Unit III	**Three Phase Induction Motor:** Construction, Types, Working, Advantages & applications, Speed equation, Torque equation, Torque speed characteristics, Power stages in motor Need of starter, Starting methods, Speed control methods, Braking methods of Three Phase IM	**6**
Unit IV	**Special Purpose Motors**: Introduction to BLDC motor, universal motor, AC & DC servo motor, Stepper motor and linear induction motor. Its features and Industrial applications.	**6**
Unit V	**Electrical Drives:** Introduction to types electrical drives, Advantages of electrical drives, Comparison between Group drive & Individual drive. Selection of motors for Cranes, Textile Mill, Paper Mill Sugar Mill, Steel Rolling Mill, Cement Mill, Pumps & Blowers Machine Tools, Refrigeration and Air Conditioning.	**6**

Unit VI **Electric Heating:** **6**

Advantages of electric heating, types of electric heating- Resistance heating, Direct arc furnace, Indirect arc furnace, Induction heating , Dielectric heating, High frequency eddy current heating

Course Outcome:

At the end of course, student will able

1 To explain different electrical measurement techniques
2 To distinguish different electrical motors and its applications
3 To describe concept of electrical heating

Text Books:

1 Electrical and Electronic Technology by Edward Huges, Pearson Education 10th Edition , 2008

References:

1 A. K. Sawhney, "A course in Electrical & Electronics Measurements & Instrumentation", Dhanpat Rai& Co, 19th edition, 2014.
2 Vedam Subrahmanyam, "Electrical Drives Concepts & Application", Tata McGraw Hill 2nd edition 2011.
3 Kothaii , Nagrath, " Basic Electrical Engineering", Tata McGraw Hill New Delhi, 3rd edition 2009.
4 "Generation, Distribution and Utilization of Electrical Energy", New Age International Publishers Ltd.-new Delhi 2nd Edition, 2006

Useful Links:

http://www.nptel.iitm.ac.in/

Mapping of CO and PO

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√				√				√			√			
CO2	√	√	√		√				√			√			
CO3	√			√	√				√			√			

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	2	10
Understand	3	3	2	10
Apply	3	3	2	10
Analyze	3	3	2	10
Evaluate	2	2	1	10
Create	2	2	1	10
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME303: Applied Thermodynamics

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. To state the First and Second Laws of Thermodynamics to understand the factors affecting the efficiency of thermal system.
2. To explain the thermodynamic properties of pure substances using tables, charts, and ideal gas law and apply them to thermodynamic analysis of a system
3. To learn fundamental concepts of classical thermodynamics and how to use them for solving real-world thermal systems and engineering problems.

Course Contents

		Hours
Unit I	**Review of laws of thermodynamics** Zeroth law, first law and Second law of thermodynamics, Statement of third law of thermodynamics. Equivalence and Corollaries of Second Law, Clausius theorem, Entropy, Clausius inequality, Entropy as a property of system, Entropy of pure substance. T-s and h-s planes, Entropy change in a reversible and irreversible processes, Increase of entropy principle, Calculation of entropy changes of gases and vapours,(numerical treatment should be based on processes) Irreversibility and exergy. Lost work. Thermodynamic temperature. **Availability:** Available and unavailable energy, concept of availability, availability of heat source at constant temperature and variable temperature Availability of closed system and open system. Numerical.	**8**
Unit II	**Properties of steam and vapour power cycles** Properties of Steam and Vapour Processes Formation of steam, Phase changes, Properties of steam, Use of Steam Tables, Study of P-V, T-S and Mollier diagram for steam, Dryness fraction and its determination, Study of steam calorimeters (Separating, Throttling and combined) Non-flow and Steady flow vapour processes, Change of properties, Work and heat transfer. Vapour Power Cycles 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. Numerical.	**7**

Unit III	**Steam Generators and Steam Condensers** Study and classification of Boilers, Thermal efficiency of Boiler (Theoretical and Actual), 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. Cooling towers.	**6**
Unit IV	**Steam Nozzles** 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. Numerical.	**6**
Unit V	**Impulse Steam Turbines** 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 and multistage turbines and its condition curve and reheat factors. Numerical	**7**
Unit VI	**Reaction Steam Turbines:** 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. Numerical	**7**

Course Outcome (CO):

At the end of this course, students will be able to

1. Conceive and relate thermodynamic problems based on their fundamental knowledge and express them in mathematical terms.
2. To analyse a thermodynamic steam cycles and understand them in the working of boilers and condensers
3. Apply knowledge of thermodynamics concepts to understand the working of boilers, turbine and related components and analyse them for efficient energy utilization.
4. Apply knowledge of thermodynamics concepts to understand the working of nozzles and apply it for solving problems.

Text Books:

1 P. K. Nag, “Engineering thermodynamics”, Tata McGraw Hill
2 R. K. Rajput, “ Engineering Thermodynamics”, Laxmi Publications
3 V. M. Domkundwar, “Engg. Thermodynamics”, Dhanpatrai& sons New Delhi.
4 V. P. Vasandani and D. S. Kumar, “ Heat Engineering”, Metropolitan book Company

References:

1 Cengel & Boles, “Thermodynamics : An engineering approach”, McGraw Hill
2 Rayner Joel, “Engineering Thermodynamics”, ELBS Longman

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√								√			√	√		
CO2		√	√							√		√			
CO3			√					√		√					
CO4	√	√	√												

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	3	3	-	10
Understand	5	3	-	20
Apply	5	5	2	10
Analyze	2	5	2	15
Evaluate	-	-	3	05
Create	-	-	3	-
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME 304: Machine tools and processes

Teaching Scheme		**Examination Scheme**	
Lectures	4 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	4	**TA**	10
		ESE	60

Course Objectives:

1. To introduce different methods of Moulding and Casting.
2. To introduce forming, Plastic Shaping and welding processes.
3. To calculate process parameters and required dimensions of components after forming operations.
4. To study various Metal Removal Processes and Machine tools.
5. To study Nonconventional Machining

Course Contents

Hours

Section I

Unit I **Casting Processes** **11**

a) Importance of casting as manufacturing process, advantages and limitations of casting processes, foundry layouts and mechanization.

b) Types of moulding and core making sands and their properties, Green sand CO_2 sand, oil sand.

c) Cold box process, investment casting, moulding machines and core making machines, Few important types of cores and moulds.

d) Gating: Functions of gating systems, Components of gating system, Design of gating systems-Elementary theory and simple calculations , Pressurized and unpressurized gating systems.

e) Directional solidification, Solidification control devices: chills, ceramics bricks.

f) Introduction to permanent mould casting process:-Gravity and pressure die-casting; Centrifugal casting; Continuous casting

g) Melting and Pouring: Types and working of fuel fired melting furnaces.Melting practices and Metallurgical control in Cupola furnace, oil/gas fired furnaces, Induction and Arc Furnace.

-Metal pouring equipments.

h) Cleaning-fettling and inspection of casting

i) Heat treatment of casting.

Unit II **Forming Processes** **11**

a) Rolling – Introduction , Hot and cold Rolling, Rolling Mill Classification, Defects in Rolling,

b) Forging- Introduction, Hand Forging Operations, Forging Machines (board Hammer, Air and Steam, Hydraulic Hammer) Open and Closed Die Forging, Defects in Forging

c) Extrusion- Introduction, Direct , Indirect , Tube , Impact and Hydraulic Extrusion, Defects in Extrusion
d) Drawing- Introduction and Types of Wire, rod and pipe drawing, Defects in Drawing

Plastic Shaping

Introduction to blow moulding, injection moulding, extrusion, calendaring and thermo forming, plastic painting, plastic coating.

Unit III **Joining Processes** **5**

a) Surface preparation and various joints.
b) Arc Welding- SMAW, TIG, MIG.
c) Resistance welding- Spot, Seam and Projection welding process.
d) Soldering and Brazing
e) Use of adhesives for joining - Classification of adhesives, types of adhesives, applications.

Section II

Unit IV **Machine Tools for Metal Cutting:** **11**

a) Lathe: Introduction, Working principle, types, specifications, principle parts, accessories, attachments, and various lathe operations, Numerical treatment of gear calculations.
b) Capstan, turret lathe- Principle parts, working, comparison with centre lathe, Turret indexing mechanism, Bar feeding mechanism, Turret tool holders.
c) Boring Machines-Horizontal and vertical boring machine, Construction and operation, boring tools and bars. Introduction to Jig boring-machine
d) Drilling Machines - Classification of drilling machines, Construction and working of radial drilling machine, Various accessories and various operations.

Unit V **Machine Tools for Metal Cutting:** **11**

a) Shaping Machine - Types-crank shaper, hydraulic shaper, Crank and slotted link quick return mechanism, Table feed mechanism, various operations.
b) Planing Machine- Types-standard double housing planer, principle parts, table drive and feed mechanism, various operations.
c) 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.
d) Gear Manufacturing Processes -Study of various processes like gear shaping, Gear hobbing. Gear finishing processes –Gear shaving, Gear burnishing and gear rolling.
e) Introduction to special purpose machines.

Unit VI **Nonconventional Machining** **4**

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

Course Outcome (CO):

Student will able to

1. Produce simple components by casting process.
2. Classify different types of forming, Plastic Shaping and welding processes.
3. Discuss basic working principle, Configuration, Specification and classification of machine tools.
4. Categorisevarious non-traditional machining processes.

Text Books:

1. P. N. Rao, “Manufacturing Technology- Foundry, Forming and Welding, Vol. I”, Tata-McGraw-Hill, New Delhi, 3rd edition, 2009.
2. P. L. Jain, “Principles of Foundry Technology”, Tata McGraw-Hill, New Delhi, 2ndEdition.
3. P. C. Sharma, “A Textbook of Production Technology (Manufacturing Processes)”, S. Chand and Company Pvt. Ltd, New Delhi.7th Edition, 2010.
4. O. P. Khanna, “Foundry technology”, DhanpatRai Publications Pvt. Ltd, New Delhi.17th Edition, 2013.
5. Amitabha Ghosh, Asok Kumar, Mallik, “Manufacturing Science”, East-West Press Private Limited
6. O. P. Khanna, “Welding Technology”. DhanapatRai Publications
7. S.K. Hajra Choudhury and A.K. Hajra Choudhury, “Elements of Workshop Technology vol. II”, Media promoters and Publishers Pvt. Ltd, New Delhi,13th Edition,2012.
8. R. K. Jain, “Production technology”, Khanna Publishers, Delhi, 15th Edition,2000.

References:

1. Hein and Rosenthal, “Principles of metal casting”, Tata McGraw-Hill Book, Company. New Delhi.
2. ASTM Volumes on Welding, casting, forming and material selection.
3. ASM Handbook, Volume- 15, 1988, Casting.
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.

Useful Links:

1. nptel.ac.in/video.php?subjectId=112105126
2. www.nptelvideos.in/2012/12/manufacturing-processes-ii.html

Mapping of COs and POs (a to l) and PSOs (m, n, o)

Course Outcomes	a	b	c	d	E	f	g	h	i	j	k	l	m	n	o
CO1	√		√	√	√		√	√		√	√			√	√
CO2	√	√	√	√			√				√			√	
CO3	√	√	√		√		√		√	√	√			√	
CO4	√		√	√	√	√	√	√		√	√			√	√

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	1	5
Understand	3	3	2	15
Apply	3	3	2	10
Analyze	3	3	2	10
Evaluate	3	3	1	10
Create	1	1	2	10
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME305: Fluid Mechanics

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. To identify various properties of fluids and their SI units.
2. To state and illustrate fundamentals of Fluid Statics, Kinematics and Dynamics.
3. To demonstrate Bernoulli's Equation for various applications.
4. To understand the physics of fluid flow and conversant with Internal, External flows and its applications.

Course Contents

		Hours
Unit I	**Fluid Properties and Fluid Statics** **A) Fluid Properties:** Definition of fluid, Fluid as a continuum, Properties of fluid, Viscosity, Types of fluid, Compressibility, Surface tension, Capillarity and vapour pressure. B) **Fluid Statics:** Pascal's law, Hydrostatic law of pressure, Total Pressure, Centre of Pressure, Buoyancy, Meta centre, Condition of Equilibrium of floating and submerged bodies (No Numerical Treatment on fluid Statics)	**7**
Unit II	**Fluid Kinematics** Eulerian and Langragian approach of fluid flow, Flow visualization, Types of flow, Streamline Path line, streak line, Stream tube, Continuity equation in Cartesian coordinates in three dimensional forms. Velocity and Acceleration of fluid particles, Stream function and velocity potential function.	**6**
Unit III	**Fluid Dynamics:** Equation of motion, Integration of Euler's equation as energy equation. Energy correction factor, concept of HGL and THL or TEL, Bernoulli's theorem, Application of Bernoulli's theorem such as venture meter, orifice meter, rectangular and triangular notch, pitot tube, orifices etc. Derivation of momentum equation, momentum correction factor. Applications of momentum equation.	**8**

Unit IV	**Laminar Flow and Pipe Flow** **A) Laminar Flow** Laminar flow through circular pipes. Laminar flow through parallel plates, Introduction to Navier Stoke's equation and its applications **B) Pipe Flow** Energy losses in transition, expansion and contraction (Darcy's and Chezy's equation), Parallel pipe, Siphon pipes, Branching pipes and equivalent pipes.	**7**
Unit V	**Boundary Layer Theory and Dimensional Analysis, Similitude** **A) Boundary Layer Theory** Boundary layer thickness, its characteristics, laminar and turbulent boundary layers, separation, boundary layer control **B) Dimensional Analysis,** Similitude Dimensionally homogeneous equations, Buckingham's Pi-theorem, Calculation of dimensionless parameters. Similitude, complete similarity, Model Scales.	**6**
Unit VI	**Forces On Immersed Bodies and Compressible Flow** **A) Forces on Immersed Bodies:** Lift and Drag, Drag on a flat plate and on aerofoil. Types of drags, Development of lift. (Magnus effect) stalling condition of aerofoil. **B) Compressible Flow:** Propagation of elastic waves, Mach Cone and Mach number. Energy equation of compressible flows. Stagnation pressure, Temperature and density.	**6**

Course Outcome (CO):

At the end of course student will able to

1. Describe the significance of properties of fluid.
2. Apply the knowledge of fluid statics, kinematics and dynamics while addressing problems of mechanical engineering.
3. Estimate the discharge through a pipe or open channel.
4. Solve the practical problems in design of channels, openings

Text Books:

1. Dr. P.N. Modi and Dr. S.M. Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House
2. Dr. R.K. Bansal, "Fluid Mechanics and Hydraulic Machines – l", Laxmi Publication Pvt. Ltd., New Delhi
3. Streeter, Wylie, Bedford, "Fluid Mechanics", McGraw Hill Publication

References:

1. White, "Fluid Mechanics", McGraw Hill Publication
2. G .S. Sawhney, "Fundamentals of fluid mechanics", I.K. International Publishing House Pvt. Limited, New-Delhi, 2008

Useful Links:

1. https://www.youtube.com/watch?v=fa0zHI6nLUo&list=PLbMVogVj5nJTZJHsH6uLCO00I-ffGyBEm

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	A	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√	√			√										
CO2	√	√	√		√							√	√		
CO3	√	√	√		√							√		√	
CO4	√	√	√		√						√				

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	-	8
Understand	2	2	-	8
Apply	3	3	-	12
Analyze	3	3	5	12
Evaluate	2	2	5	8
Create	3	3	-	12
Total	15	15	10	60

Government College of Engineering Karad
Second Year B. Tech.
ME 306: Electrical Technology Lab

Teaching Scheme | **Examination Scheme**

Laboratory 2 Hrs/week[#] | **TA/CA** **25**

Total Credit 1

Course Objectives:

1 To measure power using electrical measuring instruments.
2 To explain control of three phase induction motor
3 To discuss about different electrical drives

Course Contents

Term work should consist of any Six experiments from the following

Experiment 1 Measurement of power in three phase balanced loads by using two wattmeter method

Experiment 2 Reactive power measurement in three phase circuits

Experiment 3 Calibration of single-phase energy meter

Experiment 4 Study of 3 phase induction motor starter

Experiment 5 Speed control of 3 phase induction motor

Experiment 6 Load test on 3 phase induction motor

Experiment 7 Case study of any one industrial application.

Experiment 8 Determinations of efficiency and speed regulation of 1 phase induction motor.

Course Outcomes:

at the end of course student will able to

1.Measure power using electrical measuring instruments.
2.Explain control of three phase induction motor
3.Discuss about different electrical drives

Mapping of CO and PO

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√				√				√			√			
CO2	√	√	√		√				√			√			
CO3	√			√	√				√			√			

Assessment Pattern

Skill Level	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	CA
Assembling	√	√	√		√	√		
Testing	√	√	√		√	√		
Observing/ implementing	√	√	√	√	√	√	√	
Analyzing	√	√	√	√	√	√	√	
Interpreting	√	√	√	√	√	√	√	
Designing	√	√	√	√	√	√	√	
Creating	√	√	√	√	√	√	√	
Deducing conclusions	√	√	√	√	√	√	√	

Government College of Engineering Karad
Second Year B. Tech.
ME 307: Applied Thermodynamics Lab

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	25

Course Objectives:

1. To state the First and Second Laws of Thermodynamics to understand the factors affecting the efficiency of thermal system.
2. To explain the thermodynamic properties of pure substances using tables, charts, and ideal gas law and apply them to thermodynamic analysis of a system
3. To learn fundamental concepts of classical thermodynamics and how to use them for solving real-world thermal systems and engineering problems.

Course Contents

Experiment 1 Aim: Determination of calorific value using Bomb calorimeter.

Experiment 2 Aim: Flue gas analysis using Orsat apparatus or Gas analyser.

Experiment 3 Aim: Determination of dryness fraction of steam using Throttling

Experiment 4 Aim: Trial on boiler to determine boiler efficiency, equivalent evaporation and energy balance.

Experiment 5 Aim: Measurement of fuel properties such as Flash point, Pour point, Cloud Point.

Experiment 6 Aim: Study and Demonstration of boiler mountings, Accessories

Experiment 7 Aim: Study and Demonstration of condenser and study of cooling towers

Experiment 8 Aim: Trial on steam power plant

Experiment 9 Aim: Study of compounding of steam turbines

Experiment 10 Aim: Report on industrial visit to a steam power plant

List of Submission:

1. Total number of Experiments: any 8 (Industrial visit is compulsory)
2. Field Visit Report

Additional Information:

1. Four to five experiments shall be selected for practical examination

Course Outcome(CO):

At the end of this course, student will able to

1 Explain the methods to increase efficiency of thermal devices and analyse its impact on environment
2 Conduct experiment , analyse output data and verify it with the theoretical concepts
3 Calculate performance parameters of steam power plant and its allied components
4 Share and compile observations as a team

Mapping of CO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	A	b	c	d	e	f	g	H	i	j	k	l	m	n	o
CO1	√	√	√	√			√	√			√				
CO2	√	√	√					√	√		√	√		√	
CO3	√	√	√	√	√	√	√	√	√	√	√	√		√	
CO4				√			√		√	√					

Assessment Pattern

Skill Level	Ex-1	Ex-2	Ex-3	Ex-4	Ex-5	Ex-6	Ex-7	Ex-8	Ex-9	Ex-10	CA	ESA
Assembling	√	√	√	√	√			√			CA out of 25	
Testing	√	√	√	√	√			√				
Observing	√	√	√	√	√	√	√	√	√	√		
Analysing	√	√	√	√	√	√	√	√	√	√		
Interpreting	√	√	√	√	√			√	√			
Designing												
Creating												
Deducing Concluding	√	√	√	√	√	√	√	√	√			
CA	10	10	10	10	10	10	10	10	10	10		

Government College of Engineering, Karad
Second Year B. Tech.
ME 308: Machine Drawing Lab

Teaching Scheme		Examination Scheme	
Lectures	2	**CT1**	-
Tutorial	-	**CT2**	-
Practical	2 Hrs/week[#]	**TA/CA**	50
Total Credits	3	**ESE**	-

Course Objectives:

1. To describe BIS conventions used in machine drawing
2. To find the line/curve of intersection between two solids
3. To describe the function of various machine components
4. To study assembly and detail drawings

Course Contents

		Hours
Unit I	**Study of B.I.S. (Bureau of Indian Standards) Conventions:** Significance and importance of various BIS Conventions as per IS SP 46, Drawings sheet sizes and layout, 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 *etc.*). Symbolic representation of Welds as per BIS conventions.	**5**
Unit II	**Interpenetration of Solids:** Introduction, interpenetration of Prism with Prism, Prism with cylinder, pyramid with prism, and vice versa (Prisms and Pyramids limited up to Rectangular base), Cylinder with Cylinder, Cone with Cylinder.	**3**
Unit III	**Sketching of Machine Component**: 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, 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.	**5**

Unit IV **Surface Roughness, Limits, Fits and Tolerances:** **4**

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.

Unit V **Details and Assembly Drawing:** **5**

To prepare detail drawings from given assembly drawing. To prepare assembly drawing from given drawing of details. The number of parts is limited to ten to twelve.

Preparation of detail and assembly drawing from the following details such as:

Machine tool parts: Tool post, Tailstock, Machine vice, Chucks etc.

Engine parts: Stuffing box, Crosshead assembly, Piston and connecting rod, etc.

Miscellaneous parts: Valve assembly, Screw jack, Jigs and fixtures, Pipe vice etc.

Assembly selected should include different types of sections.

TERM WORK:

Sheet No.1 Sheet Based on BIS conventions
Sheet No 2 Sheet based on interpenetration of solids
Sheet No.3 Sketching of various machine components
Sheet No.4 Sheet Based on limits, Fits and tolerances (Production Drawing)
Sheet No.5 To draw details drawing from given assembly drawing
Sheet No.6 To draw assemblydrawing from given details drawing

Course Outcome (CO):

at the end of course student will be able to

1. Use BIS conventions in machine drawings
2. Find lines/curves of intersection between two intersecting surfaces (or interpenetrating solids)
3. Sketch the various machine components
4. Read and interpret the given production drawings
5. Understand significance of assembly and detail drawings

Text Books:

1. Dr. K. L. Narayana, Dr. P. Kannaiah, and K. Venkata Reddy, “Machine Drawing”, New Age International Publishers, New Delhi
2. N. D. Bhatt & V. M. Panchal, “Machine Drawing by”, Charotar Pub, Anand, Gujarat
3. P. S. Gill, “A Textbook of Machine Drawing”, S. K. Kataria& sons, New Delhi
4. N. D. Junnarkar, “Machine Drawing”, Pearson Education

5 R.K. Dhavan, “Machine Drawing”, S. Chand and Company, New Delhi
6 N. D. Bhatt & V. M. Panchal, “Engineering Drawing”, Charotar Publications, Anand, Gujarat

References:

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 Tolerencing 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 “Design Data Book”, P.S.G. College of Technology, Coimbatore
8 “Machine Tool Design handbook”, CMTI, Tata McGraw Hill Publication

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	H	i	j	k	l	m	n	o
CO1	√						√		√						
CO2	√														
CO3	√		√		√	√	√					√			
CO4	√		√		√				√						
CO5	√			√			√		√			√			√

Assessment Pattern

Skill Level	Ex- 1	Ex- 2	Ex- 3	Ex-4	Ex- 5	Ex-6	CA	ESA out of 25
Assembling	√		√				CA out of 25	
Testing								
Observing	√	√	√	√	√	√		
Analysing		√		√	√	√		
Interpreting		√	√	√	√	√		
Designing								
Creating		√			√	√		
Deducing Concluding	√	√	√	√	√	√		
CA	10	10	10	10	10	10		

Government College of Engineering Karad
Second Year B. Tech.
ME 309: Fluid Mechanics Lab

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	25

Course Objectives:

At the end of course student will able

1. To measure pressure using manometers.
2. To distinguish between different types of flows.
3. To understand the calibration of notches, orifice and venturimeter.
4. To demonstrate major & minor losses.

Course Contents

Note: any eight experiments.

Experiment 1 Title: Study and demonstration of Pressure Measuring Devices

Experiment 2 Title: Determination of metacentric height of a floating body.

Experiment 3 Title: Flow visualization by plotting of streamlines (Heleshaw's apparatus).

Experiment 4 Title: Reynolds experiment.

Experiment 5 Title: Verification of Bernoulli's equation.

Experiment 6 Title: Calibration of venturimeter /Orifice-meter

Experiment 7 Title: Calibration of notches.

Experiment 8 Title: Determination of coefficient of friction in pipes of different materials.

Experiment 9 Title: Determination of minor losses in pips-fittings

Experiment 10 Title: Demonstration or trial on wind tunnel for measurement of lift and drag on any model.

List of Submission:

1. Total number of Experiments:08

Additional Information

Course Outcome(CO):

1 Work efficiently in a group, integrating skills and knowledge to make decisions in the performance of fluid mechanics tasks, adopting a responsible and organized attitude to work and a willingness to learn.
2 Apply the basic concepts of fluid mechanics to carry out professional engineering activities in the field of fluid and power plants.
3 Calibrate Venturimeter, Orificemeter and V-notch.
4 Measure pressure loss due to friction for pipe flow.

Mapping of CO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	H	i	j	k	l	m	n	o
CO1				√				√							
CO2	√	√		√		√					√				
CO3	√	√		√							√		√	√	
CO4	√	√		√							√			√	

Assessment Pattern

Skill Level	Ex-1	Ex-2	Ex-3	Ex-4	Ex-5	Ex-6	Ex-7	Ex-8	Ex-9	Ex-10	CA	ESA
Assembling			√								CA out of 25	
Testing	√		√		√	√	√	√	√	√		
Observing	√	√	√	√	√	√	√	√	√	√		
Analysing	√	√	√	√	√	√	√	√	√	√		
Interpreting	√	√	√	√	√	√	√	√	√	√		
Designing												
Creating												
Deducing Concluding	√	√	√	√	√	√	√	√	√	√		
CA	10	10	10	10	10	10	10	10	10	10		

Government College of Engineering Karad
Second Year B. Tech.
ME 310 : Workshop Practice - III

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	-

Course Objectives:

1. To discuss various Metal Removal Processes and Machine tools
2. To develop the skills about manufacturing aspects for any project work, as well as throughout his career.
3. To demonstrate the different tools used in various manufacturing operations such as machining on lathe.
4. To explain the various parts and working of lathe and shaper machines

Course Contents

Experiment 1 Aim: To perform job of plain turning, taper turning, external threading and knurling operation with its process sheet.
Objective: To apply the different tools in the machining processes on lathe

Experiment 2 Aim: To study thread manufacturing processes and gear train calculations
Objective: To explain gear train setting for required thread manufacturing process.

Experiment 3 Aim: To study of Construction, Mechanism and Application of Drilling Machine, Boring Machine, Milling Machine.
Objective: To explain construction and operations of Drilling Machine, Boring Machine and Milling Machine.

Experiment 4 Aim: To study and demonstration of shaper/planer (mechanisms and stroke)
Objective: To explain construction and operations of shaper / planer

Experiment 5 Aim: To visit an industry to study Plastic Shaping, Casting, Forming, Conventional Machine Shop and gear manufacturing processes
Objective: To understand the practical difficulties encountered in industries during any manufacturing and assembly work.

List of Submission:

1. Total number of Experiments : 03
2. Total number of job: 01
3. Field Visit Report : 01

Additional Information

Course Outcome(CO):

1. Prepare job using plain turning, taper turning, external threading and knurling operation with its process sheet.
2. Demonstrate thread manufacturing processes and gear train calculations.
3. Prepare process sheet and tool layout
4. Explain working of Drilling Machine, Boring Machine, Milling Machine, Shaper / Planer.
5. Explain gear manufacturing processes and finishing processes used in the industry.

Mapping of CO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√	√	√	√	√				√		√			√	√
CO2	√	√	√		√		√								√
CO3	√	√	√	√	√				√		√			√	√
CO4	√	√	√		√										√
CO5	√	√	√		√										√

Assessment Pattern

Skill Level	Ex- 1	Ex- 2	Ex- 3	Ex-4	Ex- 5	Ex-6	Ex-7	CA	ESA
Assembling	√	√	√	√	√	√	√	2	2
Testing			√		√	√	√	2	2
Observing	√	√	√	√	√	√	√	2	2
Analysing	√	√	√	√	√	√	√	3	3
Interpreting	√	√	√	√	√	√	√	3	3
Designing			√					3	3
Creating			√					5	5
Deducing Concluding	√	√	√	√	√	√	√	5	5

Government College of Engineering Karad
Second Year B. Tech.
CC 301: Environmental Studies

Teaching Scheme		**Examination Scheme**	
Lectures	3Hrs/week	**CT1**	15
Laboratory	-	**CT2**	15
Total Credits	0 (Audit)	**TA**	10
		ESE	60

Course Objectives:

1. To learn key concepts from Economic and Social analysis as they pertain to design and evaluation of environmental policies and institutions.
2. To learn concepts and methods from ecological and physical sciences and their applications in environmental problem solving.
3. To study the ethical, cross cultural and historical context of environmental issues and the links between human and natural systems.

Course Contents

		Hours
Unit I	**Natural Resources and Associated Problems:** Nature of Environmental Studies**:** Definition, scope and importance. Multidisciplinary nature of environmental studies Need for public awareness. a) Environment resources: Use and over-exploitation, deforestation, dams and their effects on forests and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams benefits and problems. c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources. d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide problems. e) Energy resources: Growing energy needs, renewable and nonrenewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.	**8**
Unit II	**Ecosystems:** 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. Introduction, types, characteristics features, structure and function of the following ecosystem :- a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).	**6**

Unit III	**Biodiversity and its conservation :** Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation. Western Ghat as a biodiversity region. Hot-spot 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.	**6**
Unit IV	**Environmental Pollution:** 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 a individual in prevention of pollution.	**6**
Unit V	**Social Issue and Environment:** 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.	**8**
Unit VI	**Environmental Protection :** From Unsustainable to Sustainable development. 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.	**8**

Field Work :

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 slopes, *etc.*

Course Outcome:

1 Students will explain key concepts from Economic, and Social analysis as they pertain to design and evaluation of environmental policies and

institutions.

2 Student will appreciate concepts and methods from ecological and physical sciences and their applications in environmental problem solving.

3 Student will appreciate the ethical, cross cultural and historical context of environmental issues and the links between human and natural systems.

4 Student will reflect critically about their roles and identities as citizens, consumers, environmental actors in a complex and interconnected world.

Text Books:

1 Text Book of Environmental Studies by Dr. P.D. Raut from Shivaji University. (Edition 2013)

2 Concise Environmental Studies by Dr. Madhukar Bachulkar, B.V. Kulkarni, Sharvil A. Shah. R.K. Publications. (Edition 2014)

3 Miller T.G. Jr., Environmental Science. Wadsworth Publications Co. (Edition 2007)

4 Townsend C., Harper, J. and Michael Begon, Essentials of Ecology, Blackwell Science. (Edition 2012)

5 Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno-Science Publications. (Edition 2010)

References:

1 Agarwal, K.C.2001, Environmental Biology, Nidi Pub. Ltd., Bikaner. (Edition 2011)

2 BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad 380013, India, Email:mapin@icenet.net (Edition 2008)

3 Cunningham, W.P. Cooper, T.H.Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p (Edition 2010)

4 De A.K., Environmental Chemistry, Wiley Wastern Ltd. (Edition 2014)

5 Down to Earth , Centre for Science and Environment , New Delhi. (Edition 2011)

6 Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. I and II, Environmental Media. (Edition 2014)

7 The Water (Prevention and Control of Pollution) Act, 1974

8 The Air (Prevention and Control of Pollution) Act, 1981

9 The Environment (Protection) Act, 1986

10 Hazardous Wastes (Management and Handling) Rules, 1989

11 The Forest (Conservation) Act, 1980

12 The Wildlife Protection Act, 1972

13 The National Environment Tribunal Act, 1995

14 The Noise Pollution Act, 1974

Mapping of CO and PO

	PO 1	PO 2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1		√	√	√	√	√	√		√	√	√	√		
CO2	√		√	√	√	√	√		√		√			
CO3		√		√	√	√	√		√	√	√	√		
CO4	√	√	√	√	√	√	√			√		√		

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	3	3	2	12
Understand	3	3	2	12
Apply	3	3	2	12
Analyze	3	3	2	12
Evaluate	3	3	2	12
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME401: Applied Numerical Methods

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	1	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. Explain basic concepts of Numerical Methods
2. Solve introductory engineering problems using Numerical Methods
3. Describe basic functions and advantages of different Numerical Methods
4. Correlate numerical results and approximations with field problems

Course Contents

		Hours
Unit I	Brief review of analytical/exact methods for solving algebraic and differential equations; Limitations of exact methods and role of numerical methods to find approximate solutions; Advent of computers and use of numerical methods. **Errors:** Introduction, Types of errors, Rules for estimate errors, Error propagation, Errorin the approximation of function A. **Roots of Equation:** Bracketing Method: Bisection Method, False position method Open method: Newton Raphson's, Multiple Roots, Iteration system of non- linear Equations, Secant method. Roots of polynomial: Muller's Method	**7**
Unit II	**Linear Algebraic Equation:** 1. Gauss Elimination Method- Naïve Gauss Elimination, Pitfalls of Elimination, Techniques of improving solutions, Gauss- Jordan method 2. Matrix Invention- LU decomposition, Gauss Seidal, Jacobi Iteration method	**5**
Unit III	**A. Curve Fitting:** i. Least Square Regression – Linear regression, Polynomial Regression iii. Interpolation – Newton's divided difference, Interpolating polynomial, Languages interpolating polynomial	**8**
Unit IV	**Numerical Differentiation and Integration** a. Newton's cotes Integration of equation: Trapezoidal rule, Simpson's rules, Integration unequal segments. b. Integration of Equation: Romberg's Integration and Gauss Quadrature. c. Numerical differentiation, Differentiation formulae, Richardson	**7**

extrapolation, Derivation of unequally spaced data, Forward difference, Central difference, backward difference, backward difference.

Unit V **Ordinary Differential Equation** **7**

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

Unit VI **Partial Differential Equation** **6**

a. Finite Difference – Elliptical equation, Laplace's equation, Liebmen's Method, Secondary variables, Boundary condition.
b. Finite Difference- Parabolic Equation , Explicit Method- Bender-Schmidt method, Implicit method- Crank Nicolson Method
(No numerical treatment on crank Nicolson method)

Course Outcome (CO):

at the end of course student will able to

1 To explain basic concepts of numerical approximations
2 To solve introductory engineering problems
3 To describe functions and advantages of different numerical methods
4 To correlate numerical results and approximations with actual field results.

Text Books:

1 Dr. B. S.Grewal, "Numerical Methods", Khanna Publishers, New Delhi,7th Edition,2005.
2 E. Balguruswamy, "Numerical Methods", Tata Mcgraw Hill Publication Company Ltd.,8th Edition,2002.

References:

1 S.C. Chapra, "Applied Numerical Methods with MATLAB for Engineers and Scientists", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 3rd Edition,2012.
2 R. L. Burden and J. D. Faires, "Numerical Analysis Theory and Applications", Cengage Learning India Pvt. Ltd., New Delhi, 1st Edition.
3 W. Y. Yang, W. Cao and J. Morris, "Applied Numerical Methods Using MATLAB", Wiley India Pvt. Ltd., New Delhi, 1st Edition,2005.

Useful Links:

1 http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf
2 http://nm.mathforcollege.com/topics/ppt_index.html
3 http://www3.nd.edu/~b1hu/math40750-09S/

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√	√	√		√				√		√	√	√		
CO2	√	√	√		√				√		√	√	√		
CO3	√	√	√		√				√		√	√	√		
CO4			√	√		√	√					√	√		

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	1	1	1	10
Understand	2	2	2	10
Apply	5	5	2	20
Analyze	2	2	2	10
Evaluate	5	5	4	10
Create	0	0	4	0
Total	15	15	10	60

Tutorials	
Note: TA(out of 10) shall be based on tutorials	
Tutorial 1	Aim: Prepare program for roots of equation using bracketing methods Objective: Learn Half interval and False Position Method
Tutorial 2	Aim: Prepare program for roots of equation using open methods Objective: Learn Secant method and Newton Raphson Method
Tutorial 3	Aim: Prepare program for elimination methods Objective: Learn Navie-Gauss elimination and Gauss Jordon
Tutorial 4	Aim: Prepare program for interactive methods Objective: Learn LUD, Gauss Seidel method
Tutorial 5	Aim: To solve problem of curve fitting Objective: to understand regression of problem
Tutorial 6	Aim: To solve problems of Numerical Differentiation Objective: To understand methods for Numerical Differentiation
Tutorial 7	Aim: To solve problems of Numerical Integration Objective: To understand methods for Numerical Integration
Tutorial 8	Aim: To solve problems of Ordinary Differential Equation Objective: To understand different methods of solving ODE and merits of methods
Tutorial 9	Aim: To solve problems of Partial Differential Equation Objective: To solve Laplace problems (1D and 2D)

Government College of Engineering, Karad
Second Year B. Tech.
ME402: Analysis of Mechanical Elements

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	1	**CT2**	15
TotalCredits	3	**TA**	10
		ESE	60

Course Objectives:

1. Demonstrate knowledge of fundamental concepts and problem solving techniques associated with stress, strain, stress-strain diagram, bulk modulus applied to brittle and ductile materials
2. Applications involving axial loading, torsion, and bending, including introductory-level statically indeterminate systems
3. To have understanding of different loading conditions and its graphical representation to model design problem
4. Accumulate significant practice in solving a variety of application problems in solid mechanics involving concepts of principle stress-strain, deflection of beams and strain energy

Course Contents

		Hours
Unit I	**Analysis of Stress & Strain** **Uniaxial stress and strain:** Hooke's Law, Poisson's ratio, Modulus of Elasticity, Modulus of Rigidity, Strain Energy, Statically Indeterminate problems, Stress-strain diagram for ductile and brittle material, Factor of safety, Working stress. Normal and shear stresses, Thermal Stresses, Complementary shear stress, Bulk Modulus, Inter-relationship between elastic constants.	**8**
Unit II	**Torsion** Basic assumptions, Torsion formula, Torsion of hollow and solid circular shafts, compound shafts .Open and Closed Coiled Springs. **Shear Force and Bending Moment** Concept and definition of shear force and bending moment in determinate beams due to concentrated, UDL and uniformly varying load.	**8**
Unit III	**Bending and Shear Stresses in Beam** Stresses-Introduction, Pure Bending, Normal stresses in beams, Flexure formula, moment of resistance of cross-sections, Simple built-up section, Design of rectangular and circular(solid and hollow) sections; L, I and T sections Distribution of shear stresses in beams of various commonly used sections such as circular. I, T, and angles.	**8**

Unit IV **Principal Stresses and Strains** **8**

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,. Theories of elastic failure

Unit V **Deflection of Beams** **6**

Equation of Elastic Curve, Methods for Determining Deflections
Strain curvature and moment curvature relation, Solution of beam deflection problem by Double integration method, Macaulay's Method, Area moment method, (Simply Supported Beam and Cantilever.)

Unit VI **Columns** 6

Euler's formula for different end connections, Concept of equivalent length, Rankine-Gordon Formula, Empirical Formulae, Eccentrically Loaded Columns

Energy Methods

Strain energy for uniaxial stress, Pure bending (Simply Supported Beam and Cantilever.), Shear stresses (Direct Shear and Pure torsional), Use of energy theorem to determine deflections and twists of shafts

Course Outcome (CO):

Student should be able to

1. Apply mathematics to obtain analytical solutions to design problems of mechanical components
2. Demonstrate knowledge of fundamental concepts to explain elastic and inelastic behaviour, strain energy, and material properties.
3. Apply engineering principles toward solving power transmission problems of shaft, safe design of beams and to find deflection of beams
4. Recognize situations involving ethical considerations (safety through design) and be able to evaluate decisions
5. Develop appropriate models to formulate solutions.

Text Books:

1. Pytel and Kiusalaas, "Mechanics of Materials", Cengage Learning Publications.
2. Gere and Timoshenko, "Mechanics of Materials", CBS Publications.
3. G. H. Ryder, "Strength of Materials", Macmillan India Limited.
5. Ramamurtham, "Strength of material", Dhanpatrai Publications
6. Dr. R. K. Bansal, "Strength of material", Laxmi publication Pvt. Ltd., New Delhi

References:

1 S.P. Timoshenko and D.H. Young, “Elements of Strength of Materials”, East-West Press Pvt. Ltd. Publications

2 Pytel and Singer, “Strength of Materials”, Harpercollins College division publications.

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√	√	√					√	√		√	√	√		
CO2	√	√	√	√	√	√				√	√	√	√		
CO3	√	√	√	√	√	√				√	√	√	√		
CO4		√	√	√	√	√	√	√	√	√			√		
CO5	√		√	√	√		√	√		√		√	√		

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	-	8
Understand	3	3	1	12
Apply	2	2	1	8
Analyze	3	3	2	12
Evaluate	3	3	2	12
Create	2	2	4	8
Total	15	15	10	60

Tutorials

Note: TA (out of 10) shall consist of report on the assignments mentioned below:

Tutorial 1 Stresses and strain

Tutorial 2 Torsion.

Tutorial 3 Bending moment diagram.

Tutorial 4 Bending stresses in beams

Tutorial 5 Shear stresses in beams.

Tutorial 6 Principal stresses and theories of failures.

Tutorial 7 Deflection of beams.

Tutorial 8 Columns.

Tutorial 9 Shear force diagram

Tutorial 10 Strain Energy

Government College of Engineering, Karad
Second Year B. Tech.
ME 403: Fluid& Turbo Machinery

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. To understand impulse momentum principle and its applications
2. To learn the working principles of impulse and reaction water turbines.
3. To illustrate the concept of different types of pumps and compressor.
4. Train the students to acquire the knowledge and skill of analyzing different turbo machines.

Course Contents

		Hours
Unit I	**Introduction** Impulse momentum principle and its applications, Force excreted on fixed plate, moving flat plate and curved vanes, series of plates, velocity triangles and their analysis, work done equations , efficiency.	**5**
Unit II	**Impulse Water Turbines** 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. Calculation of efficiency, Power, Discharge etc. Governing of Pelton wheel, Model Testing, Unit quantities, Specific speed of turbine and performance characteristics of turbine	**6**
Unit III	**Reaction Water Turbines** Principle of operation, Construction and working of Francis and Kaplan Turbine, Effect of modification of velocity triangles on runner shape, Draft tube, Cavitation calculation of various efficiencies, Power, Discharge, Blade angles, Runner dimensions etc. Governing of Francis and Kaplan turbine. Draft tube-types and analysis. Model Testing, Specific speed of turbine and performance characteristics of turbine.	**7**
Unit IV	**Centrifugal Pumps** 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). Methods of priming, calculations of efficiencies, Discharge, Blade angles, Head, Power required Impeller dimensions etc. Specific speed and performance	**7**

characteristics of pumps.

Unit V	**Air Compressors** Application of compressed air, classification of compressor, Reciprocating compressors, construction , Work input, Necessity of cooling , Isothermal efficiency, Heat rejected, Effect of clearance volume, Volumetric efficiency, Necessity of multi staging, construction, Optimum intermediate pressure for minimum work required, After cooler, Free air delivered, air flow measurement, Capacity control. Roots blower and vane blower(Descriptive treatment)	**8**
Unit VI	**Rotodyanamic Air Compressors** Centrifugal compressor, velocity diagram. Theory of operation, losses, Adiabatic efficiency, Effect of compressibility, Diffuser, Prewhirl, Pressure coefficient, Slip factor, performance. Axial flow compressors, Velocity diagram, Degree of reaction, Polytropicefficiency, Surging, Chocking, Stalling, Performance, Comparison with centrifugal.	**7**

Course Outcome (CO):

At the end of course student will able

1. To design and calculate different parameters for turbo machines.
2. To understand thermodynamics and kinematics behind turbo machines.
3. To formulate design criteria.
4. To understand the concept of centrifugal and axial compressors.

Text Books:

1. B. U. Pai, “Turbomachines”, Wiley India
2. Dr. Onkar Singh, “Thermal Turbomachines”, Wiley India
3. Streeter, Wylie, Bedford, “Fluid Mechanics”, McGraw Hill Publication
4. Modi P N & Seth S N, “Hydraulics, Fluid Mechanics and Machinery”, Standard Book House ,New Delhi
5. V.P. Vasandani, “Theory of Hydraulic Machinary”, Khanna Publishers, Delhi

References:

1. S.M. Yahya, “Turbines, Compressors & Fans”, Tata -McGraw Hill
2. William W. Perg, “Fundamentals of Turbomachinery”, John Wiley & Sons.
3. Dr. J. Lal, “Hydraulic Machines”, Me tropolitan Book Co. Pvt. Ltd., Delhi.

Useful Links:

1. https://www.youtube.com/watch?v=dafjkTM2nlg&list=PLbMVogVj5nJSXjTminozHEFZJkN_ojx_e

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√	√	√		√						√				
CO2	√	√	√								√				
CO3	√	√	√					√			√		√		
CO4	√	√			√										

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	2	8
Understand	2	2	2	8
Apply	3	3	2	12
Analyze	3	3	2	12
Evaluate	5	5	2	20
Create	-	-	-	-
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME404: Theory of Machines-I

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. To represent kinematic behaviour of different machine elements and mechanisms
2. To select various power transmitting devices
3. To explain types of cam with followers and select according to their applications
4. To compare types of Governing mechanisms
5. To analyze effect of friction in mechanisms and machines

Course Contents

		Hours
Unit I	**Basic Concept of Mechanisms:** Links, kinematic pair , Kinematic chain, Mechanism, inversion, Types of constraints, Grubbler's criterion, Grashof's Criterion for mobility,Inversions of slider crank chain, Double slider crank chain, Four bar, Steering gear mechanisms.	**4**
Unit II	**Velocity and Acceleration in Mechanisms** Graphical analysis of Velocity and acceleration for different mechanisms using relative velocity and acceleration method, Corioli's component of acceleration, Klein's construction for slider crank mechanism, , Instantaneous centre and analytical method.	**10**
Unit III	**Friction** Laws of friction, Inclined plane, screw threads, pivots and collars. **Belts,Ropes and Chain** Belt and rope drives, Slip, creep, pulleys, power transmitted, centrifugal effect, initial tension, chains.	**7**
Unit IV	**Cams** Types of cams and followers, Profiles of cams for specified motion of different followers, Spring load on the follower, Jumping of follower.	**9**
Unit V	**Brakes and Dynamometer** Types of brake, band, block, band and block, Internal	**5**

expanding, Types of dynamometers, prony brake, rope brake dynamometer and belt transmission dynamometer

Unit VI **Governors** **5**

Types of governors, Porter, Proell and Hartnell governor, Controlling force and stability of governor, Hunting, Sensitivity, Isochronism, Governor effort and power, Insensitiveness of governors

Course Outcome (CO):

At the end of this course, student will able to

1 Explain different types of mechanisms and their applications
2 Analyze kinematic theories of mechanism
3 Design cam with follower for different applications
4 Select different power transmitting elements and governing mechanisms according to application

Text Books:

1 Ratan S.S, “Theory of Machines”, Tata McGraw Hill, New Delhi
2 P. L. Ballany, “Theory of Machines”, Khanna Publication, New Delhi
3 Thomas Bevan, “Theory of Machines”, Pearson Education Limited, New Delhi
4 Sadhu Singh ,“Theory of Machines”, Pearson Education India
5 Shah and Jadhawani, “Theory of Machines”, DhanpatRaiand Sons
6 Rao, J. S., “The Theory of Machines Through Solved Problems”, New Age International Publications Ltd., New Delhi
7 G.S. Rao and R.V. Dukipatti, “Mechanism and Machine Theory ”, New Age Int.Publications Ltd., New Delhi

References:

1 Shigley, “Theory of Machines and Mechanism”, McGraw Hill, New York
2 Mallik, A. K, Ghosh, “.Kinematic analysis and synthesis of mechanisms”, CRC Press

Mapping of COs and POs (a to l) and PSOs (m,n,o)

Course Outcomes	A	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√		√		√				√	√	√	√			
CO2	√		√		√				√	√	√	√			
CO3	√	√	√		√					√	√	√		√	
CO4	√	√	√		√					√	√	√			√

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	2	2	1	05
Understand	3	3	2	10
Apply	3	3	1	15
Analyze	3	3	2	15
Evaluate	3	3	1	10
Create	1	1	1	05
Total	15	15	10	60

Government College of Engineering, Karad
Second Year B. Tech.
ME 405: Metallurgy

Teaching Scheme		**Examination Scheme**	
Lectures	3 Hrs/week	**CT1**	15
Tutorial	-	**CT2**	15
Total Credits	3	**TA**	10
		ESE	60

Course Objectives:

1. To impart the knowledge on mechanical behaviour of materials
2. To understand the significance of mechanical properties, their evaluation and different testing methods.
3. To acquaint basics of failure of components and its analysis by different characterization methods. Also, various surface improvement methods for failure prevention.
4. To understand basics of equilibrium diagrams
5. To acquire knowledge in various class of materials and their applications, selection criteria for specific applications.
6. To import knowledge on Heat Treatment, microstructure and Powder Metallurgy techniques

Course Contents

		Hours
Unit I	**Plastic deformationof materials** Mechanism of plastic deformation, deformation of single crystal by slip & twinning.Work hardening, plastic deformation of polycrystalline materialsEffect of cold working and annealing	**5**
Unit II	**Equilibrium diagrams** 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, Isomorphous system(Solid Solution), Eutectic, Partial solubility Peritectic and Intermetallic Compounds Lever arm principles, Long and short-range freezing.	**6**
Unit III	**Study of Engineering materials** **Alloy steels & cast irons-** 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.	**6**

Non-ferrous materials **4**

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)

Unit IV **Principles of heat treatment** **10**

a) Fe- Fe3C 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 equipments, controlled atmosphere.

Heat treatment of steels

I. Annealing – Types-Full, Partial and Sub critical annealing (Various types) and purposes

II. Normalising- 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 transformationsduring tempering, purposes sub zero treatment

V. Surface hardening - Flame and Induction

VI. Chemical heat treatments for case hardening - Carburising, Nitriding, Cyniding, Carbonitriding,

VII. Simple Numerical on case hardening method by Fick’s diffusion law.

b) Heat treatment of Non ferrous Alloys

I. Annealing- Stress relief, Recrystallization and Process annealing

II. Precipitation hardening - Basic requirements, Stages, Common alloys, Variables, theories

c) Heat treatment defects and remedies.

Unit V **Mechanical Properties & Testing** **6**

Destructive Testing:

a) Tensile test, engineering stress-strain curve, true stress-strain curve, relation between engineering and true stress-strain, types of stress-strain curves, Numerical based on tension test.

b) Properties on stress-strain curve such as yield stress, stiffness, resilience etc.

b) Compression test, formability, different hardness tests- Vickers, Rockwell, Brinell, Impact test: Ductile brittle transition, Erichsen cupping test

c) Concept of fracture toughness testing.

d) Fatigue test: Cyclic stresses, the S-N curve, Crack initiation and propagation, Crack propagation rate.

e) 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

Unit VI **Powder metallurgical components:** **5**

a)Advantages, Limitations and Applications of Powder Metallurgy

b)Powder manufacturing types- Mechanical, Physical, Chemical and Electro- Chemical

c)Mixing/ Blending- (Double cone and Y- Cone mixers)

d)Compaction- types- Conventional, iso-static, HERF, Powder rolling and extrusion

e) Sintering- Types liquid stage and solid stage sintering

f)Finishing operations: Sizing, Machining, Infiltration and Impregnation

Course Outcome (CO):

At the end of course

1 Student will able to understand mechanical behaviour of materials.
2 Student will able to evaluate different mechanical properties through different tests, so that they can select proper material for desired applications.
3 Student will able to analyze and prevent the failure in components.
4 Student will able to do efficient heat treatment methods.
5 Student will able to manufacture components through powder metallurgical method.

Text Books:

1 S.H. Avner, “Introduction to physical metallurgy”, Mcgraw Hill Book Company Inc, Edition, 2nd, 1974.
2 Vijendrasingh, “Physical metallurgy”, Standard Publishers Delhi

3 W. D Callister, “Material science and engineering”, Wiley India Pvt. Ltd., 5th Edition.
4 V.D. Kodgire, “Material science and metallurgy for engineers”, Everest Publishers Pune,12th Edition
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 ,3rd Edition, 1995.
7 Kenneth G. Budinski, “Surface Engineering for wear resistance”, Prentice Hall of India

References:

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

Useful Links:

1 ocw.mit.edu › ... ›Physical Metallurgy
2 www.learnerstv.com/Free-engineering-Video-**lectures**-ltv642-Page1.htm

Mapping of COs and POs (a to l) and PSOs (m, n, o)

Course Outcomes	A	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1	√			√			√	√		√	√	√		√	√
CO2	√	√		√	√					√	√				√
CO3	√	√	√	√	√			√	√	√	√				√
CO4	√	√		√		√				√				√	√
CO5	√	√		√		√				√				√	√

Assessment Pattern

Knowledge Level	CT1	CT2	TA	ESE
Remember	3	3	1	5
Understand	3	3	2	15
Apply	3	3	2	10
Analyze	2	2	2	10
Evaluate	3	3	1	10
Create	1	1	2	10
Total	15	15	10	60

Government College of Engineering Karad
Second Year B. Tech.
ME 406: Fluid & Turbo Machinery Lab

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/ week[#]	**CA**	25
Total Credits	1	**ESE**	25

Course Objectives:

1. To describe the main / operating characteristics of turbines and pumps.
2. To explain the working of reciprocating compressor.
3. To distinguish between different hydraulic devices.
4. To distinguish between different types of pumps.

Course Contents

Note: Any six experiments with at least 3 trials.

Experiment 1 Aim: Study and trial on pelton wheel and plotting of main / operating characteristics

Experiment 2 Aim: Study and trial on any one reaction turbine and plotting of main/operating characteristics.

Experiment 3 Aim: Study and trial on centrifugal pump and plotting of operating characteristics

Experiment 4 Aim: Study and trial on reciprocating compressor

Experiment 5 Aim: Study of centrifugal blower and hydraulic ram

Experiment 6 Aim: Study of hydraulic devices- Intensifier, Accumulator, Hydraulic jacks, Press, Crane.

Experiment 7 Aim: Study of other types of pumps- Gear pump, Jet pump, Submersible pump, Air lift pump.

Experiment 8 Aim: Industrial visit to Pump/Turbine Manufacturing Industry or Hydro Power Plant.

List of Submission:

1. Total number of Experiments: 6 (Industrial Visit is Compulsory)
2. Field Visit Report

Additional Information:

Course Outcome(CO):

At the end of course, student will able to

1. Conduct trial & Calculate performance parameters of different turbomachinery.
2. Draw & compare performance characteristics curves with their theoretical nature of different turbomachinery
3. Explain construction & working of different types of pumps.
4. Explain construction & working of various hydraulic devices.

Mapping of CO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	A	b	c	d	e	f	g	h	i	j	k	l	**m**	**n**	**o**
CO1	√	√	√								√				
CO2	√				√			√			√	√			
CO3	√									√					
CO4										√					

Assessment Pattern

Skill Level	Ex- 1	Ex- 2	Ex- 3	Ex-4	Ex- 5	Ex-6	Ex-7	Ex-8	CA	ESA
Assembling	-	-	-	-	-	√	√	√	CA out of 25	-
Testing	√	√	√	√	√	√	√	-		-
Observing	√	√	√	√	√	√	√	√		-
Analysing	√	√	√	√	√	-	√	√		-
Interpreting	√	√	√	√	√	-	-	√		-
Designing	-	-	-	-	-	-	√			-
Creating	-	-	-	-	-	-	√	-		-
Deducing Concluding	√	√	√	√	√	√	√	√		
CA	10	10	10	10	10	10	10	10		

Government College of Engineering Karad
Second Year B. Tech.
ME407: Theory of Machines-I Lab

Laboratory Scheme		Examination Scheme	
Practical	2 Hrs/week#	**CA**	25
Total Credits	1	**ESE**	25

Course Objectives:

At the end of course student will able to

1. To draw velocity and acceleration diagram of mechanism
2. To draw cam and follower profiles
3. To calculate power using dynamometers
4. To explain principle and working of governors

Course Contents

Note: Atleast 06 to 10 experiments

Experiment 1 Aim: Study of basic mechanisms.
Objective: Demonstration of models and mechanisms

Experiment 2 Aim: Velocity problems by relative velocity method
Objective: Drawing of velocity diagram of mechanism

Experiment 3 Aim: Velocity problems by Kliens construction and Instantaneous center method
Objective: Drawing of velocity diagram of mechanism

Experiment 4 Aim: Acceleration problems by relative acceleration method
Objective: Drawing of acceleration diagram of mechanism

Experiment 5 Aim: Experiment on Hooks joint
Objective: Verification of ratio of angular velocities of shafts connected by Hooks joint

Experiment 6 Aim: Experiment on belt drive
Objective: study of slip,creep, tension in belt

Experiment 7 Aim: Experiment on dynomometer
Objective: Power measurement of machine

Experiment 8 Aim: Problems on cam profile
Objective: Drawing of cam and follower profiles

Experiment 9 Aim: Experiment on Governor characteristics for Porter or Hartnell governor
Objective: study of governor characteristics

Experiment 10 Aim: Computer aided analysis of simple mechanisms
Objective: Use of computer for analysis and synthesis of mechanisms

List of Submission:

1 Total number of Experiments: Any 06
2 Total number of sheets: 02-04

Additional Information

Course Outcome(CO):

At the end of course student will able

1 To draw velocity and acceleration diagrams for different mechanisms
2 To analyse hooks joint
3 To draw cam follower profile for different applications
4 To Measurement of machine power
5 To understand characteristics of governor

Mapping of LO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	A	b	c	d	e	f	g	h	i	j	k	l	m	n	o
CO1			√		√				√			√			
CO2	√	√								√					
CO3			√		√				√			√			
CO4	√	√								√					
CO5	√	√								√					

Assessment Pattern

Skill Level	Ex-1	Ex-2	Ex-3	Ex-4	Ex-5	Ex-6	Ex-7	Ex-8	Ex-9	Ex-10	CA	ESA out of 25
Assembling	√										CA out of 25	
Testing					√	√	√		√			
Observing	√	√	√	√				√				
Analysing		√	√	√	√			√				
Interpreting		√	√	√		√	√	√	√			
Designing		√	√	√				√		√		
Creating								√		√		
Deducing Concluding		√	√	√	√	√	√		√			
CA	10	10	10	10	10	10	10	10	10	10		

Government College of Engineering, Karad
Second Year B. Tech.
ME408: Computer Aided Drafting and Computer Graphics

Teaching Scheme		**Examination Scheme**	
Lecture	1 Hrs/week	**TA/CA**	50
Practical	2 Hrs/week		
Total Credits	2		

Course Objectives:

To develop an ability

1. To create 2-D drawings and 3-D models of machine components.
2. To use modern engineering techniques, tools and skills for engineering practice.
3. Use of different graphics functions to draw various objects.
4. To implement the concept of 2D-transformation

Course Outcome (CO):

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

1. Draw 2D and 3-D models of machine components
2. Create and Edit Parametric Drawings
3. Draw various graphics entities by programming.
4. Transform various 2-D entities by programming

Course Contents

		Hours
Unit I	**Profile, Operation and Viewing commands** Profile Commands:-Point, Line, Circle, Arc, Ellipse, Profile, Spline. Operation Commands:-Erase, Trim, Extend, Scale, Break, Fillet, Chamfer, Offset, Copy, Move, Mirror, Rotate etc. Viewing Commands:-Zoom, Pan, Rotate, Normal View, Isometric View, Multi View etc. Other Commands: Line type, Text, Text style, Dimensioning, Dimension style, Leader, Layers etc.	**6**
Unit II	**Introduction to 3D Modelling** Apply/modify constraints and dimensions, transform the parametric 2-D sketch into a 3D solid	**2**
Unit III	**Feature operations** Pad, Pocket, Shaft, Groove, Hole, Rib, Slot, Multi-section solid, Fillet, Chamfer, Thread, Shell, Pattern etc.	**2**

Unit IV	**Computer Graphics Programming** Initializing the graphics, Graphical functions, simple programs using graphical functions.	**2**
Unit V	**Simple Drawing Methods** Point Plotting Techniques, Qualities of good line drawing algorithms, The Digital Differential Analyzer (DDA), Bresenham's Algorithm. Generation of Circles using different algorithms viz. Bresenham's Algorithm, Mid-Point	**6**
Unit VI	**Two Dimensional Transformations:** What is transformation?, Matrix representation of points, Basic transformation Viz. Rotation, Translation and Scaling	**4**

List of Experiments

Experiment 1 "2-D sketching with geometrical and dimensional constraints using any commercially used solid modelling software"

Experiment 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."

Experiment 3 "3-D drawing of two components based on orthographic views. Print out of the same on A4 size sheet"

Experiment 4 "Production drawing of minimum one machine component with G.D. and T"s and machining symbols. Print out of the same on A4 size sheet."

Experiment 5 Write a program with menu option to input the line coordinates from the user to generate a line using Bresenham's algorithm and DDA line algorithm.

Experiment 6 Write a Program for Circle Drawing using Bresenham's algorithm.

Experiment 7 Write program to perform the following 2D transformations on the given input figure
a. Rotate through θ^o. b. Scaling c. Translation.
Note: Suggested solid modelling softwaresuch as Catia, Pro-E etc.
Suggested programming languages such as C, C++, Java etc.

Text Books:

1 N.D. Bhatt and V.M. Panchal, "Machine drawing", Charotar Publication House, Anand, 42nd Edition, 2007.
2 Basudeb Bhattacharyya, "Machine drawing", Oxford university press.
3 B. M. Havaldar, "C Graphics and Projects", Anmol Publications.

References:

1 Ibrahim Zeid, “Mastering CAD-CAM”, McGraw-Hill.
2 Michele Chambers, “Catia V5R10: For Engineers and Designers”, Wiley India Pvt. Ltd.

Useful Links:

1 http://catiatutor.com
2 http://nptel.ac.in/courses/106106090/
3 http://cplusplus.happycodings.com/computer-graphics/

List of Submission:

1 Total no. of experiments 7

Mapping of CO and POs (a to l) and PSOs (m,n,o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	**m**	**n**	**o**
CO1	√		√												
CO2										√			√		
CO3			√												
CO4	√				√										

Assessment Pattern

Skill Level	Ex- 1	Ex- 2	Ex- 3	Ex-4	Ex- 5	Ex-6	Ex-7	CA
Assembling								CA out of 50
Testing								
Observing								
Analysing	√	√	√	√	√	√	√	
Interpreting	√	√	√	√	√	√	√	
Designing								
Creating	√	√	√	√	√	√	√	
Deducing Concluding								
Total	10	10	10	10	10	10	10	

Government College of Engineering Karad
Second Year B. Tech
ME 409: Metallurgy Laboratory

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	25
Total Credits	1	**ESE**	25

Course Objectives:

1. To evaluate mechanical properties through destructive testing.
2. To understand micro structural details of ferrous and non-ferrous materials.
3. To understand non-destructive testing methods.
4. To understand different heat treatment processes and hardenability test.
5. To know the basics of selection of materials and failure analysis.

Course Contents

Experiment 1 Aim Tensile testing

Study of universal testing machine, principle and construction,

1) Tension test: To conduct tensile test on standard samples of M.S./ Aluminium/ C.I., Plotting of stress-strain curves and comparison of test results.

2) Study the effect of Gauge length on percent elongation.

Objective:

To understand principle working of tensile machine and to know, how to evaluate important mechanical properties on stress-strain diagram.

Experiment 2 Aim Hardness testing:

Study of hardness testing machines such as:

1) Brinell

2) Vickers and

4) Study of Rockwell

5) Study of Micro-hardness

Objective

To understand principle working of above said machine and to know how hardness number shown by this machines.

Experiment 3 Aim Performing fatigue testing

Objective To understand Stress vs. Number of cycles to failure curve and to determine fatigue limit.

Experiment 4 Aim Impact testing

Study of Pendulum impact testing machine and conducting impact test on samples of various materials/with different notches and interpretations of result.

Objective To know the concept of toughness and ductile to brittle transition failure.

Experiment 5 Aim: Study of Non-destructive testing.
1) Dye penetrant
2) Magnetic particle
3) Eddy current
4) Radiography
5) Ultrasonic methods.
Objective: To understand principle working of NDT machine and ability to select NDT methods.

Experiment 6 Aim Analysis of micro structural details of ferrous and non-ferrous.
1) Phase analysis
2) Grain size for steel
3) Inclusion for steel
Demonstration of microstructures using image analyzer, Quantitative Metallographic software.
Objective Ability to classify steel and non-ferrous on the basis of microstructure. Also, to understand software based equipment for microstructure, grain size and inclusion rating.

Experiment 7 Aim Performing annealing, normalizing and hardening heat treatment of steel samples; observation of microstructures and hardness.
Objective: To understand correlation between heat treatment and properties of steel.

Experiment 8 Aim Hardenability determination by Jominy End Quench test as per ASTM standard.
Objective To understand correlation between cooling rate and hardness depth.

Experiment 9 Aim Study of Ericsson Cupping test
Objective To understand the forming ability of the sheet metal.

Experiment 10 Aim Case study: Selection of materials and failure analysis of components.
Objective To acquaint knowledge of material selection and failure analysis of components. In these experiments, it is expected that student will search few online/nptel publications on selection of materials and failure analysis of any engineering components.

List of Submission:

1 Total number of Experiments- Ten numbers
2 Seminar report- On case study- Selection of materials and failure analysis
3 Field Visit Report

Additional Information:

Course Outcome(CO):

At the end of this course

1. Student will able to interpret properties on stress-strain diagram and able to select different hardness machine as per requirement.
2. Student will able to set process parameters for different heat treatment processes.
3. Student will able to understand basics of selection of materials and failure analysis
4. Student will able to select different NDT methods, depending on types of defects.

Mapping of CO and POs (a to l) and PSOs (m, n, o)

Course Outcomes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	O
CO1	√	√		√	√		√	√		√	√		√		
CO2	√	√		√	√		√	√	√	√	√			√	
CO3	√		√	√	√		√	√	√	√	√	√		√	√
CO4	√			√	√		√	√		√	√		√	√	√

Assessment Pattern

Skill Level	Ex-1	Ex-2	Ex-3	Ex-4	Ex-5	Ex-6	Ex-7	Ex-8	Ex- 9	Ex- 10	CA	ESA
Assembling											CA out of 25	
Testing	√	√	√	√	√	√	√	√	√			√
Observing	√	√	√	√	√	√	√	√	√	√		√
Analysing	√	√	√	√	√	√	√	√	√	√		√
Interpreting	√	√	√	√	√	√	√	√	√	√		√
Designing						√	√	√		√		√
Creating						√	√			√		√
Deducing Concluding	√	√	√	√	√	√	√		√	√		√
	10	10	10	10	10	10	10	10	10	10	25	25

Government College of Engineering Karad
Second Year B. Tech
ME 410: Workshop Practice – IV

Laboratory Scheme		**Examination Scheme**	
Practical	2 Hrs/week	**CA**	50
Total Credits	1	**ESE**	-

Course Objectives:

1. To explain pattern and its types, material used, allowances.
2. To apply their skills for manufacturing the pattern from the given drawing.
3. To characterize the sand based on various properties.
4. To enhance the skills in operations like pattern making, moulding

Course Contents

Experiment 1 Aim To study the pattern and types, material used, pattern allowances, construction and colour code of the pattern.
Objective: To select type of pattern, its material, allowances for given casting.

Experiment 2 Aim To study of core boxes and its types.
Objective: To explain the different types of core boxes.

Experiment 3 Aim To prepare pattern for solid casting
Objective To apply the process for manufacturing of pattern.

Experiment 4 Aim To perform different sand testing for green sand and core sand.
a. Size analysis. Grain fineness Number
b. Permeability Test
c. Clay content
d. Mould Hardness Test
Objective To determine properties of the sand

Experiment 5 Aim To study of Gating and Risering System
Objective To apply the process for minimizing casting defects

Experiment 6 Aim To study of casting defects.
Objective To indentify and prevent the casting defects

Experiment 7 Aim Industrial foundry visit to study pattern shop, sand making and moulding.
Objective To understand the practical difficulties encountered in foundry industries during casting process

List of Submission:

1. Total number of Experiments : 05
2. Total number of Job: 01

3 Field Visit Report :01

Additional Information:

Course Outcome(CO):

At the end of this course, student will able to

1 Conduct test on sand for size analysis, grain fineness number, hardness, permeability, moisture percentage, clay content etc.
2 Indentify the practical difficulties encountered in the process of sand testing and mould making.
3 Explain types, allowances and construction of pattern and core.
4 Prepare pattern for given solid casting.

Mapping of CO and POs (a to l) and PSOs (m,n,o)

	a	b	c	d	e	f	g	h	i	j	k	l	**m**	**n**	**o**
CO1	√	√	√	√	√								√	√	√
CO2	√	√	√		√				√		√				√
CO3	√	√	√		√										√
CO4	√	√	√	√	√				√		√			√	√

Assessment Pattern

Skill Level	Ex- 1	Ex- 2	Ex- 3	Ex-4	Ex- 5	Ex-6	CA
Assembling	√	√	√	√	√	√	CA out of 50
Testing	√	√	√	√	√	√	
Observing	√	√	√	√	√	√	
Analysing	√	√	√	√	√	√	
Interpreting	√	√	√	√	√	√	
Designing			√				
Creating			√				
Deducing Concluding	√		√	√	√	√	
	10	10	10	10	10	10	50

Government College of Engineering Karad.
Second Year B. Tech
HS002: General Proficiency-II

Teaching Scheme		**Examination Scheme**	
Lectures	2 Hrs/week	**CA**	50
Practical	2 Hrs/week		
Total Credits	3		

Course Objectives:

1. To introspect, develop a thorough understanding of oneself by identifying one's strengths & weakness
2. To map one's competence /employability skills & improve upon as per the same
3. To improve one's intrapersonal & interpersonal communication by mastering the art of listening & assert oneself while communicating for developing harmonious relationships
4. To identify latent talents and sharpen them into effective tools for success in career
5. To apply practical knowledge for self development focusing upon various skill sets as per industry requirement
6. To live up to the popular saying "the first impression is the last impression", the focus is on building a pleasing personality leading to positive branding of oneself
7. To keep oneself abreast with the social & professional etiquette by working on power dressing, elegant presentation & one's brand management
8. To map one's competence /employability skills & improve upon as per the same

Course Contents
Section I - Language Skills
Duration – 15 hrs

Unit I **Domain: Letter Writing**

The domain letter writing is transacted based on the theme material possession. There are five modules under this domain. Each module has a specific outcome. Each module is dealt with the help of a linguistic tool that is interaction

Module 1 **Duration: 3 hrs**

Objective: Produce & role play a conversation

A trigger (picture/Image/video/ Audio/ Script) is used to initiate interaction through this the class arrives at a common theme. Understands the features of conversation & role play it.

- To read the text critically
- To track one’s own reading process.
- To come out with graphical organisers.
- Constructing multiple texts from the given.

Module 2 **Duration: 3 hrs**

Objective: Reading an article

Based on the trigger (picture/Image/video/ Audio/ Script) related to the theme to process reading. Through this learners understand how to read a text effectively & understand the sensory perceptions and emotions involved. At the end of this process the learners come out with graphical organizers and there by construct multiple texts out of it.

Module 3 **Duration: 3 hrs**

Objective: Write a letter

To read the different forms of letter and identify the various features of a letter. Make the learners understand the correct way of writing letters through group editing.

Module 4 **Duration: 3 hrs**

Objective: Reading a news report

Based on the trigger (picture/Image/video/ Audio/ Script) related to the theme a text is given to process reading. The text given here is a news report. Through this learners understand the features of news report, learn to read a text critically & track their own reading process. At the end of this process the learners come out with graphical organizers and there by construct multiple texts out of it.

Module 5 **Duration: 3 hrs**

Objective: Writing a news report

Based on the trigger (picture/Image/video/ Audio/ Script) write a news report keeping all the features of a news report in mind. To present a news report orally and edit a news report.

Section II - Soft Skills

Duration – 24hrs

Unit II **Self-Awareness** **Duration – 6 hrs**

The module self awareness has three different topics that are**:**

- Personality Assessment
- Competency Mapping
- Self-Concept

This capsule focuses on the following:

- To introspect & develop a thorough understanding of one's personality.
- To Identifying the key traits in oneself comprising of attitude skill & knowledge
- To correlate the trait in oneself with the employability skill required for success
- To identify ones strength& weakness

To move from an imaginary self-concept to real self-concept

Unit III **Communication Skill** **Duration – 6 hrs**

The module communication skills has two different topics that are**:**

- Interpersonal Behavioral Styles
- Assertive Communication

This capsule focuses on the following:

- Being able to listen and use other appropriate communication techniques including an appreciation of non-verbal communication.
- To identify different behavioral styles & assert ones communication according to style.

Unit IV Self Management Duration – 6 hrs

The module self management has two different topics that are**:**

- Response Able Behaviour
- Beginning with End in Mind

This capsule focuses on the following:

- To develop skills and techniques to cope with daily challenges
- To gain practical solutions for day-to-day issues
- To set career goals to improve one's wellbeing and quality of life
- To understand how to calculate percentage of any numbers
- To understand how to calculate percentage of any numbers
- To develop and implement an action plan

Unit V Image Management Duration – 6 hrs

The module Image Management has two different topics that are**:**

- Presentation Skills
- Grooming and Etiquette

This capsule focuses on the following:

- To make the first impression always the best impression.
- To understand & follow the social norms in public.
- To know the importance of personal hygiene & grooming

Section III - Aptitude Skills

Duration-21 hrs

Unit VI Basic concept 1 Duration – 3 hrs

The module basic concepts 1 has two different topics that are**:**

- Percentages
- Profit and loss

This module focuses on the following:

- To understand how to calculate percentage of any numbers
- To understand how to calculate percentage of any numbers
- To improve upon calculations
- To understand when & how to calculate profit% & loss%

Unit VII **Basic concept 2** **Duration – 3 hrs**

The module basic concept 2 has two different topics that are**:**

- Time and work

This module focuses on the following:

- To understand how to calculate efficiencies of the person's
- To understand when to take positive or negative work

Unit VIII **Basic concept 3** **Duration – 3 hrs**

The module basic concepts 2 has two different topics that are**:**

- Time and distance
- Problems on trains

This module focuses on the following:

- To understand how to calculate Speed or Distance or Time when two unknown's are given
- To understand how to calculate Relative speed
- To understand how to calculate length of the train or bridge or platform

Unit IX **Reasoning 1** **Duration – 3 hrs**

The module reasoning 1 has the following topic:

- Puzzle test

This module focuses on the following:

- To understand & analyze the given information

Unit X **Reasoning 2** **Duration – 3 hrs**

The module reasoning 2 has two different topics that are**:**

- Directions sense
- Blood relations

This capsule focuses on the following:

- To understand how to calculate the direction and distance
- To understand how to say proper relations

Unit XI **Reasoning 3** **Duration – 3 hrs**

The module reasoning 3 has the following topic**:**

- Coding & decoding

This capsule focuses on the following:

- To understand how to start depending on the different types of coding

Unit XII **Reasoning 4** **Duration – 3 hrs**

The module reasoning 4 has the following topic**:**

- Number series
- Oddman out

This capsule focuses on the following:

- To understand how to calculate the series depending on the information
- To understand how to pick right answer from the given information

Course Outcome (CO):

1. To understanding of one's personality.
2. To Identifying the key traits in oneself comprising of attitude skill & knowledge
3. To correlate the trait in oneself with the employability skill required for success
4. To move from an imaginary self-concept to real self-concept
5. To identify different behavioral styles & assert ones communication according to style.
6. To set career goals to improve one's wellbeing and quality of life
7. To be responsible for ones actions
8. To make the first impression always the best impression.