FY B.TECH MECHANICAL ENGINEERING

COURSE SYLLABI

FOR

SEMESTER I

W.E.F

AY 2026-27

Chairman BoS
Mechanical Engineering Dept.
Govt. College of Engg., Karad

Government College of Engineering, Karad				
First Year (Sem – I) B. Tech. Mechanical Engineering				
ME3113: Applied Mathematics I				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		**MSE**	20
Tutorials	00 Hrs/week		**ISE**	20
Total Credits	03		**ESE**	60
			Total	100
			Duration of ESE	02 Hrs 30 Min

Course Outcomes: After completion of the course the student will be able to

CO1	Utilize concept of linear algebra for implementing Engineering domain problems.
CO2	Separate real and imaginary parts of Hyperbolic functions and logarithms of complex number.
CO3	Deal with functions of several variables, Jacobian and their applications.
CO4	Apply vector calculus for Engineering applications.

	Course Contents	CO	Hours
Unit 1	**Solution of System of simultaneous linear equations:** Rank of a matrix, Rank using normal & Echelon form, System of linear equations; consistency of homogeneous & nonhomogeneous systems, Linear dependence and independence of vectors.	CO1	**(7)**
Unit 2	**Eigen Values and Eigen Vectors:** Eigen values and Eigen vectors and their properties, Cayley-Hamilton Theorem (without proof), powers of matrix, diagonalization of matrices.	CO1	**(7)**
Unit 3	**Complex Numbers:** Demoivre's theorem, Circular functions, Hyperbolic and Inverse Hyperbolic functions, logarithms of complex number, separation into real and imaginary parts of a complex number.	CO2	**(7)**
Unit 4	**Partial Differentiation:** Partial derivatives, Homogeneous functions and Euler's theorem, Composite function, total derivative, Applications to partial differentiation; Errors and Approximations	CO3	**(7)**
Unit 5	**Jacobian:** Properties, Jacobian of implicit function, partial derivatives of implicit function using jacobian.	CO3	**(7)**
Unit 6	**Vector Calculus:** Velocity and acceleration: Tangential and normal components of acceleration, Scalar and vector point functions, Gradient of scalar point function, Directional Derivatives, Curl and Divergence of vector point functions. Solenoidal and irrotational force fields.	CO4	**(7)**
Tutorials: Following is tentative list of tutorials to be conducted in the tutorial class based on- 1. Rank, consistency of system of equations. 2. Linear dependence, independence of vectors. 3. Eigen values and Eigen vectors. 4. Powers of matrix and Diagonalization of matrices. 5. Separation into real and imaginary part of hyperbolic and logarithmic function. 6. Direct differentiation and Euler's theorem. 7. Composite function and total derivative. 8. Errors and Approximations. 9. Jacobian of implicit function. 10. Directional Derivatives, Curl and Divergence of vector point function.			**(10)**

Text Books

1.	H.K.Das, S. Chand and sons, Advanced Engineering Mathematics by,22nd edition, 2018.
2.	Debashis Datta Textbook of Engineering Mathematics New Age International Publication,6th edition 2006.
3.	Ravish R..Singh, Mukul Bhatt, Engineering Mathematics A Tutorial Approach,.Tata, McGraw Hill 2010.

Reference Books

1.	G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.

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2.	Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,2006.
3.	Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi,2008
4.	Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
5.	D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005
6.	B. S. Grewal, Higher Engineering Mathematics, 43th edition, Khanna publication, New Delhi 2013.
7.	N P Bali and Dr.Manish Goyal, Textbook of Engineering Mathematics Laxmi publication 12th edition 2020.
Useful Links	
1.	http://www.nptel.iitm.ac.in
2.	www.ocw.mit.edu

Mapping of COs and POs:

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO 1	PSO 2	PSO 3
CO 1	2	2	1	2	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 3	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	2	2	1	1	-	-	-	-	-	-	-	-	-	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	4	10
Understand	-	4	10
Apply	5	4	15
Analyse	5	4	10
Evaluate	5	4	15
Create	-	-	-
TOTAL	20	20	60

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Mechanical Engineering Dept.
Govt. College of Engg., Karad

Government College of Engineering, Karad				
First Year (Sem – I) B. Tech. Mechanical Engineering				
ME3102: Applied Physics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/Week		**MSE**	20
Tutorials	00 Hrs/Week		**ISE**	20
Total Credits	03		**ESE**	60
			Total	100
			Duration of ESE	02:30 Hrs

Course Outcomes :

After completion of course the Students will be able to

CO1	Explain concepts of Crystal Structure, Quantum Physics, light for Engineering.
CO2	Understand physical significance and fundamental properties of crystal, light, sound, acoustics and NDT
CO3	Demonstrate applications of different physical phenomena in engineering and technology.
CO4	Compute required physical quantity from given data.

	Course Contents	CO	Hrs
Unit 1	***The structure of Crystalline Solids / Solid State Physics:*** Introduction (Lattice point, Space lattice, Basis, Crystalline solid), Unit cell- Primitive and non- primitive, Lattice parameters, Bravais Lattice (Seven crystal systems), Miller indices, Characteristics and examples, inter planer distance and their examples, relation between density and lattice constant, with examples, Bragg's law and spectrometer, Determination of crystal structures with X-ray diffraction spectrometer and examples.	CO1, CO2, CO3	(06)
Unit 2	***Wave optics*** Interference of light, Newton's rings, Examples, Farunhofer's diffraction from a single slit, Rayleigh criterion; Diffraction gratings and its theory, Wavelength of spectral lines, resolving power, Examples, Double Refraction, Positive and Negative crystal, Optical activity, Specific Rotation, Half Shade Polarimeter and their Examples.	CO1, CO2, CO3	(07)
Unit 3	***LASER*** Introduction, Characteristics of LASER beam, Absorption, Spontaneous Emission, Stimulated Emission, Population Inversion, Types of pumping agent, Components of LASER, Lasing action, Solid- state lasers (ruby), Diode Laser, Applications of LASER in science and engineering, Holography Techniques.	CO2, CO3, CO4	(07)
Unit 4	**Acoustics and Ultrasonic** **Acoustics**: Architectural Acoustics, Reverberation Time, Absorption, Sabine's formula, Conditions and Remedies for good acoustics, Method of design for good Acoustics problems. **Ultrasonic waves:** Ultrasonic waves, Characteristics of Ultrasonic waves, Magnetostriction oscillator and Piezoelectric Oscillator, Applications. Problems	CO2, CO3, CO4	(06)
Unit 5	**Quantum Physics:** Introduction to Quantum mechanics, Wave Particles Duality, De-Broglie waves, Properties of Matter wave, Physical significance of wave function, Heisenberg Uncertainty principle for position and momentum of particle, Compton Effect and Photoelectric Effect and their examples.	CO1, CO2	(06)
Unit 6	**Non-destructive testing:** Types of defect, Method of NDT, Visual Inspection, Liquid/Dye penetrant Testing, Magnetic particle testing, Eddy current testing, Ultrasonic inspection testing, x-ray radiography, Advantages.	CO2, CO3, CO4	(08)

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Text Books	
1.	Avadhanulu and Kshirsagar- Engineering Physics, S Chand publishing
2.	V. Rajendran -Engineering Physics, Tata McGraw-Hill Publishing Company limited

Reference Books	
1.	S. O. Pillai, Solid State Physics: Structure & Electron Related Properties, Eastern Ltd,, New Age International Ltd.
2.	Charles Kittle, Introduction to Solid State Physics - Wiley India Pvt. Ltd.(8th Edition).
3.	Alan Giambattista and others- Fundamentals of physics, Tata McGraw Hills
4.	B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi.
5.	R. K. Gaur & Gupta S. L, Engineering Physics -Dhanapat Rai Publication.
6.	Arthur Beiser -Modern Physics - Tata McGraw Hills
7.	K. Thyagarajan, A. K. Ghatak- LASERS: Theory and Applications; Macmillan India Limited.
8.	L. J. Schiff- Quantum Mechanics ; Mc-Graw Hill International Edition.
9.	N. Subramanyam & Brijlal- Text Book of Optics ; (Vikas Publishing House Pvt.Ltd)

Useful Links	
1.	en.wikipedia.org/wiki/ Fundamentals of Physics
2.	www.hyperphysics.com, www.google.com
3.	physics.info/magnetism, www.youtube.com, Nptl video

Mapping of COs and POs

PO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	3	2	1	-	-	1	1	-	-	-	1	-	-	-
CO 2	3	2	1	-	-	1	1	-	-	-	1	-	-	-
CO 3	3	2	1	-	-	1	1	-	-	-	1	-	-	-
CO 4	3	2	1	-	-	1	1	-	-	-	1	-	-	-

Assessment Pattern: (with revised Bloom's Taxonomy)

Knowledge Level	MSE	ISE	ESE
Remember	5	4	20
Understand	5	4	-
Apply	5	4	10
Analyse	-	4	20
Evaluate	5	4	10
Create	-	-	-
Total	20	20	60

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Mechanical Engineering Dept.
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Government College of Engineering, Karad				
First Year (Sem –I) B. Tech. Mechanical Engineering				
ME3103: Basic Mechanical Engineering				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		**MSE**	20
Tutorials	00 Hrs/week		**ISE**	20
Total Credits	03		**ESE**	60
			Total	100
			Duration of ESE	02 Hrs 30 Min

Course Outcomes (CO):

Students will be able to

CO1	Explain thermodynamic laws, basics of IC Engines and Automobile.
CO2	Describe Refrigeration and Air-Conditioning system with its different applications.
CO3	Illustrate about Renewable and non-renewable energy sources and power plant.
CO4	Explain Mechanical Power Transmission and different Manufacturing Processes.

	Course Contents	CO	Hours
Unit 1	**Introduction to Thermodynamics**: First law of Thermodynamics - Application of first law to steady flow and non-flow processes, limitations of first law (numerical treatment), PMM-I. Second law of Thermodynamics – Statements, Carnot engine, PMM-II	**CO1**	**(08)**
Unit 2	**Introduction to Automobiles:** **I.C. Engine** : Construction and Working of C.I. and S.I. Engine, Two stroke, Four Stroke advantages and disadvantages, engine components, Air-fuel ratio. **Automobile** : Different chassis layouts (including electric and hybrid vehicle), Components of vehicle, Types of automobile	**CO1**	**(07)**
Unit 3	**Introduction to Refrigeration and Air-Conditioning:** Vapour compression and Vapour absorption system, refrigerant types and properties. Window Air Conditioning, Split Air Conditioning (descriptive treatment only). Applications of refrigeration and air conditioning	**CO2**	**(06)**
Unit 4	**Energy sources and power plants:** Renewable and non-renewable energy sources. Solar energy: Solar flat plate collector, concentric collector – Parabolic and cylindrical, PV cell, solar dryer, solar cooker. Wind energy. Power plants: Steam, Geothermal, Wave, Tidal, Hydro power. Bio-gas, Bio-Diesel	**CO3**	**(06)**
Unit 5	**Mechanical Power Transmission:** Axle, shaft, keys, pulleys, gears *etc*. Belt drives, gear drives, and chain drives. (Simple numerical treatment on Torque, speed and power for belt and gear drive), Types of coupling, Types of bearing	**CO4**	**(06)**
Unit 6	**Manufacturing Processes:** Introduction to manufacturing processes: Casting process - steps involved in casting, Metal forming processes – Rolling, forging, drawing; Metal removing processes-Turning, Drilling, Milling,	**CO4**	**(07)**

Text Books

1.	Engineering Thermodynamics, P. K. Nag, Tata McGraw Hill Publications, 3rd edition, 2006
2.	Thermodynamics and Thermal Engineering, J. Rajadurai, New age International,1st edition 2003
3.	Thermal Engineering, Mahesh M. Rathore Tata McGraw Hill Publications First edition, 2010
4.	Internal Combustion Engine, V Ganeshan , Tata McGraw Hill publication 2015
5.	Refrigeration & Air-Conditioning, C. P. Arora Tata McGraw Hill, 3rd edition, 2010
6.	Solar Energy, S. P. Sukhatme and J. K. Nayak, Tata McGraw-Hill, 3rd Edition 2008
7.	Power Plant Engineering, R. K. Rajput, Laxmi Publications (P) LTD, 2008
8.	Design of Machine Elements, V. B. Bhandari., Tata McGraw Hill Publication, 4th Edition
9.	Manufacturing Technology- Foundry, Forming and Welding, Vol. I, P. N. Rao TMH, Delhi, 3rd edition, 2014.
10.	Elements of Workshop Technology -Vol. II, S.K. Hajra Choudhury and A. K. Hajra Choudhury Media promoters and Publishers Pvt. Ltd, New Delhi,13th Edition,2012.

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Reference Books	
1.	Mechanical Engineering Design, J. E. Shigley, MGH New York
2.	Engineering Thermodynamics, J.B. Jones and Dugan , Prentice –Hall Of India, 1st edition, Reprint in India 2006
3.	Thermodynamics – An Engineering Approach Cengel & Boles 1st edition Reprint 2000
4.	Principles of Refrigeration, Roy J. Dossat, Wiley Eastern Limited, New Delhi,2006
5.	Power Plant Technology, M.M.El Wakil, Tata Mc Graw Hill. Int, 2nd Edition. Reprint, (2010
6.	ASTM Volumes on Welding, casting, forming and material selection.
Useful Links	
1.	http://www.nptel.iitm.ac.in
2.	www.ocw.mit.edu

Mapping of COs and POs

PO→ CO ↓	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	2	-	2	2	-	1	-	-	-	-	1	1	1
CO 2	2	2	-	2	2	-	1	-	-	-	-	1	1	1
CO 3	2	1	-	2	2	-	1	-	-	-	-	1	1	1
CO 4	-	1	-	2	2	-	1	-	-	-	-	1	1	1

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSC	ISC	ESE
Remember	10	10	25
Understand	05	05	20
Apply	05	05	15
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

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Mechanical Engineering Dept.
Govt. College of Engg., Karad

Government College of Engineering, Karad				
First Year (Sem –I) B. Tech. Mechanical Engineering				
ME3104: Applied Mechanics				
Teaching Scheme			**Examination Scheme**	
Lectures	03 Hrs/week		**MSE**	20
Tutorials	00 Hrs/week		**ISE**	20
Total Credits	03		**ESE**	60
			Total	100
			Duration of ESE	02 Hrs 30 Min

Course Outcomes :

1.	Demonstrate a solid understanding of the basic concepts of mechanics.
2.	Apply problem-solving techniques to analyze and solve problems related to equilibrium of rigid bodies and friction.
3.	Explain the principles of trusses, including the analysis of joints and sections.
4.	Utilize knowledge of centroid and moment of inertia, as well as kinematics and laws of motion, to solve practical problems.

	Course Contents	CO	Hours
Unit 1	Basic concepts and fundamental laws, force, system of forces, resolution and composition of force, resultant, Principal of transmissibility of force, Moment and couple, Varignon's theorem and law of moment, Equilibrium, free body diagram, Lami's theorem, equilibrium equations, equilibrant force.	**CO1**	**(07)**
Unit 2	**Beam:** Definition and types of beams, types of loads, types of supports, analysis of simple by analytical method and virtual work method to calculate support reactions. **Friction:** Concept of friction, angle of friction, cone of friction, angle of repose. Friction on horizontal plain and on inclined plain.	**CO1**	**(07)**
Unit 3	**Analysis of Truss:** Types of trusses, Assumption, Method of Joints, Method of section, Analysis of simple truss with max. 7 members. Introduction to space truss.	**CO2**	**(07)**
Unit 4	Centroid of plane and composite figures, parallel and perpendicular axis theorems, moment of inertia of standard shapes from first principle, moment of inertia of composite figures, radius of gyration, Concept of mass moment of inertia.	**CO3**	**(07)**
Unit 5	Kinematics of rectilinear motion, motion curves, Newton's motion Law, Introduction to Projectile.	**CO4**	**(09)**
Unit 6	**Kinetics: -** De Alembert's principle, work-energy principle, Impulse -momentum principle, Collision of elastic bodies; direct central impact, oblique impact, coefficient of restitution, loss of kinetic energy.	**CO4**	**(05)**

Text Books

1.	Engineering Mechanics, S. S. Bhavikatti, New Age International Pvt. Ltd, Eighth Edition, 2021
2.	Applied Mechanics, S. B. Junnerkar, Charotar Publishing House, 18th Edition, 2015
3.	Textbook of Applied Mechanics, Khurmi. R. S, Tata McGraw Hill Publishing Company, 2006
4.	Engineering Mechanics (Statics and Dynamics), Palanichamy M. S., and Nagan, S., McGraw Hill Education India Pvt Ltd, 2000

Reference Books

1.	Engineering Mechanics, Irving H. Shames, Prentice Hall of India, New Delhi, 2016
2.	Engineering Applied Mechanics, S. N. Saluja, SatyaPrakashan, New Delhi,1992

Useful links

https://nptel.ac.in/courses/122102004

https://archive.nptel.ac.in/courses/112/106/112106286/

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Mapping of COs and POs

PO→ CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	1	-	1	-	-	-	-	-	-	-	1	-	-
CO 2	2	2	-	2	2	-	1	-	-	-	-	1	1	-
CO 3	2	1	-	2	2	-	1	-	-	-	-	1	1	-
CO 4	-	1	-	2	2	-	1	-	-	-	-	1	1	-

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	MSC	ISC	ESE
Remember	10	10	25
Understand	05	05	20
Apply	05	05	15
Analyse	-	-	-
Evaluate	-	-	-
Create	-	-	-
TOTAL	20	20	60

Chairman BoS
Mechanical Engineering Dept.
Govt. College of Engg., Karad

Government College of Engineering, Karad				
First Year (Sem – I) B. Tech. Mechanical Engineering				
ME3105: Design Thinking				
Teaching Scheme			**Examination Scheme**	
Lectures	01 Hrs/week		**MSE**	--
Practical	02 Hrs/week		**ISE**	50
Total Credits	02		**ESE**	--
			Total	50

Prerequisite : Professional Skills

Course Outcomes (CO): Students will be able to

CO1	Compare and classify the various learning styles and apply them in their engineering education.
CO2	Develop new ways of creative thinking and learn the innovation cycle of Design Thinking process for developing innovative products.
CO3	Prepare empathy map and journey map for problem.
CO4	Possess skills necessary to communicate design engineering ideas and design and apply innovative ideas using prototypes.

	Course Contents	CO	Hours
Unit 1	**Overview of Design Thinking Process:** Understanding the Learning Process, Kolb's Learning Styles, Assessing and Interpreting, Design Thinking Process: Business context of innovation for applying design thinking, two models of design thinking, phases of design thinking.	CO1, CO2	(03)
Unit 2	**Introduction to design thinking and its approaches:** Definition of Design Thinking, Need for Design Thinking, Objective of Design Thinking, Origin of design thinking, understanding design thinking and its process model, Human-Centered Design (HCD) process - Empathize, Define, Ideate, Prototype and Test and Iterate or Empathize, Analyze, Solve and Test.	CO1	(04)
Unit 3	**Empathize** How to emphasize, Role of empathy in design thinking, purpose of empathy maps, Things to be done prior to empathy mapping, creation of user personas, customer journey mapping.	CO2, CO3	(04)
Unit 4	**Analyze or Define** Root cause analysis, conflict of interest, perspective analysis, big picture thinking through system operator, big picture thinking through function modelling Silent brainstorming, metaphors for ideation, CREATE and What-If tool for ideation, introduction to TRIZ, Inventive principles and their applications	CO1, CO2	(05)
Unit 5	**Test (Prototyping and Validation)** What is Prototype? Why Prototype? Rapid Prototype Development process, Testing, Sample Example, Test Group Marketing Prototyping, Assumptions during the design thinking process, Validation in the market, best practices of presentation.	CO2, CO4	(05)
Unit 6	**Design Innovation** Benefits of iteration in the design thinking process, taking the idea to the market, introduction to innovation management in a company.	CO4	(05)

	Laboratory Content	
Experiment 1	Understanding of Design Thinking and its process model, Principles, and tools. (Activity: Design a mind map for processes of design thinking).	CO1, CO2
Experiment 2	How to Empathize, Role of Empathy in design thinking, Empathy Maps Design. (Activity: Construct empathy maps to provide right solution to any challenges through interviews, GD, observations, and other sources).	CO3
Experiment 3	Methods for Empathetic Design, Creation of User Personas. (Activity: Construct Persona profile which includes user information).	CO2, CO3

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Experiment 4	Customer Journey Mapping (Activity: Develop customer journey map to provide a roadmap visual of customers experience).	CO3
Experiment 5	Problem clarification, Understanding of the problem. (Activity: Construct worksheet for customer journey map to select best route).	CO1
Experiment 6	Problem analysis and Reformulation of the problem. (Activity: Generate summarized report for customer journey map).	CO2
Experiment 7	Case Study - students can pick one idea from their brainstorm list and use the "Sketch Prototype Worksheet" to sketch out their solution for their classmate.	CO2
Experiment 8	Root Causes Analysis, Conflict of Interest, Description of customer need.	CO4
Experiment 9	Design Cash Flow Diagram and Value Chain Analysis Diagram for weekly expenditure of person.	CO2
Experiment 10	Study the iterations in design thinking process.	CO2, CO4

Textbooks

1.	Bala Ramadurai, "Karmic Design Thinking", First Edition, 2020.
2.	E. Balaguruswamy, "Developing Thinking Skills (The way to Success)", Khanna Book Publishing Company, (2022).

Reference Books

1.	Vijay Kumar, "101 Design Methods: A Structured Approach for Driving Innovation in Your Organization".
2.	IDEO , "Human-Centered Design Toolkit: An Open-Source Toolkit to Inspire New Solutions in the Developing World", IDEO 2011.
3.	Marc Stickdorn and Jakob Schneider, "This is Service Design Thinking: Basics, Tools, Cases", BIS Publishers, 2014.
4.	Ulrich, Karl T. Design: Creation of artifacts in society, 2011.
5.	Tim Brown "Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation", Harper Collins, 2009.

Useful Links

1.	https://onlinecourses.nptel.ac.in/noc22_mg32/preview By Prof. Bala Ramadurai/ IIT Madras
2.	https://youtu.be/4nTh3AP6knM
3.	https://www.tutorialspoint.com/design_thinking/design_thinking_introduction.htm

Mapping of COs and POs

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

1: Slight(Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	30	30	30	30	30	30	30	30	30	30	30
Task II	10	10	10	10	10	10	10	10	10	10	10
Task III	10	10	10	10	10	10	10	10	10	10	10
ISE	50	50	50	50	50	50	50	50	50	50	50

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Government College of Engineering, Karad				
First Year (Sem-I) B. Tech. Mechanical Engineering				
ME3106: Applied Physics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/Week		**ISE**	25
Total Credits	1		**ESE**	--
			Total	25

Course Outcomes :

After the completion of the course, the students will be able to:

CO1	Demonstrate structure of Material.
CO2	Demonstrate a behavior of light by LASER, Ultrasonic waves and monochromatic light.
CO3	Compute required physical quantity from given data.
CO4	Demonstrate recent synthesis methods for engineering and technology.

Laboratory Contents		CO
Experiment 1	To identify symmetric elements of Cubic crystal.	CO1, CO3
Experiment 2	To identify crystal structure from X-Ray diffraction pattern.	CO1, CO3
Experiment 3	To determine the velocity of ultrasonic waves in liquid medium by interferometer.	CO2, CO4
Experiment 4	Find an object by Ultrasonic waves	CO2, CO4
Experiment 5	To calculate the divergence of LASER beam.	CO2, CO4
Experiment 6	Determination of wavelength of LASER using diffraction grating.	CO2, CO4
Experiment 7	To study interference pattern by Newton's ring Experiment.	CO2, CO4
Experiment 8	To determine the specific rotation of the given sugar solution with Polarimeter.	CO2, CO3,CO4
Experiment 9	To calculate Resolving power of Telescope	CO2, CO3
Experiment 10	To understand the quantization of energy by Frank Hertz Experiment	CO2, CO3
Experiment 11	To study Inverse Square Law.	CO2, CO3
Experiment 12	To study fundamentals of fiber optics using fiber optics trainer	CO2, CO3
Experiment 13	To understand the reconstruction of hologram by Holography	CO2, CO3
Experiment 14	To calculate the reverberation time of specific hall.	CO2, CO4
	Demonstration Experiment	
Experiment 15	To synthesize Nano particles by spray Pyrolysis/CVD method	CO4
Experiment 16	To study behavior of material with temperature by TGA/DTA.	CO4

List of Submission:

1. Minimum number of Experiments: 10

Mapping of COs and POs:

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

1: Slight (Low) 2: Moderate(Medium) 3: Substantial(High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
ISE											25

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Government College of Engineering, Karad					
First Year (Sem –I) B. Tech. Mechanical Engineering					
ME3107: Basic Mechanical Engineering Lab					
Laboratory Scheme:			**Examination Scheme:**		
Practical	2 Hrs/week		**ISE**	50	
Total Credits	**1**		**ESE**	25	
			Total	75	

Course Outcomes (CO): Students will be able to

CO1	Explain IC engine components and Two stroke and Four stroke engine
CO2	Demonstrate VCR, solar water heating system and components of power plant
CO3	Describe types of gears, gear trains, pump and compressor and power conversion devices
CO4	Demonstrate hydraulic turbine and explain metal removal and metal joining process

Course Contents		CO
Experiment 1	Study and demonstration of IC engine components	CO1
Experiment 2	Study and demonstration of Two stroke and Four stroke engine	CO1
Experiment 3	Study and demonstration of vapour compression refrigeration and window air conditioner	CO2
Experiment 4	Study and demonstration of solar water heating system	CO2
Experiment 5	Industrial visit to steam power plant or hydroelectric power plant..	CO3
Experiment 6	Study and demonstration of diesel power plant	CO1,3
Experiment 7	Study and demonstration of types of gears and gear trains	CO3
Experiment 8	Study and demonstration of pumps and compressors	CO3
Experiment 9	Study and demonstration of hydraulic turbine	CO3
Experiment 10	Study and demonstration of metal removing process	CO4
Experiment 11	Study and demonstration of metal joining process	CO4

List of Submission: Minimum number of Experiments: 08

Mapping of COs and POs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	2	2	-	1	-	-	-	-	1	1	1
CO2	2	2	-	2	2	-	1	-	-	-	-	1	1	1
CO3	2	1	-	2	2	-	1	-	-	-	-	1	1	1
CO4	-	1	-	2	2	-	1	-	-	-	-	1	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp 1	Exp 2	Exp 3	Exp 4	Exp 5	Exp 6	Exp 7	Exp 8	Exp 9	Exp 10	Avg
Task I	25	25	25	25	25	25	25	25	25	25	25
Task II	15	15	15	15	15	15	15	15	15	15	15
Task III	10	10	10	10	10	10	10	10	10	10	10
ISE	50	50	50	50	50	50	50	50	50	50	50

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Government College of Engineering, Karad				
First Year (Sem-I) B. Tech. Mechanical Engineering				
ME3108: Professional Communication Skills				
Laboratory Scheme			**Examination Scheme**	
Lecture	01 Hrs/week		**ISE**	50
Practical	02 Hrs/week		**ESE**	25
Total Credits	2		**Total**	75

Course Outcomes (CO): After completion of the course student will be able to

CO1	Provide a learning environment to practice listening, speaking, reading and writing skills.
CO2	Assist the students to carry on the tasks and activities through guided instructions and materials
CO3	Effectively integrate English language learning with employability skills and training.
CO4	Provide hands-on experience through case-studies, mini-projects, group and individual presentations.

	List of Experiments	CO
Experiment 1	**Newspaper Reading**, finding difficult English words to enhance the glossary. Write down the summary of News and Present it effectively.	CO1
Experiment 2	**Reading Skills**- Reading Book (Any book) finding difficult English words to enhance the glossary. Write down the summary of book/any Topic and Present it effectively. Self-Introduction Activity	CO1
Experiment 3	**Reading Sills**- Watching English Movies Write down the same to Summaries. Strategies for Creating & Editing Effective Writing -Email Writing Activity	CO2
Experiment 4	**Reading Skills**- Listening English podcast, (seen and the unseen) Write down the same to Summaries. Extempore Activity	CO3
Experiment 5	**Reading Skills**- Reading Readers Digest/India Today/Autocar/EFY. Write down the same to Summaries. Strategies for Creating & Editing Effective Writing, Blog Writing (specific/suggest topics/give topics)	CO1
Experiment 6	**Watching TeD Talk and summarize it.** Strategies for Creating & Editing Effective Writing -Story writing and Narration	CO3
Experiment 7	**Develop a Welcome speech** on the given Theme/situation /Formulate a speech for introducing a guest in the given situation. **Group Discussion**- Group Discussion Rules	CO3
Experiment 8	**Just a Minute (JAM) -**Prepare for 1 min on spontaneous topic and deliver public talk on same. Solving MNC (Company 1) Verbal Ability questions	CO4
Experiment 9	**Debate:** International Topic and summarize the opinion as a Country. Strategies for Creating & Editing Effective Writing -Email Writing Activity2	CO4
Experiment 10	**Writing effective resumes and Cover Letters** Mock Interviews (Personal HR)	CO3

Text Books

1.	AICTE's Prescribed Textbook: English (with Lab Manual), Khanna Book Publishing Co.
2.	Kul Bhushan Kumar, Effective Communication Skills. Khanna Book Publishing, 2022.
3.	Practical English Usage. Michael Swan. OUP. 1995. 4. Remedial English Grammar. F.T. Wood. Macmillan.2007 5. On Writing Well. William Zinsser. Harper Resource Book. 2001 6. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

List of Submission		
1	Total number of Experiments: Minimum 10	
2	Total number of sheets: NA	
3	Project/Dissertation Report: NA	
4	Seminar report: NA	
5	Field Visit Report: NA	

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Mapping of COs and Pos

PO → CO ↓	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO 1	2	2	1	2	-	-	-	-	-	-	-	-	-	-
CO 2	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 3	2	2	1	1	-	-	-	-	-	-	-	-	-	-
CO 4	2	2	1	1	-	-	-	-	-	-	-	-	-	-

Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	ISE	ESE
Remember	10	05
Understand	15	05
Apply	15	10
Analyse	10	05
Evaluate	-	-
Create	-	-
TOTAL	50	25

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Government College of Engineering, Karad				
First Year (Sem – I) B. Tech. Mechanical Engg.				
ME3109: Applied Mechanics Lab				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/week		**ISE**	25
Total Credits	1		**ESE**	--
			Total	25

Prerequisite : Applied Physics

Course Outcomes:

CO1	Demonstrate a clear understanding of the fundamental concepts in mechanics, including the basic laws governing force, moment, and couple.
CO2	Apply the principles of Varignon's theorem, the law of moments, Lami's theorem, and the importance of free body diagrams in problem-solving.
CO3	Develop a comprehensive understanding of the behavior and analysis of simple and compound beams, as well as the utilization of the virtual work method to determine support reactions.
CO4	Apply practical techniques to calculate the mass moment of inertia (M.I.) for various objects, considering their mass distribution and shape.

Course Contents

Experiment 1	To verify the polygon Law forces. Objective: Study basic concepts and fundamental laws, force, moment and couple.	CO1
Experiment 2	To understand the nature of forces in the members of jib crane. Objective: Study resolution and composition of force, system of forces, resultant	CO1
Experiment 3	To verify law of moments using Bell crank lever Objective: Study Varignon's theorem and law of moments, Lami's theorem, and free body diagram.	CO1, CO2
Experiment 4	To determine the reaction for simply supported beam. Objective: Analysis of simple and compound beams, virtual work method for support reactions	CO1, CO3
Experiment 5	To determine mass moment of inertia of Flywheel. Objective: To determine Moment of inertia of a Flywheel.	CO1, CO4
Experiment 6	To calculate the efficiency of simple screw jack. Objective: Study of simple lifting machine using screw jack.	CO1
Experiment 7	To determine the mechanical advantages, velocity ratio &efficiency of a differential wheel and axle.	CO1
Experiment 8	To determine the coefficient of restitution for different materials. Objective: To determine the coefficient of restitution for a given pair of materials.	CO4
Experiment 9	Drawing sheet: To find resultant - 3 problems	CO1
Experiment 10	Drawing sheet: To find support reactions - 3 problems	CO1

List of Submission:

Minimum number of Experiments: 08

Textbooks

1.	Engineering Mechanics, S. S. Bhavikatti, New Age International Pvt. Ltd. ,2021
2.	Engineering Mechanics, R. K. Bansal and Sanjay Bansal, Jain Bros. Publishers, Delhi ,2015
3.	Textbook of Applied Mechanics, Ramamrutham. S, Dhanpat Rai Publications, 2016
4.	Engineering Mechanics (Statics and Dynamics), Palanichamy M. S., and Nagan, S., McGraw Hill Education India Pvt Ltd, 2000

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Reference Books	
1.	Vector Mechanics for Engineers Vol.-I and II, F. P. Beer and E. R. Johnston, Tata Mc- Graw Hill Publication, 2017
2.	Engineering Mechanics, Irving H. Shames, Pearson Education India, 4 th Edition, 2005
3.	Engineering Mechanics, S. N. Saluja, Satya Prakashan, New Delhi, 2nd Edition, 1970
Useful Links	
1.	https://nptel.ac.in/courses/122102004
2.	https://archive.nptel.ac.in/courses/112/106/112106286/
3.	https://eerc01-iiith.vlabs.ac.in/List%20of%20experiments.htm

Mapping of COs and Pos:

PO→ CO ↓	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PSO 1	PSO 2	PSO 3
CO 1	3	-	-	1	-	-	-	-	-	-	-	-	1	-
CO 2	1	2	-	1	-	1	1	-	-	-	-	1	-	-
CO 3	-	1	2	2	1	1	-	-	-	-	-	2	-	-
CO 4	-	1	2	1	-	1	1	-	-	-	-	2	-	-

Assessment Pattern:

Skill Level (as per CAS Sheet)	Exp1	Exp2	Exp3	Exp4	Exp5	Exp6	Exp7	Exp8	Exp9	Exp10	Avg
Task I	15	15	15	15	15	15	15	15	15	15	15
Task II	05	05	05	05	05	05	05	05	05	05	05
Task III	05	05	05	05	05	05	05	05	05	05	05
CA											25

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Government College of Engineering, Karad				
First Year (Sem – I) B. Tech. Mechanical Engineering				
ME3110: Yoga				
Laboratory Scheme:			**Examination Scheme:**	
Practical	2 Hrs/Week		**ISE**	50
Total Credits	1		**ESE**	--
			Total	50

Course Outcomes(CO): After completion of the course students will be able to

CO1	Understand basic skills associated with yoga which builds up physical, mental strength, flexibility, balance and coordination.
CO2	Learn breathing exercises and healthy fitness activities.
CO3	Learn techniques for increasing concentration and decreasing anxiety which leads to stronger academic performance.
CO4	Develop understanding of psychological problems associated with the age and lifestyle. Also apply injury prevention principles related to yoga.

Course Contents	CO
Following list of topics and practical's is only the guidelines to the instructor: • योगाचा इतिहास: योगसूत्र ग्रंथ, पतंजली मुनी. • अष्टांग योग: १. यम: अहिंसा,सत्य,अस्तेय,ब्रम्हचर्य,अपरिग्रह २. नियम:शौच,संतोष,तपास,स्वाध्याय,ईश्वरप्रणीधान ३. आसन: विविध स्थितीतील आसने ४. प्राणायाम : विविध प्रकार ५. प्रार्थना ६. धारणा: एकाग्र चित्त ७. ध्यान ८. समाधी वरील अष्टांग योगाचे थोडक्यात महत्व • सूर्यनमस्कार: महत्व व फायदे • प्रात्यक्षिक : प्रार्थना,सूर्यनमस्कार,आसने,प्राणायाम व ध्यान याचा सराव	CO1 CO2 CO3 CO4

Reference Books:

1.	Nagendra, H. R. & Nagarathna, R. (2002). Samagra Yoga Chikitse. Bengaluru: Swami Vivekananda Yoga Prakasana.
2.	Kumar, Ajith. (1984) Yoga Pravesha. Bengaluru: Rashtrothanna Prakashana.
3.	D.M Jyoti, Yoga and Physical Activities (2015) lulu.com3101, Hillsborough, NC27609, United States.
4.	Uppal, A.K. (1992). Physical Fitness. New Delhi : Friends Publication.

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Mapping of COs and Pos:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	POS1	PSO2	PSO3
CO1	-	-	-	-	-	2	2	2	3	2	-	-	-	-
CO2	-	-	-	-	-	2	2	2	3	2	-	-	-	-
CO3	-	-	-	-	-	2	2	2	3	2	-	-	-	-
CO4	-	-	-	-	-	2	1	2	1	1	-	-	-	-

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Assessment Pattern:

The evaluation will be done on the basis of participation and performance of students in practical hours. The consistency and accuracy in yoga, intrinsic goodness, right attitude, happiness and joyous way of doing things will be observed by yoga teacher.

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Government College of Engineering, Karad				
First Year (Sem- I) B. Tech Mechanical Engineering				
MS3112: Makers Space Laboratory I				
Laboratory Scheme			**Examination Scheme**	
Practical	04 Hrs/week		**ISE**	75
Total Credits	02		**ESE**	25
			Total	100

Prerequisite: Basic concepts of Physics, Chemistry and Mathematics

Course Outcomes (CO): Students will be able to

CO1	Use basic engineering tools and laboratory equipment.
CO2	Integrate mechanical, electrical, electronic, civil, and computing concepts.
CO3	Prepare technical documentation and engineering reports.
CO4	Work collaboratively in multidisciplinary teams.

Course Contents

Module 1 (Civil Domain)

- Smart Sustainable Campus Planning
- Water and Air Quality Parametric analysis
- Road Intersection and Traffic Congestion Planning
- Waste Identification and Recycling/Reusing/Energy Generation Ideas

Module 2 (Mechanical Domain)

- Workshop and Fabrication Practices
- CAD and Product Design
- Mechanical-Electrical Integration
- Smart Structural Prototype

Module 3 (Electrical Domain)

- Electrical Safety, Tools and Basics Circuits
- Electrical Machines and Drives
- Renewable Energy Systems
- Electrical-Electronics Integration
- Smart Energy Prototype

Module 4 (E&TC Domain)

- Components in electronics and its characteristics, resistor, capacitor, inductor, transistor, diode, LED, etc.
- Basic electronics instruments handling
- Embedded systems
- PCB designing (Power supply designing)

Module 5 (IT Domain)

- Python Programing

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- Raspberry Pi and Arduino IDE Installation, Setup and Programming
- Website Development
- Database Management System and Data Visualization Techniques

Module 6 (Project Management, Sustainability, and IPR)

- Introduction to Agile methodologies, teamwork, and project management tools.
- Importance of documentation in engineering projects.
- Fundamentals of sustainability, sustainability leadership, and carbon footprint analysis.
- Overview of Intellectual Property Rights (IPR), including patents, copyrights, and trademarks.

Mapping of COs and Pos:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO1	PSO2	PSO3
CO1	2	1	–	1	3	–	–	–	–	–	–	1	1	1
CO2	3	2	2	1	2	–	–	–	–	–	–	1	1	1
CO3	–	–	–	–	1	–	–	–	–	3	–	1	1	1
CO4	–	–	–	–	–	–	–	–	3	2	1	1	1	1

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

Guideline for Assessment Pattern (with revised Bloom's Taxonomy)

Knowledge Level	ISE	ESE
Remember	-	-
Understand	15	5
Apply	15	5
Analyse	15	5
Evaluate	15	5
Create	15	5
TOTAL	75	25

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