Integral University, Lucknow

Effective from Session: 2023-24 (Even Semester)							
Course Code	ME101	**Title of the Course**	Basic Mechanical Engineering	**L**	**T**	**P**	**C**
Year	I	**Semester**	I / II	3	1	0	4
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1. Be able to have the basic concepts of thermal sciences and temperature measurement on the basis of Zeroth law of thermodynamics. 2. To understand and apply first and second law of thermodynamics to various processes and real systems. 3. Be able to model the problem using free-body diagrams and reach to solution by using equilibrium equations. 4. To impart knowledge of structural analysis for safe design. 5. Be able to test different mechanical properties of engineering materials.						

Course Outcomes	
CO1	Explain basic concepts of thermal sciences and temperature measurement on the basis of zeroth law of thermodynamics.
CO2	Understand and apply first and second law of thermodynamics to various processes and real systems.
CO3	Model the problem using free-body diagrams and reach to solution by using equilibrium equations.
CO4	To perform structural analysis for safe design.
CO5	Knowledge of different mechanical properties of engineering materials and its testing.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamental Concepts for modelling of thermal systems**	Role of thermodynamics in different fields of engineering, thermodynamics system, surrounding and universe, macroscopic & microscopic point of view, concept of continuum, thermodynamic equilibrium, property, state, path, process, Energy and its form, temperature and it's measurement, Zeroth law of thermodynamics.	8	CO1
2	**First law & Second law of thermodynamics as a tool for analysing thermal systems**	First law of thermodynamics and its application for non flow processes, Flow processes and control volume, Flow work, Steady flow energy equation, Mechanical work in a steady flow process. Essence of second law of thermodynamics, Thermal reservoir, heat engines, COP of heat pump and refrigerator and its introduction to industrial applications. Statements of second law, Carnot cycle, Clausius inequality and its applications.	8	CO2
3	**Introduction to engineering mechanics and its application**	Role of engineering mechanics in different fields of engineering, Laws of motion, Transfer of force to parallel position, Resultant of planer force system. Free Body diagrams, equilibrium and its equation, Coulomb's law of friction, Equilibrium of bodies involving dry friction.	8	CO3
4	**Structure analysis for safe design**	Beams: Introduction, its types and uses in engineering application, concept of shear force and bending moment, Shear and bending moment diagram for statically determinate beams. Simple Stress and strain: Introduction, Normal & shear stress- strain for unidirectional loading, pure bending of beam and its applications.	8	CO4
5	**Mechanical properties and testing of engineering materials**	Introduction to engineering materials & their applications, Mechanical properties of engineering materials. Mechanical Testing: Tensile and compressive test, stress-strain diagrams for ductile and brittle materials bending test, hardness testing and impact test.	8	CO5

Reference Books:

Van Wylen G.J. & Sonnlog R.E. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. NY.

Wark Wenneth: Thermodynamics (2nd edition) Mc Graw Hill Book Co. NY.

Holman, J.P.: Thermodynamics, Mc Graw Hill Book Co.NY.

Shames I.H., Engineering Mechanics, P.H.I.

D.S. Kumar, Mechanical Engineering, S.K. Katarial & Sons.

Bhavi Katti S.S., Engineering Mechanics, New Age Pub.

P.K. Bharti: Engineering Mechanics, Kataria and Sons.

W. D. Callister, 2006, "Materials Science and Engineering-An Introduction", 6th Edition, Wiley India

e-Learning Source:

https://www.youtube.com/watch?v=Dy2UeVCSRYs&list=PL2_EyjPqHc10CTN7cHiM5xB2qD7BHUrv7

https://www.youtube.com/watch?v=DzyIEz3dKXQ&t=1s

https://www.youtube.com/watch?v=A-3W1EbQ13k&list=PLyqSpQzTE6M_MEUdn1izTMB2yZgP1NLfs

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)														
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2	1		2						3	3	2	2
CO2	3	3	3	2		3						3	3	3	2
CO3	3	3	3	2		3						3	3	2	1
CO4	3	2	2	2		3						3	3	2	1
CO5	3	3	2	1		3						3	3	2	2

1-   **Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation**

Integral University, Lucknow

Effective from Session: 2023-24								
Course Code	ME209	Title of the Course	MEASUREMENTS, METROLOGY AND CONTROL	L	T	P	C	
Year	II	Semester	IV	3	1	0	4	
Pre-Requisite	None	Co-requisite	None					
Course Objectives	1 To develop in students the knowledge of basics of Measurements and measuring devices. 2 To understand the concepts of various measurement systems & standards with regards to realistic applications. 3 The application of principle of metrology and measurements in industries 4 To develop competence in IoT's for sensors, transducers and terminating devises with associated parameters 5 To develop basic principles and devices involved in measuring surface textures.							

Course Outcomes	
CO1	Understand the significance of measuring system, devices with their interpretation in variables like time, force, torque and pressure
CO2	Able to derive IoT integrated sensor based solution for different applications in mechanical measurement.
CO3	Understand various advanced measuring machine tool and able to describe principle of metrology and measurements in industries.
CO4	Understand the principle of optical methods of measurement and metrology, and apply the acquired knowledge for the accurate and precise measurement of a given quantity.
CO5	Analyse control system under different time domain

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Mechanical Measurements**	Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration of measuring instruments, concept and sources of errors in measurement, statistical analysis of errors. Introduction to basic measuring parameters and devices like time, pressure, strain, force, torque, temperature and vibration measurement.	10	CO1
2	**IoT based Sensors and transducers**	Introduction to IoT based measurements, Measuring physical and virtual quantities in digital world, Sensors and Types of sensors, Analog Vs Digital Sensors, Wired Vs Wireless Sensor, Smart sensors, MEMS based sensors, etc., Types of Converters, Types of Transducers and Actuator, Microcontroller and Microprocessor, Digital transducers, Encoders, Touchpad. Finger print scanner etc.	08	CO2
3	**Metrology and Inspection**	Coordinate measuring machine (CMM): Need, constructional features and types Metrology and Inspection: Standards of linear measurement, Line and end standards. Limit fits and tolerances. Interchangeability and standarisation. Linear and angular measurements devices and systems Comparators: Sigma, Johansson's Microkrator, Limit gauges classification, Taylor's Principle of Gauge Design.	08	CO3
4	**Measurement of geometric forms and Surface**	Measurement of geometric forms like straightness, flatness, roundness. Tool markers microscope, profile projector, autocollimator. Interferometry: Principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: Quantitative evaluation of surface roughness and its measurement	08	CO4
5	**Automatic Controls**	Components and Systems: Translation and rotational mechanical components, series and parallel combinations, cascade system, analogous system. Servomechanisms.	06	CO5

Reference Books:

Mechanical Measurements: Beckwith Thomas G., Narosa Publishing House, New Delhi, 1993

Metrology and Measurement: Anand Bewoor & Vinay Kulkarni: McGraw-Hill, 2017

Hand Book of Modern Sensors: physics, Designs and Applications, Jacob Fraden, 3rd edition, Springer, New York, 2015.

Measurement Systems, Application Design: Deoblein E.O., McGraw Hill, 1990.

Engineering Metrology: Jain, R.K., Khanna Publishers, 2022

Mechanical Measurements and Control: Kumar D.S., Metropolitan, New Delhi, 2015

Modern Control Engineering, Katsuhiko Ogata, 5th ed., Prentice Hall, New Jersey USA, 2010

e-Learning Source:

https://www.youtube.com/watch?v=tN7iAzVEqa0&list=PLwdnzlV3ogoXJLQ8lSGb1hsztt24l9kZZ

https://www.youtube.com/watch?v=Z0GrR1hSrfI&list=PLwdnzlV3ogoXJLQ8lSGb1hsztt24l9kZZ&index=3

https://www.youtube.com/watch?v=HpIEeBtJupY&list=PLbMVogVj5nJSZiwuh_tp50dKry8mCxzKA

https://www.youtube.com/watch?v=TtQE3lol6fU

https://www.youtube.com/watch?v=njgixrZOT1E

PO-PSO CO	Course Articulation Matrix: (Mapping of COs with POs and PSOs)

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	2	2	2	-	1	-	2	-	2	-	3	3	3
CO2	3	3	3	3	3	-	1	-	3	-	3	-	3	3	3
CO3	3	3	3	3	3	-	1	-	3	-	3	-	3	3	3
CO4	3	3	3	1	2	-	1	-	2	-	2	-	3	3	3
CO5	3	3	3	1	2	-	1	-	2	-	2	-	3	3	3

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation

Name & Sign of Program Coordinator	**Sign & Seal of HoD**

Integral University, Lucknow

Effective from Session: 2023-24							
Course Code	ME308	Title of the Course	ENGINEERING PRODUCT DESIGN	L	T	P	C
Year	3	Semester	5	3	1	0	4
Pre-Requisite	NONE	Co-requisite	NONE				
Course Objectives		To impart basic concepts of engineering product design and their applications.					

Course Outcomes	
CO1	The students will learn about the basic concepts of engineering product development design and their Applications.
CO2	The students will understand the morphology of design and ergonomics of product design.
CO3	The students will learn about the concept of design for manufacturing and the economical aspects of design.
CO4	The students will understand the concepts of reliability engineering and value engineering.
CO5	The students will learn about the modern techniques of product development and its appraisal.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction to Product Design: Product Definition, Scope, Terminology, Applications. Design definitions, the role and nature of design, old and new design methods, design by evolution with examples of bicycle, safety razor etc. Need Analysis: Identification of need, analysis of need. design criteria, need based development, technology based developments, functional aspects. Physical reliability & economic feasibility of design concepts	8	CO1
2	Design morphology and ergonomics of design	Morphology of Design: Divergent, transformation and convergent phases of product design. Ergonomics in design: Design for aesthetics and ergonomics, human factors in design. Man-Machine interface: Design of displays and controls, compatibility of displays and controls. anthropometric data and its importance in design. applications of computers in product design.	8	CO2
3	Design for Mfg & Assembly	Design for Mfg & Assembly: Methods of designing for manufacturing & assembly. Designs for maintainability, design for safety, design for environment. Economic aspects in design: Fixed and variable costs. Break-even analysis. Concept of Utility, Utility value, Utility index.	8	CO3
4	Reliability and Value Engineering	Reliability engineering: Reliability considerations, bath tub curve, reliability of systems in series and parallel. Failure rate, mean time to failure (MTTF) and mean time between failures (MTBF). Value Engineering: Basic concept of value engineering, advantages, applications, role in product design and development. Value engineering function, value engineering phases, value engineering process.	8	CO4
5	Advanced techniques for product development	Introduction to concurrent engineering, reverse engineering, additive manufacturing and its applications. Product patent and Appraisal: Appraisal information and literature search, patents & IP Acts, standards and codes. Environment and safety considerations.	8	CO5

Reference Books:
1. Product Design & Manufacturing - A.K.Chitab & R.C.Gupta, PHI (EEE).
2.The Technology of Creation Thinking - R.P. Crewford – Prentice Hall
3. The Art of Thought – Grohem Walls – Bruce & Co., New York
4. Product Design & Decision Theory - M.K. Starr - Prentice Hall

e-Learning Source:
1.   https://www.youtube.com/watch?v=9WPZStQp03Q&list=PLSGws_74K01-KPzaLUtCV7R-CognwVoP8
2.   https://www.youtube.com/watch?v=HN9GtL21rb4&list=PLSGws_74K018yZOnbSaqWJZ837QyBB7vu

Course Articulation Matrix: (Mapping of COs with POs and PSOs)																	
PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO5	PSO6	PSO7
CO1	2	2	2	3	2	1	2						3	3	2			
CO2	1	2	1	2	3	2	1						1	1	2			
CO3	1	1	1	1	2	1	2						1	3	1			
CO4	2	2	3	1	3	2	2						1	2	2			
CO5	2	2	3	3	1	2	3						1	2	1			

Name & Sign of Program Coordinator	Sign & Seal of HoD