Integral University, Lucknow

Effective from Session: 2024-25							
Course Code	DMA-301	**Title of the Course**	APPLIED MATHEMATICS-II(A)	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**1**	**0**	**NA**
Pre-Requisite	DMA-301	**Co-requisite**	NA				
Course Objectives	To know the basic concepts of Mathematics with their Applications in Engineering.						

Course Outcomes	
CO1	The students learn about the application of Matrices in complex Engineering problems for recording Math reports.
CO2	The students gain the skill of applying the known results of Matrix algebra for the study of structural properties of graphs and applications of graph theory such as electrical network analysis and electronic circuits in expressing a problem.
CO3	The students use matrix transforms in computer graphics. Software and hardware graphics processor uses matrices for performing operations such as scaling, translation and rotation.
CO4	The students learn to form and solve problems using differential equations of Electrical circuits, decay of radioactive elements, Motion under gravity, Newton's law of cooling and simple Harmonic motion.
CO5	To motivate students on the relevance of differential equations in various engineering disciplines for example one-dimensional transient heat conduction.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1.	Matrix-I	Type of matrix: Null matrix, unit matrix, square matrix, symmetric and skew-symmetric matrix, orthogonal matrix, diagonal and triangular matrix, Hermitian and Skew-Hermitian matrix, unitary matrix. Algebra of Matrix: Addition, subtraction and multiplication. Determinant of matrix, cofactor of matrix, computing inverse through determinant and cofactor. Elementary row/column transformation: meaning and use in computing inverse of matrix.	10	1
2.	Matrix-II	Linear dependence/independence of vectors. Definition and computation of rank of matrix through determinants, elementary row and column transformation (Echelon and Normal form of matrix), consistency of equations.	8	2
3.	Eigen Values and Eigen Vectors, Cayley Hamiltom Theorem	Definition and evaluation of Eigen values and Eigen vectors of a matrix of order 2 and 3. Cayley Hamilton theorem (without proof) and its verification, use of Cayley-Hamilton theorem in finding inverse.	6	3
4.	Ordinary Differential Equation	Introduction, formation, order, degree of ordinary differential equation. Formation of ordinary differential equations through physical, geometrical, mechanical, electrical consideration. Solution of differential equations of first order and first degree by variable separable, reducible to variable separable forms, linear and Bernoulli form and exact differential equation.	8	4
5.	Second Order Differential Equation Simple Application	Properties of solution, linear differential equation of second order with constant coefficients, complimentary function and particular integral, equation reducible to linear form with constant coefficients. LCR circuit, Motion under gravity, Newton's law of cooling, Radioactive decay, Population growth, Oscillations of a string, Equivalence of electrical mechanical system.	8	5

References Books:

1. Applied Mathematics: Kailash Sinha, Meerut publication
2. Applied Mathematics: P.K Gupta, Asian Publication
3. Applied Mathematics: H.R Luthra, Bharat Bharti Prakashan.
4. Applied Mathematics: H.K Das, C.B.S Publication.
5. Mathematics for Polytechnic: S.P Deshpande, Pune Vidyarthi Griha.

e-Learning Source:

https://youtu.be/rBNQ0r7CN2c?si=dWel4wkajbAzEvrt

https://youtu.be/syLIPtxjN0E?si=Gn9S_AjtmUriMP45

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	-	3	-	-	-	-	-	1	-	-	-
CO2	-	3	-	-	1	-	-	-	-	2	-

Integral University, Lucknow

CO3	-	3	-	-	1	-	1	-	1	-	-
CO4	-	3	-	-	1	-	-	-	-	-	1
CO5		3	-	-	-	-	-	-	-	2	-

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

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

Integral University, Lucknow

Effective from Session: 2010-11							
Course Code	DME-301	**Title of the Course**	MECHANICS OF SOLID	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	3	1	0	-
Pre-Requisite	10^{th} Passed	**Co-requisite**	-				
Course Objectives	1. To impart knowledge about the significance of strength of materials and testing of newly developed engineering materials used in industries and research organizations for elastic and plastic deformations. 2. To inculcate specialized knowledge and skill in designing of various components used in mechanical engineering for static loading. 3. To cultivate the ability to develop and implement new and improved advanced design elements and strength of materials resulting in creation and distribution of value in engineering applications. 4. To impart knowledge about Deflection of Beams, Thin & Thick cylinder, Column & Strut, Open and Closed coiled springs and different other common mechanical engineering design elements						

Course Outcomes	
CO1	Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple elastic solids. Calculate and represent the stress diagrams in bars and simple structures.
CO2	Solve problems relating to pure and non-uniform bending of beams and other simple structures.
CO3	Solve problems relating to torsional deformation of bars and other simple tri-dimensional structures.
CO4	Understand the concept of Strain Energy and be able to solve the problems related to simple structures.
CO5	Understand the concept of Buckling and Crushing and be able to solve the problems related to column/Struts

Unit No.	**Title of the Unit**	**Content of the Unit**	**Contact Hrs.**	**Mapped CO**
1	Stress strain and properties of materials and Complex stresses	Mechanical properties of materials Ductility, Tenacity, Brittleness, Toughness, Hardness, Factor of safety. Different types of loads and stresses, strain in a stepped bar. Determination of stress and elongation of a bolt in a bolted joint when subjected to direct external load only, stresses in compound bars and columns. Equivalent modulus of a compound bar, temperature stresses. Shrinkage of a tyre on a wheel. Temperature stress in compound bar, stress-stain curves for mild steel, Aluminium, cast iron & rubber. Stresses on an oblique plane in a body subjected to direct load, concept of compound stresses. Principal stress and Principal planes under direct and shear stresses. Graphical determination by Mohr's circle.	10	1
2	Shear force , bending moment and Theory of simple bending	Shear force and bending moment for concentrated and uniformly distributed loads on simply supported beams, cantilever and overhanging beam. Shear force and bending moment diagrams. Relationship between shear force and bending moment. Point of contra flexure, calculations for finding the position of contra flexure. Condition for maximum bending moment. Simple bending, examples of components subjected to bending such as beam, axle, carriage spring etc. Assumptions made in the theory of simple bending in the derivation of bending formula. Section Modulus Definition of neutral surface and neutral axis and calculation of bending stresses at different layers from the neutral surface for beam of different sections, Pure bending, Concept of Moment of Inertia and case study	10	2
3	Strain energy and Torsion	Meaning of strain energy and resilience. Derivation of formula for resilience of a uniform bar in tension. Proof resilience, modulus of resilience, suddenly applied load, Impact or shock load. Strain energy in a material subjected to uniaxial tension and uniform shear stress. General expression for total strain energy of simple beam subjected to simple bending. Strength of solid and hollow circular shafts. Derivation of torsion equation. Polar modulus of section. Advantages of hollow shafts over solid shaft. Comparison of weights of solid and hollow shafts for same strength. Horse power transmitted. Calculation of shaft diameter for given horse power.	8	3
4	Slopes and Deflections of Beams	Definition of slope and deflection, sign convention. Circular bending. Calculation of maximum slope and deflection for the following standard cases by double integration or moment area method. Cantilever having point load at the free end. Cantilever having point load at any point of the span. Cantilever with uniformly distributed load over the entire span Cantilever having U.D.L. over part of the span from free end Cantilever having U.D.L. over a part of span from fixed end Simply supported beam with point load at centre of the span. Simply supported beam with U.D. load over entire span. NOTE: All examples will be for constant moment of inertia without derivation of formula.	8	4
5	Columns and struts	Definition of long column, short column and slenderness ratio. Equivalent length, Critical load, Collapsing load, End conditions of columns. Application of Euler's and Rankines formula (No Derivation). Simple numerical problems.	4	5

References Books:

1. Strength of Materials: R. K. Rajput, S. Chand Publications
2. Strength of Materials: R K Bansal.

e-Learning Source:

https://www.youtube.com/watch?v=A1SWKe6ZwVc&list=PL521D094C8752CE67

https://www.youtube.com/watch?v=xMCReTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V

Integral University, Lucknow

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	2	3	1	2	1	-	-	-	-	-	-	-	1	1	1	-	1	-
CO2	2	2	-	1	1	-	-	-	-	-	-	-	-	2	1	-	2	-
CO3	2	3	1	2	-	-	-	-	-	-	-	-	-	1	1	-	2	-
CO4	2	3	2	1	1	-	-	-	-	-	-	-	-	1	1	-	1	-
CO5	2	3	2	1	1	-	-	-	-	-	-	-	-	2	1	-	1	-

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

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

Integral University, Lucknow

Effective from Session: 2010-11							
Course Code	DME-302	**Title of the Course**	MATERIAL SCIENCE-1	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**1**	**0**	**40**
Pre-Requisite	10 th Passed	**Co-requisite**	None				
Course Objectives	To know the behavior science of materials and understand efficient use of materials in today's industries.						

Course Outcomes	
CO1	Understand the basic concept of material science .
CO2	Student should be aware with properties of materials.
CO3	Student should be able to information about prevention of atmospheric corrosion and rusting.
CO4	Understand different non destructive testing method.
CO5	Student can understand about miscellaneous materials.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
Unit-1	Structure of metals and their deformation	Brief introduction to the subject metallurgy and its scope in engineering field, classification of materials of industrial importance. Their chemical thermal, electrical, magnetic, mechanical and technogical properties and their selection criteria for use in industry. Structure of metals and its relation to their physical, mechanical and technological properties. Elementary idea of arrangement of atoms in metals, molecular structures crystal structures and crystal imperfections. Deformation of metals, effects of cold and hot working operations over them. Recovery recrystallisation and grain growth, solid solutions, alloys and inter metallic compounds, allotropy of metals, effect of grain size on properties of metals. Corrosion its causes and prevention.	7	CO1
Unit-2	Properties and usage of metals:	Ferrous Metals: Classification of iron and steel. Sources of iron ores and places of availability. Outline of manufacture of pig iron, wrought iron, cast iron and steel. (Flow diagram only) Cast iron: Types as per I.S. - White, malleable, grey mottled, modular and alloy, properties and common uses. Classification of steels according to carbon content and according to use as per I.S. Mechanical properties of various steels and their uses. Name and places of steel plant in India.Availability of various section of steel in market, its forms and specifications.	9	CO2
Unit-3	Non-ferrous Materials:	Alloy Steel : Effect of alloying various elements, viz Cr, Ni, Co, V, W, Mo, Si and Mn on mechanicalproperties of steel, Common alloy steels, viz, (a) Ni-Steel(b) Ni-Cr-steel (c)Tungsten Steel (d)Cobalt steel (e)Stainless steel (f) Tool steel (g)High Carbon Steel, High Speed tool Steel, Satellite Metal, Tungsten Carbide Diamonds (e)Silicon manganese steel(f)Spring steel (g)Heat resisting alloy steels (Nimonic steels (h)Impact hardening steel	8	CO3
Unit-4	Non-ferrous Materials	Important ores and their metal content, outline of manufacturing methods, trade names, properties(Phy/Mech./Elect.) and use of the following metals: Aluminum, Zinc, Copper, Tin, Silver, Lead., Base metal with principle alloying elements (I.S.I. specification). Important properties and use of the following alloys: a)Aluminum Alloys: Aluminum-Copper alloy, Al, Zn alloy, Aluminum- Silica Alloy-Al-Ni-Alloy, Duralumnium-derived alloys (R.R. and Y-alloy) (b)Copper Alloys: Brass, Bronze, Gun metal, Phosphor Bronze, Aluminum Bronze, Ni Bronze.	8	CO4
Unit-5	Nickel Silver	Nickel Silver: Nickel-Copper Alloy (monel metal) inconel, Nickel, Silver Bearing Metals: Lead base alloys, tin base alloys. (White metals or babbit metals) Copper base alloys Solders: Solders-(Lead, Tin solder, Plumber solder, Tinman's solder or Tin solder) Silver solder, Brazing alloys (spelter), Inconel alloys.	8	CO5

References Books:

Manufacturing Process for Engineering Materials: Kalpak Jain - Pearson Education

K.M. Gupta

P.N. Rao

e-Learning Source:

https://archive.nptel.ac.in/courses/112106293/

Integral University, Lucknow

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3				1	3		2		1
CO2	3	1	3	3	1		3	3	2		
CO3	2		1	2	2	3	3			2	
CO4	3	2		1	1			1			
CO5	2	1		1	3	2			3		1

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

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

Integral University, Lucknow

Effective from Session: 2010-11							
Course Code	DME-303	**Title of the Course**	THERMAL ENGINEERING-1	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**1**	**0**	**40**
Pre-Requisite	10 th passed	**Co-requisite**					
Course Objectives	This is a discipline which finds many applications in our daily life.						

Course Outcomes	
CO1	Thermal engineering is a branch within mechanical engineering that is being pursued widely at the postgraduate level.
CO2	As a thermal engineering student, you will study heating and cooling processes; and the conversion of heat into various energies including mechanical, chemical and electrical energy.
CO3	This is a discipline which finds many applications in our daily life. For example, it is used to control the heat and temperature rise in computer by keeping the microprocessor in the CPU adequately cool.
CO4	Thermal engineers assist in designing heating systems and explore ways to improve on and take advantage of renewable energy sources.
CO5	Thermal engineers find innovative solutions to build next generation cooling designs that produce the desired temperatures are compact in size, cost effective as well as adaptable to fit Different system designs.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
Unit-1	Fundamental of thermodynamics	Definition, concept of thermodynamic system and surroundings. Closed system, open system, isolated system, thermodynamics definition of work. Zeroth low of thermodynamics. First law of thermodynamics for cyclic and noncyclic processes. Idea of internal energy and enthalpy. Thermodynamic processes - constant volume, constant pressure, constant temperature (Isothermal) processes, adiavatic process polytropic process, their representation on P-V diagram and calculation ofwork done. Application of the first law of these process. Simple numerical problems.	8	CO1
Unit-2	Laws of Thermodynamics	Second law of thermo dynamic, concept of perpetual motion machine of first order and that of second order. Concept of heat engine, heat pump and refrigerator. Carnot cycle efficiency for heat engine and cop for refrigerator and heat pump. ENTROPY -its physical concept and significance, reversibility and efficiency, Irreversibility and entropy. Expression for change of entropy in various thermodynamic processes. Simple numerical problemsconcerning the above.	8	CO2
Unit-3	Properties of steam	Idea of steam generation beginning from heating of water at 0oC to its complete formation into saturated steam. Pressure temperature curve for steam. Idea of dry saturated steam, wet steam and its dryness fraction, super heated steam and its degree of super heat. Enthalpy, entropy, specific volume and saturation pressure and temperature of steam. Use of steam table and mollier chart. Simple numerical problems.	8	CO3
Unit-4	Steam generators	Types of steam generators - Low pressure and High pressure boilers, Modern high pressure high discharge boiler - Stirling boiler, Lamont, Loefflor, Benson, Velox, ramsin and Schmidi-Hartmann boiler, Computer controlled accessories, Equivalent evaporation, Boiler performance efficiency	8	CO4
Unit-5	Steam turbine	Classification, details of turbine, working principle of impulse and reaction turbine, compounding methods of steam turbine, efficiency bleeding, concept of steam nozzles, governing of turbine. Principle of operation, classification, A brief concept of condenser details.	8	CO5

References Books:

Engineering Thermodynamics: R. K. Rajput, Laxmi Publications

Thermal Engineering : R.S. Khurmi and J.K. Gupta- S. Chand Publications

e-Learning Source:

https://archive.nptel.ac.in/courses/112103307/

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	3	3		2	2		2	2		1	
CO2		3	3				2		3		
CO3	3	3				2	2	2	1		
CO4	3	2	3			2					
CO5	3			2	2	3					

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

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

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Effective from Session: 2010-11							
Course Code	DME-304	**Title of the Course**	MECHANICAL ENGINEERING DRAWING	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**1**	**0**	**3**	**-**
Pre-Requisite	10th	**Co-requisite**	---				
Course Objectives	This course aims to develop the fundamental drawing skills necessary for mechanical engineering applications, emphasizing both manual drafting and CAD tools. Students will understand the principles of machine drawing, including views, sections, dimensioning, and engineering conventions for welding, riveting, screws, surface finish, limits, fits, and tolerances. They will gain proficiency in AutoCAD, learning to create 2D and 3D drawings using various tools, commands, and techniques for precision and efficiency. The course emphasizes the preparation of sectional and assembly drawings of components like pipe joints, couplings, and machine parts, transitioning between detailed and assembly views. It also focuses on freehand sketching, orthographic and isometric projections, and drafting cutting tools and mechanical components. By mastering these skills, students will effectively communicate engineering concepts and designs.						

Course Outcomes	
CO1	Basic knowledge about how to read part drawing and assembly drawing
CO2	Knowledge about various drawing symbols of like welding, riveting, materials, general fittings etc.
CO3	Draw free hand sketches of various kinds of objects.
CO4	To draw assembly drawing of various machine components.
CO5	Knowledge and use of auto cad commands to draw various objects.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	General Concept Of Machine Drawing	Views and sections (Full and half), dimensioning Technique -Unidirectional and aligned practice conventions as per latest code of practice for general engineering drawing. General concept of IS working drawing symbols for Welding & Riveting Screws & Screw threads Surface Finish Marks Limits, Fits & Tolerances	7	CO1
2	Familiarization With Auto Cad Commands:	What is CAD, Different type of CAD software available, Advantages of using CAD, AUTOCAD graphical user interface - Setting up drawing environment: Setting units, Drawing limits, Snap, Opening and Saving a drawing, Setting drafting properties, Different coordinate system used. Commands and their aliases, Different methods to start a command. Selecting object, removing object from selection set, Editing with grips, Editing object properties. Use of draw commands - Line, Arc, Circle, Polygon, Polygon, Polyline, rectangle, Ellipse, construction line, Spline. Use of modify commands - erase offset, Move, Copy, Mirror, Fillet, Chamfer, Array, Scale, Stretch, rotate, Explode, Lengthen. Creating 2D objects using Draw and Modify commands, Use of Hatch commands. Controlling the drawings display; Zoom, PAN, view ports, Aerial view. Drawing with precision: Adjusting snap and Grid alignment. Use of Tools Menu bar for calculating distance, angle, area, ID points, Mass using inquiry command, Quick select. Adding text to drawing, Creating dimension. Use of UCS, Alignment of UCS, Move UCS, Orthographic UCS. Creating 3 D objects using region, boundary, 3D Polyline, Extrude, revolve feature. Use of solid 3D edit features, Shell, Imprint, Separate, Section, Boolean functions like Union, Subtract and Intersect, Extrude faces, Move faces, Delete face, Offset faces, Copy faces and colour faces commands. To show the section - Use of slice, Section commands.	10	CO2
3	Sectioned View and Assembly Drawings	Sectioned View of Foundation bolts Pipe Joints - Flanged, Socket, Hydraulic joint and Union joint. Assembly Drawing of Knuckle joint- Part drawing, Solid Modeling, Assembly and Sectioning. Protective type flange coupling- Part drawing, Solid Modeling, Assembly and Sectioning. Bench vice - Part drawing, Solid Modeling, Assembly and Sectioning.	8	CO3
4	Assembly drawing and Freehand sketches	Assembly drawing from detail and vice versa. Tail stock of Lathe machine Screw jack Drilling Jig Spur gear profile drawing from given data Free hand sketching of Pipe fittings-Such as-Elbows-Reducers, T-Cross and Bibcock. IC engine piston, Simple bearing, Cotter and Knuckle joint, pulleys and flywheel-Sectioned views. Cutting tools of Lathe machine, shaper and common milling cutters.	8	CO4

Integral University, Lucknow

5	Orthographic Drawing from Isometric Drawings	Gear puller and C-clamp Sketching of orthographic views from isometric views be practiced.	7	CO5

References Books:

Machine Drawing :K.L.Narayana

e-Learning Source:

https://archive.nptel.ac.in/courses/112/104/112104172/

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

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

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

Integral University, Lucknow

Effective from Session: 2013-14							
Course Code	DME-306	**Title of the Course**	Basic Electronics Engineering	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**3**	**1**	**0**	**-**
Pre-Requisite	-	**Co-requisite**	-				
Course Objectives	To introduce the basics of semiconductor devices, digital electronics, and Electronic Instruments.						

Course Outcomes	
CO1	Identify the basic terminology associated with electronics and explain the basic concepts of Semiconductor diodes such as p-n junction.
CO2	To apply the basics of diode to design the various circuits such as rectifier, clipper-clamper and filters using it and their detailed performance analysis.
CO3	Draw and explain the structure of BJT & FET with characteristics of different configurations.
CO4	Describe and analyze the application of transistors for Current and voltage amplification
CO5	Perform various digital operations using Boolean algebra and analyze different signal parameters using CRO.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	**Semiconductor Diode**	**Mechanism of conduction in semiconductors:** Mobility and Conductivity, Electron and holes in an intrinsic semiconductor, Donor and Acceptor impurities, Fermi level, Carrier densities in semiconductor, drift of career in electric and magnetic field, Diffusion and Recombination. **Junction diode:** PN junction characteristic, Depletion layer, Diode Resistance, Capacitance, Switch time Breakdown mechanism, Zener and Avalanche breakdown characteristics. **Diode as circuit Element:** Half wave and full wave rectifiers, Filters, Zener Diode regulated power supplies, The diode clamper, clipper and multiplier circuits, special diode LED, Schottky diode.	8	1
2	**BJT Characteristics and Circuits**	Basic characteristics of NPN, PNP transistor, CE, CB, CC configurations, transistor biasing, biasing analysis and stability. transistor hybrid equivalent circuits, transistor amplifier and its small signal low frequency analysis using hybrid equivalent circuits, Feedback amplifiers.	8	2
3	**Field Effect Transistor**	**JFET:** Characteristic, equivalent circuit, basic amplifier circuits. **MOSFET:** Enhancement and depletion types, N channel, P channel. DC characteristic, use of MOSFET as a switch and as an amplifier.	8	3
4	**Switching Theory And Logic Gates**	Number system, Boolean algebra, Logic gates, Canonical forms, Minimization of logical function using Karnaugh map.	8	4
5	**Operational Amplifiers and Electronic instrument**	**Operational Amplifiers:** Concept of ideal operational amplifier (inverting and non-inverting) and its applications, inverter, integrator, differentiator, voltage follower, summing and differential amplifier. **Electronic instrument:** Multimeter, CRO and its applications.	8	5

References Books:

1. L. Millman & A. Grabel: Microelectronics TMH 1999
2. R L Boylestad & I Nashelesy: Electronic Devices and Circuit Theory, PIII 1998
3. B. G. Bueetman & Banerjee: Solid State Electronic Devices PIII 2001
4. Milliman & Halkias: Integrated Electronics TMH 1996

e-Learning Source:

1. Semiconductor Devices and Circuits by Swayam
2. Analog Circuits by NPTEL

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2													
CO2		2	2	1												
CO3		2	2													
CO4		2	1													
CO5		1	2													

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

Name & Sign of Program Coordinator	Sign & Seal of HoD

Integral University, Lucknow

Effective from Session: 2010-11							
Course Code	DME-351	**Title of the Course**	MECHANICS OF SOLID LAB	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	3	-
Pre-Requisite	10^{th}	**Co-requisite**	---				
Course Objectives	To understand and compare the changes in properties of materials by different heat treatment processes. To impart the knowledge of microstructures of different ferrous and non-ferrous metals and specimen preparation. To get the practical knowledge about tensile and compressive testing to find desired properties of materials by using UTM and spring testing machines.						

Course Outcomes	
CO1	Calculate the values of yield strength, percentage elongation, breaking strength and ultimate strength, percentage reduction in area of the given specimen under tension test on universal testing machine.
CO2	Conduct the Rockwell hardness test to measure the hardness of the given specimen.
CO3	Conduct the Brinell hardness test to measure the hardness of the given specimen.
CO4	Conduct the spring test to evaluate the various parameter of the open coil and closed coil spring.
CO5	Conduct the torsion test to determine the modulus of rigidity of given specimen.

Exp No.	Title of the Experiment	Content of the Experiment(Any Ten)	Contact Hrs.	MappedCO
1.	Shear force	To find the shear force at a given section of simply supported beam for different loading.	3	1
2.	Method of deflection	To find the value of 'E' for a steel beam by method of deflection for different loads.	3	
3.	U.T.M.	To determine the ultimate tensile strength, its modulus of Elasticity, Stress at yield point,% Elongation and contraction in x-sectional area of a specimen by U.T.M. through necking phenomenon.	3	
4.	Ultimate crushing strength	To determine the ultimate crushing strength of materials like steel and copper and compare their strength	3	
5.	Hardness no.	To determine Rock Well Hardness No. Brinell Hardness No. of a sample.	3	2, 3
6.	Impact test	To estimate the Shock Resistance of different qualities of materials by Izod's test and charpy test.	3	
7.	Bending moment	To determine the bending moment at a given section of a simply supported beam for different loading.	3	
8.	Torsion	To determine the angle of twist for a given torque by Torsion apparatus and to plot a graph between torque and angle of twist.	3	5
9.	Maximum stress	To determine the Max-Fibre stress in X-section of simply supported beam with concentrated loads and to find the neutral axis of the section.	3	
10.	Heat treatment process	To perform heat treatment process on materials of known carbon percentage - 1. Annealing 2. Normalising 3. Case Hardening. Mini Project i. Collect samples of heat insulating materials ii. Collect samples of various steels and cast iron. iii. Collect sample of Non-Ferrous alloys. iv. Collect samples of Non-Metallic engineering materials	3	
11.	Spring test	To determine the various parameters of Helical coil spring	3	4
12.	Microstructure	Preparation of specimens and study of microstructure of eight given metals and alloys on metallurgical microscope.(Brass, Bronze. Grey Cast Iron., Malleable Cast Iron. Low Carbon Steel., High Carbon Steel. High Speed Steel, Bearing Steel)	3	
13.	Diamond polishing	Study of diamond polishing apparatus.	3	
14.	Metallurgical microscope	Study metallurgical microscope.	3	
15.	Microstructure of Polished Specimen	(a) To prepare specimens for microscope examination (For Polishing and etching). (b) To examine the microstructure of the above specimens under metallurgical microscope. (c) To know composition of alloy steel by spebber steeloscope (d) To know carbon in steel by carbon steel estimation apparatus	3	

References Books:

Strength of Materials: R K Bansal

e-Learning Source:

https://www.vlab.co.in/

PO-PSO CO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 6	PO 7	PO 8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4	PSO 5
CO1	3	2	-	1	3	-	-	-	-	-	-	-	-	1	1	-	1	-
CO2	2	1	3	-	-	-	-	-	-	-	-	-	-	2	1	-	2	-
CO3	2	1	3	-	-	-	-	-	-	-	-	-	-	1	1	-	2	-
CO4	2	1	3	-	-	-	-	-	-	-	-	-	-	1	1	-	1	-

Integral University, Lucknow

CO5	2	1	3	-	-	-	-	-	-	-	-	-	-	2	1	-	1	-

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

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

Integral University, Lucknow

Effective from Session: 2010-11							
Course Code	DME-353	**Title of the Course**	THERMAL ENGINEERING LAB	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**0**	**0**	**3**	**0**
Pre-Requisite	DME-353	**Co-requisite**	--				
Course Objectives	Apply basic principles of Mathematics and Science to solve engineering problems. Identify and rectify simple and common troubles in automotive vehicles. Supervise operation of boilers, steam turbines, air compressors, IC engines, refrigeration and air-conditioning equipment. Use hydraulic and pneumatic equipment. Use various instruments to measure heat/air related parameters.						

Course Outcomes	
CO1	Thermal engineering applied in the field of Heating, ventilation, and air conditioning (HVAC)
CO2	Thermal engineering applied in the field of boiler design.
CO3	Thermal engineering applied in the field of Solar heating and solar power plant.
CO4	Thermal engineering applied in the field of Combustion engines.
CO5	Thermal engineering applied in the field of Thermal Power plant, Cooling systems and Heat exchangers.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	EXPERIMENT NO-1	Determination of temperature by : i. Thermo couple ii. Pyrometer	**3**	**CO1**
2	EXPERIMENT NO-2	Study of constructional details and specification of high pressure boiler and sketch (through field visit)	**3**	**CO1**
3	EXPERIMENT NO-3	Performance testing of steam boiler.	**3**	**CO2**
4	EXPERIMENT NO-4	Study of steam turbines through models and visits.	**3**	**CO1**
5	EXPERIMENT NO-5	Determination of dryness fraction of wet steam sample.	**3**	**CO3**
6	EXPERIMENT NO-6	Study and understanding of various types of furnace and their use through available furnaces/visits.	**3**	**CO2**
7	EXPERIMENT NO-7	Study and sketching of various hand tools, Lifting tacks, Gadgets used in plant.	**3**	**CO2**
8	EXPERIMENT NO-8	Study of fuel sypply and lubrication system in I.C. engine.	**3**	**CO3**
9	EXPERIMENT NO-9	Study of battery ignition system of a multi-cylinder petrol engine stressing on ignition timing, setting fixing order and contact breaker gap adjustment.	**3**	**CO3**
10	EXPERIMENT NO-10	Morse test on multi-cylinder petrol engine	**3**	**CO2**
11	EXPERIMENT NO-11	To prepare heat balance sheet for diesel/petrol engine.	**3**	**CO2**
12	EXPERIMENT NO-12	Demonstration of mounting and accessories on a boiler for study and sketch (field visit).	**3**	**CO3**
13	EXPERIMENT NO-13	Determination of B.H.P. for diesel and petrol engine by dynamometer.	**3**	**CO3**

References Books:

Engineering Thermodynamics: R. K. Rajput, Laxmi Publications

Thermal Engineering : R.S. Khurmi and J.K. Gupta- S. Chand Publications.

e-Learning Source:

https://mrcet.com/downloads/ME/Mech%20III-I.pdf

https://www.stannescet.ac.in/cms/staff/qbank/MECH/Lab_Manual/ME8512-THERMAL%20ENGINEERING%20LABORATORY-802275728-THERMAL%20LAB%20-1_merged.pdf

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**
CO2	**1**	**2**	**1**	**1**	**1**	**1**	**2**	**2**	**1**		**2**
CO3	**2**	**3**	**1**	**1**	**1**	**1**	**2**	**1**	**1**		**1**
CO4	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**1**	**1**		**1**
CO5	**1**	**3**	**1**	**1**	**1**	**1**	**1**	**1**	**1**		**1**

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

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

Integral University, Lucknow

Effective from Session: 2013-14							
Course Code	DME-356	**Title of the Course**	Basic Electronics Engineering Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	**0**	**0**	**3**	**-**
Pre-Requisite	-	**Co-requisite**	-				
Course Objectives	To introduce the fundamentals of semiconductor devices, transistors, digital electronics, and basic electronic instruments.						

Course Outcomes	
CO1	To introduce with the basic concept of semiconductor diode and its circuits.
CO2	To introduce with the fundamental of BJT.
CO3	To introduce with basic principle of FET.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	Experiment-1	Identification of Some Popular IC of 74 and 40 series with Pin Number and other details.	03	1
2	Experiment-2	Application and use of Multimeter, CRO, Audio Oscillator and Power Supply (D.C.).	03	1
3	Experiment-3	To measure the input and output voltage and plotting of input and output wave shapes for half wave rectifier circuit.	03	1
4	Experiment-4	To measure the input and output voltage and plotting of input and output wave shapes for full wave rectifier (center tapped and bridge rectifier) circuit.	03	1
5	Experiment-5	Plot the wave shapes of a full wave rectifier with shunt capacitor, series inductor and filter circuit.	03	1
6	Experiment-6	To measure the overall gain of two stages R.C. coupled amplifier at 1kHz and note the loading of second stage on the first stage.	03	2
7	Experiment-7	To measure the voltage gain, input and output impedance and plotting of frequency response of an emitter follower circuit.	03	3
8	Experiment-8	To plot the FET characteristics and determination of its parameters from these characteristics.	03	3
9	Experiment-9	To determine the range of frequency variation of a RC phase shift oscillator.	03	3
10	Experiment-10	To test adjustable IC regulator and current regulator.	03	3

References Books:

e-Learning Source:

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	3	2													
CO2	2	3	2													
CO3	1	2														
CO4																
CO5																

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

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