Integral University, Lucknow

Effective from Session: 2017 - 18							
Course Code	MT201	**Title of the Course**	**ENGINEERING MATHEMATICS – III**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	Complex Variables, Calculus, Ordinary Differential Equations.	**Co-requisite**					
Course Objectives	• To identify the functions in engineering problems as analytic function and their study as a function of a complex variables. To learn the analysis of a system in time domain and predict the transient performance parameters of a system for different standard inputs. To understand the basic concepts of different types of controllers. • To specify some difficult integration that appear in applications can be solved by complex integration. • To understand the method of finding the series solution of Bessel's and Legendre's differential equations. • To specify probability is an area of study which involves predicting the relative likely hood of various outcomes. • Able to expand the given periodic function defined in the given range in terms of sine and cosine multiple of terms as a Fourier series.						

Course Outcomes	
CO1	To solve Engineering problems using complex variable techniques
CO2	To evaluate the line integrals of a complex valued function
CO3	To apply the analytical technique to express periodic function as a Fourier sine and cosine series. Determine Z transform of DT signal and specify ROC, Using Z-transform properties to solve such problems efficiently
CO4	To apply the concept of probability to find the physical significance of various distribution phenomena.
CO5	To apply series solution of Bessel's differential equations for BVP.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Complex Variable I**	Analytic functions, C-R equations and harmonic functions, Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivatives of analytic functions, Liouville's theorem, Fundamental theorem of Algebra.	8	1
2	**Complex Variable II**	Representation of a function by power series, Taylor's and Laurent's series, singularities, zeros and poles, Residue theorem, evaluation of real integrals of type $\int_0^{2\pi} f(\cos\theta,\sin\theta)d\theta$ and bilinear transformations.	8	2
3	**Integral Transforms**	Fourier integral, Fourier complex transform, Fourier sine and cosine transforms and applications to simple heat transfer equations. Z-transform and its application to solve difference equations.	8	3
4	**Probability and Descriptive Statistics**	Probability, Correlation and Regression, Binomial distribution, Poisson distribution, Normal distribution.	8	4
5	**Series Solution**	Series solutions of ODE of 2nd order with variable co-efficient with special emphasis to differential equations of Bessel, Bessel functions and their properties.	8	5

Reference Books:

1. Kreyszig E. (1993) : Advanced Engg. Mathematics John Willey & Sons inc.S. Hasan Saeed, Automatic Control System, Kataria and sons, New Delhi
2. Dennis G. Zill : Advanced Engineering Mathematics, CBS Pub.
3. B.S. Grewal : Higher Engineering Mathematics, Khanna Pub. Katsuhiko Ogata, Modern Control Engineering, PHI
4. H.K. Dass : Advanced Engineering Mathematics, (S. Chand & Company)

e-Learning Source:

https://nptel.ac.in/courses/111103070

https://nptel.ac.in/courses/111102129

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

https://nptel.ac.in/courses/111106112

	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	PSO4
CO1	3	2	1	2	2	1				1		2	1	1		
CO2	3	2	1	2	2	1						2	1	1		
CO3	3	2	1	1	1	1						2	1	1		
CO4	3	2	1	2	3	1				1		2	1	1		
CO5	3	1	1	1	2	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: 2022-23							
Course Code	ME201	**Title of the Course**	MATERIALS SCIENCE	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• To review physics and chemistry in the context of materials science & engineering. • To describe the different types of bonding in solids, and the physical ramifications of these differences. • Introduce the relation between processing, structure, and physical properties. • Introduce metals, ceramics, polymers, and electronic materials in the context of a molecular level understanding of bonding. • Give the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class.						

Course Outcomes	
CO1	To review physics and chemistry in the context of materials science & engineering.
CO2	To describe the different types of bonding in solids, and the physical ramifications of these differences.
CO3	Introduce the relation between processing, structure, and physical properties
CO4	Introduce metals, ceramics, polymers, and electronic materials in the context of a molecular level understanding of bonding.
CO5	Give the beginning student an appreciation of recent developments in materials science & engineering within the framework of this class.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction** **Crystallography and Imperfections.**	Classification of materials, Engineering requirements of materials, Important properties of engineering materials. Crystal structure, Space lattice, Unit cell, Bravais lattices, Atomic packing factor; Miller Indices, X-ray crystallography techniques; Types of imperfections.	8	CO1
2	**Mechanical Properties and Testing** **Micro-Structural Examination.** **Phase Diagram and Equilibrium Diagram**	Stress strain diagram for ductile and brittle materials, Hardness, Impact, Fatigue and Creep testing, Non-destructive testing. Microscope principle and methods, preparation of samples and microstructure examination, X-ray diffraction, Grain size determination.**:** Unary and Binary phase diagrams, lever rule, Iron-carbon equilibrium diagram. Time Temperature Transformation (TTT) diagrams.	11	CO2
3	**Ferrous and Non-ferrous Metals and Alloys.** **Heat Treatment.**	Iron and steel manufacturing, Furnaces, Various types of carbon steels, alloy steels and cast iron, Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and their applications, Various types of Brass, and Bronze, Aluminium alloys. Introduction, heat treatment processes such as Annealing, Normalizing, Hardening Tempering, Case hardening and Surface hardening.	8	CO3
4	**Magnetic Properties** **Thermal Properties Electrical Properties of Materials.**	Types of Magnetism. Ferromagnetic domains, Soft and hard magnetic materials, Measurement of magnetic susceptibility, Applications of magnetic materials. Basic phenomenon, Type I and II superconducting materials, Applications of superconductors. Specific heat, Thermal conductivity, Thermal expansion, Thermal shock resistance, Thermoelectric effect. **:** Introduction, Resistivity, Conductivity, Semiconductors, P-N junction and Transistors, Insulators, Dielectrics.	5	CO4
5	**Plastics** **Ceramics** **Environmental Degradation** **Advanced Materials**	Polymers, Plastics and their applications, Mechanical behavior and Processing of plastics, Future of plastics. Structure, types, properties and applications, Processing ceramics, Mechanical behaviour and applications of traditional and advanced ceramics. Corrosion, oxidation, and prevention. Composite materials, Smart materials, biomaterials, super alloys, shape memory alloys.	8	CO5

Reference Books:

Material Science and Engineering: W.D. Callister, John Wiley and Sons.

Elements of Material Science and Engineering: Van Vlack, Pearson Education.

Material Science : V. Ragahvan, PHI

Material Science: Narula, TMH

Material Science: Abdul Mubeen, Khanna Publishers.

Material Science and Metallurgy : C.D. Yesudian and D.G.H. Samuel, Scitech.

e-Learning Source:

https://www.youtube.com/watch?v=KMcsjCXfLQw&list=PLyAZSyX8Qy5Am_2StOOQ5vCUE3VIcAenE

https://www.youtube.com/watch?v=5nBBUahtz-c&list=PLyAZSyX8Qy5C8ciqBBlypbx91j4nowUbL

https://www.youtube.com/watch?v=2rxbxNem1iI&list=PLyqSpQzTE6M_ON8uXt-PP8uX6hMWJeYSJ

	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	3	2	2	1					3	2	1	2
CO2	3	3	3	3	3	3	1					3	3	2	2
CO3	3	3	2	2	3	3	1					2	3	2	2
CO4	3	2	2	1	3	2						2	2	2	1
CO5	3	1	3	1	3	3	3					3	3	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: 2016-17							
Course Code	ME202	**Title of the Course**	APPLIED THERMODYNAMICS	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1. Be able to have the basic concepts of thermal sciences and their application in formulating the thermal engineering problems. 2. Have a good understanding of first and second laws of thermodynamics and will be in a position to fully understand the analysis to taught at the higher levels. 3. Be in a position to check the feasibility of proposed processes and cycles using the ideas of second law of thermodynamics and entropy 4. To carry out thermodynamic analysis of various cycles of operation. 5. To create the basic awareness for applying the concepts of thermodynamics in processes used in different industrial applications.						

Course Outcomes	
CO1	Demonstrate basic concepts of thermal sciences and their application in formulating the thermal engineering problems.
CO2	Demonstrate about steam generation, properties of steam and its application.
CO3	Demonstrate the use of steam in power generation in the efficient manner.
CO4	Demonstrate concepts related to I.C. engine and gas turbine and its analysis.
CO5	Analyze basic refrigeration and air conditioning systems.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Basic Thermodynamics	Thermodynamics-Definition, application, systems, laws of thermodynamics, simple numerical problems, availability of energy and irreversibility, Helmholtz and Gibb's function, mathematical conditions for exact differential, Maxwell'sRelations, Calapeyron's equation and joule-thompson inversion curve, simple numerical problems based on the above topics.	6	CO1
2	Steam and Boilers Properties of Steam and Steam Engines	Definition, classification and working of fire-tube and water-tube boilers, boiler mountings and accessories. Modern steam generators- La-Mont and Loeffler boilers. Boiler Efficiency, Equivalent Evaporation and Heat balance sheet. Boiler Draught. Simple numerical problems. Concept of Enthalpy and Entropy. Temperature Versus Total heat graph during steam formation, sensible heat of water, properties of steam-wet, dry, superheated steam, Advantages of superheated steam, Uses of steam tables and Mollier chart. External work done during evaporation, Internal energy of steam. Simple numerical problems on above topics. Measurement of dryness fraction by throttling calorimeter. Working of steam engines, Rankine and modified Rankine cycles. Indicator diagram, Compound steam engines, Work done, Numerical problems.	13	CO2
3	Steam Nozzles and Steam Turbines	Steam nozzles, types, nozzle efficiency, throat area, steam flow through nozzles, mass of steam discharged, critical pressure ratio, and super saturated flow. Numerical problems.Classification and working of steam turbines staging, efficiencies, velocity triangles for single stage moving blades, power produced, re-heat factor, Bleeding of turbines, Governing of turbines, Comparison of impulse and reaction turbines, comparison between steam turbines and reciprocating steam engines. Simple Numerical Problems	9	CO3
4	I.C. Engine and Gas Turbines	Review of I.C. engine Cycles, Classification of I.C. Engines. Work done and efficiencies. Valve timing diagrams, Numerical Problems on performance of I.C. Engines and Morse Test. Working of a Gas turbine, closed and open systems, performance of gas turbines, Inter cooling and Re-heating. Thermal Efficiencies. Comparison between I.C. engines, Steam turbines and Gas turbines, Thermal refinement of a gas turbine cycle, Numerical problems.	6	CO4
5	Refrigeration and Air-Conditioning	Introduction, units of refrigeration, Clausius Statement of second law of thermodynamics, C.O.P.Air refrigerator working on Bell coleman cycle, Vapour compression cycle. Mechanism of a domestic refrigerator. Vapour absorption refrigeration system. Air-Conditioning, needs, types, mechanism of a Domestic Air conditioner. Industrial Airconditioning. Simple numerical problems.	6	CO5

Reference Books:

1. Engineering Themodynamics : R.K. Rajput, Laxmi Publishing.
2. Thermal Engineering : P.L. Balaney, Khanna Publishing
3. Heat Engineering: V.P. Vasandani and D.S. Kumar P.M.B. Co. Pvt. Ltd.
4. Thermal Engineering: P.S. Khurmi and J.K. Gupta, S. Chand and Co.
5. Steam and Gas Turbine: R.Yadav LPH Allahabad.
6. . Engineering Thermodynamics: Jones and Dugon, PHI

e-Learning Source:

https://www.youtube.com/watch?v=AwbhbN20xl8&list=PLwdnzlV3ogoVJnW1S9GgOKYj5heOzl1dn

https://www.youtube.com/watch?v=6JwhQtw3JFg&list=PLFD532699BF29580A

https://www.youtube.com/watch?v=9GMBpZZtjXM&list=PLD8E646BAB3366BC8

	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	2	1					3	3	2	2
CO2	3	3	3	2	2	3	1					2	3	3	2
CO3	3	3	2	2	2	3						2	3	2	2
CO4	3	2	2	2	3	3						2	3	2	2
CO5	3	1	1	1	1	3						2	3	2	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: 2016--17							
Course Code	ME203	**Title of the Course**	STRENGTH OF MATERIALS	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
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	Fundamental concepts and importance of Compound stresses, Mohr's Circle. 3-D Stress, Theory of Failure, Castiglione's Theorem, Impact Load & Strain energy.
CO2	Fundamental concepts and importance of Deflection of Beams, Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams. Fundamental knowledge of Torsion as well as combined bending & torsion of solid & hollow shafts.
CO3	Fundamental concepts and importance of Helical and Leaf Springs, Deflection of springs by energy method, helical springs under axial load and under axial twist axial both for open and closed coiled springs, Fundamental concepts and importance Columns and Struts, Combined bending and direct stress, middle third and middle quarter rules, Struts with different end conditions. Euler's theory and experimental results, Ranking Gordon Formulae.
CO4	Fundamental concepts and design of Thin Cylinders and Thick Cylinders: Hoop, Longitudinal and Radial stresses s and strains. Volumetric strain. Thick cylinders subjected to internal or external pressures, Compound cylinders.
CO5	Fundamental concepts and importance of Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross- sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction**	Introduction of simple and compound stresses, Moh'r Circle. 3-D Stress, Theory of Failure, Castigliano's Theorem, Impact Load Three-dimensional state of stress & strain, equilibrium equations. Generalized Hooke's Law. Theories of Failure. Castigliano's Theorem. Impact load & stresses, Strain Energy.	8	CO1
2	**Stresses in Beams. Deflection of Beams Torsion**	Review of pure Bending. Direct and shear stresses in beams due to transverse and axial loads, composite beams. Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams. Review of Torsion, combined bending & torsion of solid & hollow shafts.	8	CO2
3	**Helical and Leaf Springs Columns and Struts**	Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs. Combined bending and direct stress, middle third and middle quarter rules, Struts with different end conditions. Euler's theory and experimental results, Ranking Gordon Formulae, Examples of columns in mechanical equipment's and machines.	8	CO3
4	**Thin Cylinders and Spheres. Thick Cylinders**	Hoop and axial stresses and strains. Volumetric strain. Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders. Stresses due to interference fits.	8	CO4
5	**Curved Beams: Unsymmetrical Bending**	Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression. Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear centre and flexural axis (for symmetry about both axis and about one axis) for I-section and channel-section.	8	CO5

Reference Books:
1. Strength of Materials: Ryder Macmillon..
2. Strength of Materials: Rajput, S.Chand.
3. Strength of Materials: R K Bansal.
4. Advanced Mechanics of Solids: Kazmi, THM.
5. Strength of Materials: Lehri , S.K. Kataria& Sons.
e-Learning Source:
https://www.youtube.com/watch?v=xMCReTC--Dg&list=PLbP4qbTd-5UfbzcWgQ3EY-GeLs5Feg95V
https://www.youtube.com/watch?v=A1SWKe6ZwVc&list=PL521D094C8752CE67
https://www.youtube.com/watch?v=_2d8YsXwm7M&list=PL35EBF66D99E7A0EC

	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	2	1	1	1	3	3	3	3	2	2
CO2	3	3	3	2	2	3	1					2	3	3	2
CO3	3	3	2	2	2	3	2	3	2	1	3	2	3	2	2
CO4	3	2	2	2	3	3						2	3	2	2
CO5	3	1	1	1	1	3						2	3	2	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: 2016-17							
Course Code	CE201	**Title of the Course**	FLUID MECHANICS	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1. To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, Gas dynamics etc. 2. To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows. 3. To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow. 4. To imbibe basic laws and equations used for analysis of static and dynamic fluids and to inculcate the importance of fluid flow measurement and its applications in Industries. 5. To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.						

Course Outcomes	
CO1	State the Newton's law of viscosity and explain the mechanics of fluids at rest and in motion by observing the fluid phenomena.
CO2	Compute force of buoyancy on a partially or fully submerged body and analyze the stability of a floating body.
CO3	Derive Euler's Equation of motion and Deduce Bernoulli's equation and Examine energy losses in pipe transitions and sketch energy gradient lines.
CO4	Evaluate pressure drop in pipe flow using Hagen-Poiseuille's equation for laminar flow in a pipe
CO5	Examine boundary layer over flat plate and analyze wall shear stress, drag force.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction Fluid Statics	Fluid and continuum, physical properties of fluids, ideal and real fluids, Newtonian and Non-Newtonian fluids, measurement of surface tension. Pressure-density-height relationship, measurement of pressure, manometers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to uniform acceleration	8	CO1
2	Kinematics of Fluid Flow Dynamics of Fluid Mechanics	Steady and unsteady, uniform and non-uniform, laminar and turbulent flows-, one-, two- and three-dimensional flows, streamlines, streak lines, and path lines, continuity equation, rotation and circulation, elementary explanation of stream function and velocity potential, graphical and experimental methods of drawing flow nets. Euler's equation of motion along a streamline, Bernoulli's equation from Euler's equation. Application of Bernoulli's equation- Pitot Tube, flow through orifice, mouthpieces, nozzles, notches, weirs, Venturi meter, Orifice meter, sluice gates under free and submerged flow conditions. Aeration of nape, cavitation, free and forced vortex, momentum equation and its application to stationary and moving vans, pipe bends, and problems related to combined application of energy and momentum equations, flow measurements, determination of Cv, Cc and Cd, energy loss.	8	CO2
3	Dimensional Analysis and Hydraulic Similitude Laminar Flow	Dimensional analysis, Buckingham's π theorem, important dimensional numbers and their significance, similitude, similarity laws, geometric, Kinematics and dynamic similarity, model studies. Equation of motion for laminar flow through pipes, Stoke's Law, flow between parallel plates, flow through porous media, Fluidization, measurement of viscosity.	8	CO3
4	Turbulent flow. Boundary layer Analysis.	Transition from laminar to turbulent flow, equation for turbulent flow, eddy viscosity, mixing length concept and velocity distribution in turbulent flow, Hot-wire anemometer and LDA. Boundary layer thicknesses, boundary layer over a flat plate, laminar boundary layer, application of momentum integral equation, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, atmospheric boundary layer, local and average friction coefficient, separation of boundary layer and its control, measurement of shear.	8	CO4
5	Flow Past Submerged Bodies Compressibility Effects in Pipe Flow	Drag and lift, drag on sphere, Cylinder and disc, lift, Magnus effect and circulation. Pipe Flow: Nature of turbulent flow in pipes, equation for velocity distribution over smooth and rough surfaces, resistance coefficient and its variation, flow in sudden expansion, contraction, diffusers, bends, valves and siphons, concept of equivalent length, branched pipes, pipes in series and parallel, simple networks. Transmission of pressure waves in rigid and elastic pipes; Water hammer, analysis of simple surge tank excluding friction.	8	CO5

Reference Books:

Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand Publication

S.K. Agarwal: Fluid Mechanics and Machinery, TMH.

Grade,R.J and A.G Mirajgaoker, 'Engineering Fluid Mechanics (including hydraulic Machines), Second Edition, Nem Chand and Bros., Roorkee,1983.

Grade,R.J 'Fluid Mechanics through problems.', Wiley Eastern Limited, New Delhi, 1989

Hunter Rouse," Elementary Mechanics of Fluid", John Wiley & Sons. Omc/.1946

e-Learning Source:

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

https://www.youtube.com/watch?v=HGbbdXNcIQA&list=PLbMVogVj5nJQEgL1sHuY24d6omOqXInnt

https://www.youtube.com/watch?v=lJSUeEqGNY0&list=PLwdnzlV3ogoV-ATGY2ptuLS9mwLFOJoDw

	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	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

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

Integral University, Lucknow

Effective from Session: 2016-17							
Course Code	ME204	**Title of the Course**	Materials science and testing lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	III	0	0	2	1
Pre-Requisite	ME102	**Co-requisite**	None				
Course Objectives	● To gain knowledge about identifying materials and the effect of corrosion. ● 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. ● To develop an understanding and practical knowledge about the importance of impact and cupping test.						

Course Outcomes	
CO1	To acquire knowledge of material identification of 50 common items and learn about the corrosion and its effect.
CO2	To conduct and measure the hardness value of different metals before and after heat treatment processes by using Brinell hardness tester.
CO3	To learn about the specimen preparation for metallographic preparation and microstructure of different metals.
CO4	To conduct and analyse tensile and compressive tests over universal testing machine and spring testing machine.
CO5	To conduct and analyse the Izod impact test and cupping test over a given specimen.

Unit No.	**Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Material identification	Material identification of say 50 common items kept in a box	2	CO1
2	Heat treatment & Brinell hardness	Comparative study of microstructure of different given specimen before and after heat treatment and Hardness testing of given specimen using Rockwell and Vicker/Brinell testing machines.	4	CO2
3	Microstructure	Specimen preparation for micro structural examination-cutting, grinding, polishing, etching.	2	CO3
4	UTM & Spring testing	Strength testing of a given mild steel specimen on UTM with full details and Spring index testing on testing spring testing machine.	4	CO4
5	Izod impact & Cupping test	Impact testing on impact testing machine like Charpy, Izod or both and cupping test over a given sheet specimen.	4	CO5
e-Learning Source:				
https://www.vlab.co.in/				

	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	PSO4
CO1	3	2	2	2	2	3			3	2		3	3	2	3
CO2	3	3	3	3	2	3			3	2		3	3	2	3
CO3	3	3	3	3	2	3			3	2		3	3	2	3
CO4	3	3	3	3	2	3			3	2		3	3	2	3
CO5	3	3	2	3	2	3			2	2		3	3	2	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: 2016-17							
Course Code	ME205	**Title of the Course**	APPLIED THERMODYNAMICS LAB	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**0**	**0**	**2**	**1**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To give the Knowledge of water tube and fire tube boilers • To impart knowledge about steam generation, properties of steam and its application. • To impart the concepts related to I.C. engine, and its performance testing. • To impart the basic concepts related to refrigeration and air conditioning. • To impart the basic concepts related to air conditioning.						

Course Outcomes	
CO1	Knowledge of Boilers, steam generation in power plants.
CO2	Analyze basics of refrigeration systems.
CO3	Analyze basics of air conditioning systems.
CO4	Demonstrate concepts related to I.C. engine
CO5	Demonstrate the performance testing of 4 stroke IC engine

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Boiler	Study of La-Mont Boiler.	2	CO1
2	Boiler	Study of Loeffler Boiler	2	CO1
3	Refrigerator	Study and working of a domestic Refrigerator.	2	CO2
4	Air Conditioner	Study and working of an Air Conditioner	2	CO3
5	2 Stroke Petrol Engine	Study and working of a 2 Stroke Petrol Engine	2	CO4
6	4 Stroke Petrol Engine	Study and working of a 4 Stroke Petrol Engine.	2	CO4
7	4 Stroke Diesel Engine	Study and working of a 4 Stroke Diesel Engine.	2	CO4
8	Morse Test	To perform the Morse Test on a 4-Stroke 4 Cylinder Petrol Engine and prepare heat balance sheet./ To determine the brake power of four stroke diesel engine and draw the heat balance sheet for 4-Stroke Diesel Engine.	2	CO5

Reference Books:

Applied Engineering Themodynamics :P.K Nag TMH Publication

Engineering Themodynamics : R.K. Rajput, Laxmi Publishing.

Thermal Engineering: P.S. Khurmi and J.K. Gupta, S. Chand and Co.

e-Learning Source:

None

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
3	3	2	3	2	3			3	2		3	3	2	2	3
3	3	2	3	2	3			3	2		3	3	2	2	3
3	3	2	3	2	3			3	2		3	3	2	2	3
3	3	2	3	2	3			3	2		3	3	2	2	3
3	2	2	2	2	3			2	2		3	3	2	2	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: 2016-17							
Course Code	ME206	**Title of the Course**	MACHINE DRAWING LAB-I	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**0**	**0**	**2**	**1**
Pre-Requisite	ME103	**Co-requisite**					
Course Objectives	• Helping the student in drafting their technical ideas • Understanding the importance of the linking functional and visualization aspects in the preparation of the part drawings. • Help the student in the visualization of assembly and sub assembly of various machine elements. • To impart basic knowledge on Computer Aided Design methods and procedures.						

Course Outcomes	
CO1	Know and understand the parts and detailed assembly drawing of various machine elements like Steam engine cross head, Eccentric, Lathe tail stock, screw jack, machine vice etc.
CO2	Able to understand product symbols of Surface roughness and Machining.
CO3	Interpret engineering drawings using fundamental of Limit fits and tolerances.
CO4	Improve their visualization skills so that they can apply these skills in developing new products by understanding simple machine parts
CO5	Gain the basic concepts of Auto- CAD and the methods of advance engineering drawing using intermediate geometry and comprehend the theory of projection.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Assembly Drawings	Introduction, Steam engine cross head, Eccentric, Lathe tail stock, stop valve, gate valve, safety valve, air valve, screw jack, machine vice, swivel vice. Drawing exercises.	2	CO1
2	Part Drawing	Introduction, Engine parts, Petrol engine parts, Steam engine cross head, Eccentric, Self centering vice, Drawing and exercises.	2	CO1
3	Surface Roughness	Introduction, Surface roughness, Machining symbols, Drawing exercises.	2	CO2
4	Limits Tolerance and Fits	Introduction, Limit System, Tolerances, Fits, Tolerances of form and position. Drawing exercises.	2	CO3
5	Production Drawing	Introduction, Types of production drawings, developing and reading of production drawing of simple machine elements like gears, connecting rod and piston.	2	CO4
6	Production Drawing	developing and reading of production drawing of simple machine elements like gears, connecting rod and piston.	2	CO4
7	Computer Aided Drafting	Introduction, Overview, Auto CAD basics, basic geometric Commands, Modeling, Sectional View, isometric view	2	CO5
8	Computer Aided Drafting	Development of simple 3Dimensional and 3Dimensional drawings.	2	CO5

e-Learning Source:

http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/egraphics_lab/labs/exp1/index.php

	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	3	1	1				3	3	2	2
CO2	3	2	3	2	2	3	2	1				3	3	2	2
CO3	3	3	2	2	3	2	2	1				3	3	2	2
CO4	3	3	3	2	2	2	1	1				3	3	2	2
CO5	3	2	3	2	2	3	1	1				3	3	2	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: 2016-17							
Course Code	CE205	**Title of the Course**	Fluid Mechanics Lab	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**0**	**0**	**2**	**1**
Pre-Requisite	None	**Co-requisite**	None				
Course Objectives	• To impart practical knowledge/techniques to verify Bernoulli's Theorem and its application. • To impart practical knowledge/techniques to determine the Meta-centric height of a ship model and to verify Impulse Momentum equation experimentally. • To impart practical knowledge/techniques to study the transition from laminar to turbulent flow and determine the lower critical Reynolds number. • To impart practical knowledge/techniques to Plot the flow pattern net using the Hele-Shaw apparatus and find the Coefficient of Discharge in rectangular and triangular notch. • To impart practical knowledge/techniques to determine the variation of friction factor 'f', for turbulent flow in commercial pipes						

Course Outcomes	
CO1	Learn the concept of Bernoulli's Theorem and apply it to find the discharge using Venturi meter and Orifice meter.
CO2	Determine the Meta-centric height of a ship model and verify the Impulse Momentum equation experimentally.
CO3	Study the transition from laminar to turbulent flow and determine the lower critical Reynolds number.
CO4	Plot the flow pattern net using the Hele-Shaw apparatus and find the Coefficient of Discharge in rectangular and triangular notch.
CO5	Determine the variation of friction factor 'f', for turbulent flow in commercial pipes.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Bernoulli's Equation	To verify Bernoulli's Equation experimentally.	2	CO1
2	Orifice meter	To calibrate an orifice meter and study the variation of the coefficient of discharge with the Reynolds number.	2	CO1
3	Venturi meter	To calibrate a venturi-meter and study the variation of the coefficient of discharge with the Reynolds number.	2	CO1
4	Meta-centric height	To determine experimentally meta-centric height of a ship model.	2	CO2
5	Impact of jet	To verify Impulse-Momentum Equation experimentally.	2	CO2
6	Laminar and Turbulent flow	To Study the transition from laminar to turbulent flow and determine the lower critical Reynolds number.	2	CO3
7	Hele-Shaw apparatus	To Plot the flow net using the Hele-Shaw apparatus	2	CO4
8	Notch apparatus	To calibrate a given v-notch or a rectangular notch and determine the coefficient of discharge	2	CO4
9	Friction factor	To study the variation of friction factor 'f', for turbulent flow in commercial pipes.	2	CO5

e-Learning Source:

https://fm-nitk.vlabs.ac.in/

	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	3			3	2		3	3	2	3
CO2	3	3	2	3	2	2			3	2		3	3	3	2
CO3	3	3	3	2	2	2			3	2		3	2	2	2
CO4	3	3	3	2	3	3			3	2		3	3	2	2
CO5	3	3	3	3	2	3			2	2		3	3	2	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: 2017-18							
Course Code	ME213	**Title of the Course**	POLYMER SCIENCE AND TECHNOLOGY	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1. Understanding the fundamental of polymer science 2. Understanding the process and methods of different polymerization 3. To get updated about recent development of polymer industry 4. Knowledge of different polymers and their properties for developing the different products. 5. Understanding of various plastic processing methods.						

Course Outcomes	
CO1	Isolate the key design features of a product which relate directly to the material(s) used in its construction, List the processes and methods of manufacturing of different plastic products
CO2	Indicate how the properties of polymeric materials can be exploited by a product designer, develop reaction pertaining to the polymerization of different polymers
CO3	Describe the role of rubber-toughening in improving the mechanical properties of polymers
CO4	Identify the repeat units of particular polymers and specify the isomeric structures which can exist for those repeat units
CO5	Estimate the number- and weight-average molecular masses of polymer samples given the degree of polymerization and mass fraction of chains present

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Introduction	Introduction, chemistry of polymer synthesis, polymer reaction kinetics, Mechanical properties of polymers, effect of structure on properties of polymers, Introduction to high performance polymers, polymer composite.	8	CO1
2	Manufacturing of polymer products	Manufacturing of Polymer products: Introduction of composites, Manufacturing of polymer composite. Hand lay Up method, Polymer processing technique, Extrusion moulding, Injection moulding, compression moulding.	8	CO2
3	Polymerization:	Polymerization: Introduction, step-growth polymerization, frees radical chain growth polymerization, Emulsion polymerization, ionic and cationic polymerization, chain statistics and rubber elasticity	8	CO3
4	Welding of polymer	Welding of Polymer: Methods of Polymer joining, Friction method, Hot air technique, and the process in general, The hot gas (air) generating equipment, Material preparation, Weld parameter in polymer welding. Weld factor, comparison of polymer weld bead and metal weld bead.	8	CO4
5	Preparation and applications	Preparation and Applications: Preparation, properties and technical applications of thermo-plastics (PVC, PVA), thermostats (PF, UF) and elastomer (SBR, GR-N), silicones. Application of polymers in space, ocean, electronics, medical, agriculture, automobile, sports and building construction.	8	CO5

Reference Books:

1. Polymer Science And Technology: Premamoy Ghogh
2. Polymer Science And Technology: Joel R. Fried
3. Polymer Science And Technology: Robert O Ebewele

e-Learning Source:

https://www.youtube.com/watch?v=54urJPOnaeU&list=PLyqSpQzTE6M_KQ5MqUkoOqAxxOrdvFOMB

https://www.youtube.com/watch?v=RMzGBRL_o3E&list=PLSGws_74K01_G67ptndBraskY3jCW7FLQ

https://www.youtube.com/watch?v=IaD2GlwPdOI&list=PLanXeDkWrN6zRnDVFhhNcccGLmKRn4fFB

	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	1	1	2	1	2	3	1					1	1	-	-
CO2	2	2	-	-	2	2	2					2	3	1	1
CO3	1	2	1	2	-	2	3					1	-	2	1
CO4	1	-	3	-	1	1	-					3	1	-	2
CO5	1	1	-	-	2	-	1					1	-	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: 2016-17							
Course Code	EC219	**Title of the Course**	LASER SYSTEMS AND APPLICATIONS	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1 To develop the knowledge of basics of Laser system. 2 To understand the concepts of various Laser operations. 3 To understand the concepts of various Laser systems. 4 To develop the knowledge of laser applications in fields of material processing and communication. 5 To develop the knowledge of laser applications in fields of surgery , metrology and LIDAR etc.						

Course Outcomes	
CO1	Basic concepts quantum physics, Schrodinger wave equation and Heisenberg uncertainty principle
CO2	Fundamentals of Relation between Einstein's A and B coefficients, Population inversion, Pumping.
CO3	Widening the concepts of working of general lasers and their type
CO4	Application of laser in material processing, medicine and communication
CO5	Application of laser in surgery, metrology paint stripping, quality control & packaging

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Introduction to Laser System**	Review of elementary quantum physics, Schrodinger wave equation, Heisenberg uncertainty principle, concept of coherence & it's type, absorption, spontaneous emission & stimulated emission processes, principle operation of laser action.	8	CO1
2	**Laser Operation**	Relation between Einstein's A and B coefficients, Population inversion, Pumping, Gain, Optical cavities, component of laser Associated mathematical problems.	8	CO2
3	**Laser Systems**	Introduction to general lasers and their types. Three & four level lasers, laser rate equation, CW & Pulsed Lasers, atomic, ionic, molecular, excimer, liquid and solid state Lasers and systems, short pulse generation and Measurement.	8	CO3
4	**Applications of Laser-I**	Laser application in material processing (drilling, cutting, welding, marking, cladding), medicine (ophthalmology, glaucoma), communication (optical fiber communication), Bar code readers.	9	CO4
5	**Applications of Laser-II**	Applications: Laser applications in surgery, metrology paint stripping, quality control & packaging, LIDAR, holography. Laser Rapid Manufacturing.	7	CO5

Reference Books:

K.R. Nambiar, "Laser Principles, Types and Application" New Age International

S. A. Ahmad, "Laser concepts and Applications" New Age International

Paul, C. P., Bhargava, P., Kumar, A., Pathak, A. K. and Kukreja, L. M. (2013) Laser Rapid Manufacturing: Technology, Applications, Modeling and Future Prospects, in Lasers in Manufacturing (ed J. P. Davim), John Wiley & Sons, Inc., Hoboken, NJ, USA.

Martellucci, S., Chester, Arthur N., Verga Scheggi, A.M, Laser Applications for Mechanical Industry, Springer, Germany

e-Learning Source:

https://www.youtube.com/watch?v=PK4yFaGHSFc&list=PLU0oJASIjGxdZMtypwhvGrnmuzNnNdcKt

https://www.youtube.com/watch?v=Ab1nxxkgjH8&list=PLp6ek2hDcoNCj_QQA2CmW1JIHAm5aD7o_

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

	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	3	2	2	3	3	2				3	3	3	2
CO2	3	2	2	2	2	3	3	2				3	3	2	2
CO3	3	3	3	2	2	3	3	3				3	3	2	3
CO4	3	3	3	2	2	3	3	2				3	3	3	2
CO5	3	3	2	2	3	3	3				3		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: 2017-18							
Course Code	ME207	**Title of the Course**	KNIEMATICS OF MACHINE	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	1.To impart understanding of different types of Mechanism and its inversion. 2. To analyze the velocity and acceleration of planar mechanisms. 3. To synthesize planar mechanisms based on motion requirements. 4. Understanding of gear drives and analysis of gear trains.						

Course Outcomes	
CO1	Ability to identify and analyze the mechanisms required for a particular motion requirement.
CO2	Capability to analyze the velocity and acceleration of planar mechanisms.
CO3	Propensity to synthesize planar mechanisms for the given motion parameters
CO4	Ability to design and analyze various types of CAM.
CO5	Ability to understand the suitability of different gear drives for motion/power transmission and to analyze different types of gear trains.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Links, mechanism	Links, Kinematics pairs, Linkage, Mechanisms,Inversion of slider crank chain, Number of degrees of freedom for a plane mechanis,Kutzbach Criterion for Plane mechanism Gruber's Criterion for Plane mechanism, Inversion of four bar chain, Single slider crank chain, Double slider crank Chain	8	CO1
2	Method for determining the velocity	Method for determining the velocity of a point on a link, Instantaneous center, Number of Instantaneous centers in a mechanism, Types of instantaneous Centers, Kennedy's theorem,velocity of a point on a link by instantaneous center method.velocity of a point on a link by relative velocity method, Acceleration diagram for a link, Acceleration of a point on a link, Acceleration in slider crank Mechanism,Coriolis Component of acceleration.	8	CO2
3	Pantograph, Straight line motion mechanisms	Pantograph, Straight line motion mechanisms, Peucellier's mechanism, Hart's straight line mechanism .Scott reusel mechanism, Grasshopper mechanisms.Analysis of hook's joint.Introduction to the analysis of Complex mechanism, Davis and Ackermann steering gear mechanism.Introduction to kinematic synthesis of planer Linkages, geometrical methods.3position synthesis of coupling rod, analytical method Frendenstem equation for function generation (3 position.	8	CO3
4	Classification of Cams and followers	Classification of Cams and followers, Displacement, Velocity and acceleration diagram for different motions of follower, construction of cam profile for different motions of follower,Cams with specified contours like Tangent cam with reciprocating roller follower, Circular Arc cam with flat faced follower.	8	CO4
5	Classification of Gear	Classification of Gear, Terminology of gears, Law of gearing, minimum number of teeth to avoid interference.Path of contact, Arc of Contact,Gear Trains (Simple, Compound and planetary), Introduction to kinematic.	8	CO5

Reference Books:

1. Theory of Machines: Thomas Bevan, ELBS/CBS
2. Theory of Machines: S.S. Ratan, TMH
3. Theory of Machines: R.K. Bansal, Laxmi Publication
4. Mechanisms and Machines Theory: A.K. Ambekar, Jain Bros.
5. Theory of Machines: W.T. Green

e-Learning Source:

https://www.youtube.com/watch?v=MJeRFzs4oRU&list=PLBEA57F7E7560C8E8

https://www.youtube.com/watch?v=yDEJxYGAoso&list=PLbRMhDVUMngdCkMipemSKP_dCgZLLfOe8

	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	1	1	3	2					3	3	2	2
CO2	3	3	2	1	1	2	2					2	3	3	2
CO3	3	3	3	2	1	2	1					3	3	2	2
CO4	3	2	2	2	1	2						2	3	2	2
CO5	3	3	2	2	1	2						2	3	2	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: 2017-18							
Course Code	ME208	**Title of the Course**	MANUFACTURING SCIENCE- 1	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	NONE	**Co-requisite**	NONE				
Course Objectives	• Demonstrate understanding of various manufacturing processes. • To make the student conversant with manufacturing of machine tool structures by using different manufacturing processes. • To learn various analytical aspects of different manufacturing techniques such as various forging, rolling, extrusion, drawing and casting methods. • To make acquainted the various unconventional manufacturing processes. • Forming load estimation during different metal forming processes. • 6. Implement the Knowledge of Gained Subject in Industry.						

Course Outcomes	
CO1	Students become able to understand the basics of various manufacturing processes and their application in industry.
CO2	Students will demonstrate the ability to apply the fundamentals of different manufacturing techniques such as various forging, rolling, extrusion, and drawing.
CO3	Students become able to understand the concepts of sheet metal process and their operations. They became able to find out the cutting force for sheet metal process.
CO4	Demonstrate the various unconventional manufacturing processes like powder metallurgy, electromagnetic forming processes, explosive forming processes etc
CO5	Demonstrate the fundamentals of casting process and design process of their various parts like riser, runner, sprue etc.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Introduction Metal Forming Processes.	Importance of manufacturing. Economic and technological considerations in manufacturing. Survey of manufacturing processes. Materials and Manufacturing processes for common items. Elastic and Plastic deformation, yield criteria. Hot working vs cold working. Load required accomplishing metal forming operation. Analysis (equilibrium equation method) of forging process with sliding and sticking friction and mixed condition for slab and disc. Work required for forging. Hand power and drop forging	8	CO1
2	Drawing, Extrusion and Rolling	Analysis of wire and strip drawing and maximum reduction. Analysis of Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills.	8	CO2
3	Sheet Metal Working.	Die and punch assembly and press working methods and processes. Cutting mechanisms, blanking Vs piercing, Compound vs progressive die. Flat face vs Inclined face punch. Analysis of forming process likes cup/deep drawing and bending.	8	CO3
4	Unconventional Metal Forming Processes. Plastic Components.	Unconventional metal forming processes such as explosive forming, electromagnetic and electro-hydraulic forming. Powder Metallurgy: Introduction, process, advantages and applications. Manufacturing of Plastics, its past, present and future. Injection molding, Extrusion of plastic Section, Welding of plastics, Applications of plastics, Resins and adhesives.	8	CO4
5	Casting (Foundry) Jigs and Fixtures.	Introduction: Basic principle and survey of casting processes. Types of patterns and allowances. Types and properties of moulding sands. Elements of a mould and design considerations of gating, riser, runner, cores, Solidification of casting. Sand casting, defects, remedies and inspection of castings. Cupola furnace. Die casting. Centrifugal casting, Investment casting. Locating and clamping devices, Principles of Jigs and fixtures and their applications.	8	CO5

Reference Books:

Manufacturing Technology: P.N. Rao, TMH.

Manufacturing Science: Ghosh and Mallik, East West Press.

Manufacturing Processes for Engineering Materials: Kalpakian, Pearson Education.

Materials and Processes in Manufacturing: Degarmo, PHI.

Production Technology: R.K. Jain, Khanna Publishers.

A Text Book of Production Engineering: P.C. Sharma, S. Chand.

e-Learning Source:

https://www.youtube.com/watch?v=jdFrBtHeJbs&list=PLSGws_74K01-g9nnTMBssGURHawYYQfMQ

https://www.youtube.com/watch?v=uRVaLUQUmA8&list=PLACB124F79F677B6A

	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						2	2	2	1
CO2	3	2	3	3		3						3	3	3	3
CO3	3	3	3	2		3						3	2	3	2
CO4	3	2	2	2		3						2	3	2	1
CO5	3	3	2	1		3						2	2	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: 2017-18							
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, Metrology 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 sensors, transducers and terminating devises with associated parameters 5 To develop basic principles and devices involved in measuring surface textures.						

Course Outcomes	
CO1	Explain the basics of standards of measurement, limits, fits & tolerances industrial applications.
CO2	Identify the uses of gauges and comparators.
CO3	Understand the significance of measurement system, errors, transducers, intermediate modifying and terminating devices
CO4	Interpret measurement of field variables like force, torque and pressure
CO5	Comprehend the fundamentals of thermocouple and strain measurement.

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	Mechanical Measurements: Introduction. Transducers Signal Transmission and Processing	Introduction to measurement and measuring instruments, Generalized measuring system and functional elements, units of measurement, static and dynamic performance characteristics of measurement devices, calibration, concept of error, sources of error, statistical analysis of errors. Sensors and Types of sensors, types of transducers and their characteristics. Devices and Systems. Signal Display and Recording Devices	9	CO1
2	Time Related Measurements. Vibration	Counters, stroboscope, frequency measurement by direct comparison Measurement of displacement. Measurement of Pressure: Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures. Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration. Measurements of Force and Torque: Different types of load cells, elastic transducers, pneumatic and hydraulic systems. Temperature Measurement: By thermometers, bimetallic, thermocouples, thermistors and pyrometers. Seismic instruments, vibration pick ups and decibel meters, vibrometers accelerometers	9	CO2
3	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.	6	CO3
4	Measurement of geometric forms. Surface texture	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.	8	CO4
5	Controls : Introduction, Representation of Control Components and Systems:	Controls : Introduction: Concept of Automatic Controls – open loop and closed loop system. Servomechanisms. Block diagrams, transfer functions. Applications of Laplace – Transform in control systems with simple examples/ numericals. Representation of Control Components and Systems: Translation and rotational mechanical components, series and parallel combinations, cascade system, analogous system. Controllers: Brief introduction to Pneumatic, hydraulic and electric controllers	8	CO5

Reference Books:

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

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

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

Engineering Metrology: Hume K.J., MacDonald and Co.

Engineering Metrology: Gupta, I.C., Dhanpat Rai and Sons, New Delhi.

Mechanical Measurements: Sirohi, New Age Publishers.

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

Mechanical Measurements: Jain, R.K., Khanna Publishers.

e-learning Resources:

https://www.youtube.com/watch?v=8DTt-f6wQxE&list=PL41FA714195562989

https://www.youtube.com/watch?v=3nio_KKMbnU&list=PLFW6lRTa1g83VG9vmMfSHf2o6q_SlcC9x

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

	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	2	1					3	1		
CO2	3	3	3	2	2	3	1					2	3	1	1
CO3	3	3	2	2	2	3						2		2	1
CO4	3	2	2	2	3	3						2	1		2
CO5	3	1	1	1	1	1						2		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:							
Course Code	EC217	**Title of the Course**	System and Automatic Control	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	**3**	**1**	**0**	**4**
Pre-Requisite	Mathematics, Basic Electrical Engineering	**Co-requisite**					
Course Objectives	❖ To understand the concepts of control system and their applications. To provide a systematic approach to interpret different physical systems, mechanical systems and electrical systems and construct the equivalent electrical model of mechanical system. To learn about the representation of a system by transfer function, block reduction method and signal flow graph. ❖ To understand the basic concepts of different types of controllers. ❖ To learn the analysis of a system in time domain and predict the transient performance parameters of a system for different standard inputs. ❖ To learn the analysis of a system in frequency domain by Polar Plots, Nyquist Plot and Bode Plot. To study the stability of the system with location of Poles and Zeros and study the stability by using Routh Hurwitz Criterion. To understand the concept of compensation and design the suitable compensator to make the system stable by Bode Plot ❖ To understand the concepts of Root Locus and to understand the concept of compensation and design the suitable compensator to make the system stable by Root Locus.						

Course Outcomes	
CO1	Given a system, students shall be able to **represent** the system in mathematical form, **identify** type of the system**, apply** block reduction technique and Mason's Gain formula to obtain the transfer function of the given system, and **formulate** differential equation to represent the model of a mechanical system into equivalent electrical system and **solve** using Laplace transform.
CO2	For a given system, **student** shall be able to understand the concept of different types of controllers used.
CO3	For a given system, **student** shall be able to **analyze** and **evaluate** the system in time domain and **predict** the performance in time domain for different standard input signals. **Evaluate** the steady-state error. **Examine** and **analyze** the stability by Routh-Hurwitz Criterion.
CO4	For a given system, student shall be able to **analyze** the system in frequency domain and explain the nature of stability. **Examine** and **analyze** the stability by Nyquist criterion and Bode Plot. For a given unstable system, students shall be able to **identify** and **select** the suitable compensator. To make the system stable **select** and **design** the suitable compensator for implementation. To **develop** the compensator by using Bode Plot.
CO5	For a given system student shall be able to study and understand the concept Root Locus. For a given unstable system, students shall be able to **identify** and **select** the suitable compensator. To make the system stable **select** and **design** the suitable compensator for implementation. To **develop** the compensator by using Root Locus.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	**Introduction to Control Systems**	Introduction to control, open-loop control, feedback control. System modeling; Modeling of electromechanical systems, Modeling of thermal and liquid systems, Laplace transform: Properties of Laplace transform, Laplace transforms of electromechanical systems, Transfer functions, Poles, zeros. Representation of multiple subsystems: Block diagrams, Signal flow graphs.	8	1
2	**Controllers**	Basic control action- characteristics of on-off, proportional, single-speed floating, integral and derivative control modes- P+I, P+D and P+I+D control modes-Pneumatic and electronic controllers to realize various control actions. Tuning of PID controller- Ziergler Nichols method damped oscillation method.	8	2
3	**Time**	Response of first and second order system, system response versus pole	8	3

	Response:	zero location, approximation of higher order system by low order system. Stability analysis: stability analysis using Routh-Hurwitz test. Feedback systems: Steady state and tracking analysis.		
4	**Frequency Response Analysis**	Bode plot technique, Stability Analysis: The Nyquist theorem , Stability Margins, Closed loop frequency response, Frequency domain compensation techniques: Lead and Lag compensators.	8	4
5	**Root Locus**	Sketching a root locus, Selection of gain from the root locus, Controller design using root locus: Lead Compensation, Lag Compensation.	8	5

Reference Books:

1. B.C Kuo, Automatic Control System, PHI
2. Katsuhiko Ogata, Modern Control Engineering, PHI
3. I.J.Nagrath & M.Gopal, Control System Engineering, New Age International Publisher
4. S.K. Bhattacharya, Control System Engineering, Pearson Education.
5. S. Hasan Saeed, Automatic Control System, Kataria and sons, New Delhi

e-Learning Source:

https://www.youtube.com/@s.h.tutorials

https://onlinecourses.nptel.ac.in/noc19_de04/preview

https://www.youtube.com/watch?v=RcuGxWc0HyQ

https://www.youtube.com/watch?v=XMfH2P2Fc6Q

https://nptel.ac.in/courses/107106081

	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	PSO4
CO1	**3**	**3**	**2**	**1**	**1**	**1**		**1**	**1**			**1**	**3**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**2**	**1**	**1**			**1**			**1**	**3**	**2**	**3**	**3**
CO3	**3**	**3**	**3**	**2**	**1**	**1**			**1**				**3**	**2**	**3**	**3**
CO4	**3**	**3**	**3**	**2**	**1**				**2**				**3**	**2**	**3**	**3**
CO5	**3**	**3**	**2**	**2**					**1**				**3**	**2**	**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: 2020-21							
Course Code	**CS203**	**Title of the Course**	**Cyber Law & Information Security**	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**2**	**1**	**0**	**3**
Pre-Requisite	**None**	**Co-requisite**	**None**				
Course Objectives	• Knowledge about cyber law, intellectual property and cyber crimes(internet security threats), trademarks and domain theft • Knowledgeon the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents. • Knowledge about Information System and principles of Information Security (as confidentiality, integrity, and availability) • Knowledge of cryptography and techniques used to detect and prevent network intrusions.						

Course Outcomes	
CO1	Understand key terms and concepts in cyber law, intellectual property and cybercrimes(internet security threats), trademarks and domain theft.
CO2	Keep an appropriate level of awareness, knowledge and skill on the disciplines of technology, E-business and law to allow them to minimize the occurrence and severity of information security incidents.
CO3	Understand about Information System and principles of Information Security (as confidentiality, integrity, and availability)
CO4	Understand about cryptography and techniques used to detect and prevent network intrusions.
CO5	

Unit No.	Title of the Unit	Content of Unit	Contact Hrs.	Mapped CO
1	**Fundamentals of Cyber Law**	Jurisprudence of Cyber Law, Object and Scope of the IT Act 2000, Introduction to Indian Cyber Law, Unicitral Model Law, ISP Guideline. Intellectual property issues and cyber space, Indian perspective, Overview of Intellectual property related legislation in India, Patent, Copy Right, Trademark law, Law related to semiconductor layout &design.	8	1
2	**E - Commerce**	Security Threats to E - Commerce, Virtual Organization, Business Transactions on Web, E-Governance and EDI, Concepts in Electronics payment systems, E-Cash, Credit/Debit Cards, E- Agreement, Legal recognition of electronic and digital records, E- Commerce Issues of privacy, Wireless Computing- Security challenges in Mobile devices. Digital Signatures - Technical issues, legal issues, Electronic Records, Digital Contracts, and Requirements of Digital Signature System.	7	2
3	**Investigation and Ethics**	Cyber Crime, Cyber jurisdiction, Cyber crime and evidence act, Treatment of different countries of cyber crime, Ethical issues in data and software privacy, Plagiarism, Pornography, Tampering computer documents, Data privacy and protection, Domain Name System, Software piracy, Issues in ethical hacking. Internet security threats: Hacking, Cracking, Sneaking, Viruses, Trojan horse, Malicious Code & logic bombs.Introduction to biometric security and its challenges, Finger prints.Cyber crime forensic: CASE STUDY in Cyber Crime.	9	3
4	**Information security**	Information Systems and its Importance, Role of Security in Internet and Web Services, Principles of Information Security, Classification of Threats and attacks, Security Challenges, Security Implication for organizations, Security services - Authentication, Confidentiality, Integrity, Availability and other terms in Information Security, Information Classification and their Roles. Introduction to Cryptography, Issues in Documents Security, Keys: Public Key, Private Key, Firewalls, Basic Concepts of Network Security, Perimeters of Network protection & Network attack, Need of Intrusion Monitoring and Detection.	9	4
5				

Reference Books:
1. Harish Chander “Cyber Law and IT Protection” , PHI Publication, New Delhi
2. Merkov, Breithaupt,“ Information Security”, Pearson Education
3. “Cyber Law in India” - Farooq Ahmad-Pioneer books.
4. K. K. Singh, Akansha Singh “Information Security and Cyber law”, Umesh Publication, Delhi
e-Learning Source:
https://nptel.ac.in/courses/106106129

	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	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**2**			
CO2	**3**	**2**	**1**	**1**	**1**	**2**	**3**	**2**	**2**	**2**	**3**	**1**	**3**	**2**	**2**			
CO3	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**2**	**3**	**1**	**1**	**2**	**2**	**1**	**2**			
CO4	**3**	**2**	**1**	**2**	**3**	**1**	**1**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**1**			
CO5	**1**	**2**	**2**	**3**	**1**	**2**	**1**	**3**	**1**	**2**	**1**	**2**	**1**	**2**	**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: 2017-18							
Course Code	ME210	**Title of the Course**	MANUFACTURING SCIENCE LAB	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	0	0	2	1
Pre-Requisite		**Co-requisite**					
Course Objectives	• Demonstrate understanding of various manufacturing processes. • To make the student conversant with manufacturing of machine tool structures by using different manufacturing processes. • To learn various analytical aspects of different manufacturing techniques such as various forging, rolling, extrusion, drawing and casting methods. • To make acquainted the various unconventional manufacturing processes. • Forming load estimation during different metal forming processes. • Implement the Knowledge of Gained Subject in Industry.						

Course Outcomes	
CO1	Students become able to understand the basics of various manufacturing processes and their application in industry
CO2	Students will demonstrate the ability to apply the fundamentals of different manufacturing techniques such as various forging, rolling, extrusion, and drawing.
CO3	Students become able to understand the concepts of sheet metal process and their operations. They became able to find out the cutting force for sheet metal process.
CO4	Demonstrate the various unconventional manufacturing processes like powder metallurgy, electromagnetic forming processes, explosive forming processes etc.
CO5	Demonstrate the fundamentals of casting process and design process of their various parts like riser, runner, sprue etc.

Unit No.	**Title of Experiment**	**Content**	**Contact Hrs.**	**Mapped CO**
1	Pattern design	Principles of pattern design for good moulding and sound casting	2	CO1
2	Pattern making	Making of pattern using wood for desired casting in foundry shop	2	CO1
3	Furnace	Study of oil-fired tilting furnace and use of furnace to melt metal for casting	2	CO2
4	Tube bending	Analyze of proper ways for tube bending on tube bending machine	2	CO2
5	Jigs & fixture	Study of various jigs and fixture and other techniques for locating work	2	CO3
6	Sand testing	Testing of sand for permeability and moisture content	2	CO3
7	Mould making	Making of sand mould for casting using tool and holding devices	2	CO4
8	Blanking	Blanking and piercing on machine and to study the difference	2	CO5

e-Learning Source:

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

	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	PSO4	PSO5	PSO6	PSO7
CO1	3	3	2	3	2	2			2			3	3	2	2	2	2	2
CO2	3	3	3	3		3			2			3	2	3	2	3	2	3
CO3	3	3	3	3				2				2	2	2	3	3	3	2
CO4	3	3		3		3			2			2	2	2	2	3	3	3
CO5	3	3	2	3		3			2			2	2	2	3	2	2	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: 2017-18							
Course Code	ME211	**Title of the Course**	Measurement Metrology & Control Lab	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**0**	**0**	**2**	**1**
Pre-Requisite	NIL	**Co-requisite**	NIL				
Course Objectives	• To impart practical knowledge/ techniques to determine least count of Vernier Caliper & Micrometer. • To impart practical knowledge/ techniques to determine ovality of shaft using dial indicator. • To impart practical knowledge/ techniques to determine rpm of a shaft using stroboscope. • To impart practical knowledge/ techniques to calibrate digital instrument using strain gauge. • Imparting knowledge to measure the unknown taper angle of a given object with the help of sine bar and slip gauges.						

Course Outcomes	
CO1	Demonstrate basic experimental technique to determine least count of Vernier Caliper & Micrometer.
CO2	Demonstrate basic experimental technique to measure the unknown taper angle of a given object with the help of sine bar and slip gauges.
CO3	Demonstrate basic experimental technique to determine ovality of a shaft using dial indicator
CO4	Demonstrate basic experimental technique to calibrate digital instrument using strain gauge.
CO5	Demonstrate the ability to determine rpm of a shaft using stroboscope.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Vernier Caliper	To determine least count of Vernier Caliper.	2	CO1
2	Micrometer	To determine least count of Micrometer.	2	CO1
3	Dial Indicator	To determine ovality of shaft using dial indicator.	2	CO2
4	Stroboscope	To determine rpm of a shaft using stroboscope.	2	CO2
5	Strain Gauge	To calibrate digital instrument using strain gauge.	2	CO3
6	Sine Bar	To measure the unknown taper angle of a given object with the help of sine bar and slip gauges.	2	CO3
7	Pressure Transducer	To calibrate digital instrument using pressure transducer.	2	CO4
8	Profile Projector	To calculate the pitch using profile projector.	2	CO5
e-Learning Source:				

	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	3	3	3	3			2			3	3	2	2
CO2	3	2	2	3	3	3			2			3	3	2	2
CO3	3	3	2	3	3	3			2			3	3	2	2
CO4	3	3	2	3	3	3			2			3	3	2	2
CO5	3	2	2	2	3	3			2			3	3	2	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: 2017-18							
Course Code	ME212	**Title of the Course**	MACHINE DRAWING LAB-II	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	IV	**0**	**0**	**2**	**1**
Pre-Requisite	ME206	**Co-requisite**					
Course Objectives	• This course envisages reinforcing and enhancing the knowledge and skill acquired in the earlier course. • Creating knowledge about the various practices with regard to the dimensioning, sectioning and development of views. • Review of fundamental machine parts and preparation of the part or assembly drawings as per the conventions. • Interpretation of machine drawings that in turn help the students in the preparation of the production drawings • To impart basic knowledge on Computer Aided Design methods and procedures.						

Course Outcomes	
CO1	Construct basic and intermediate geometry and comprehend the theory of projection.
CO2	Know and understand the parts and detailed assembly drawing of various machine elements like Steam engine cross head, Eccentric, Lathe tail stock, stop valve, gate valve, safety valve, air valve, screw jack, machine vice, swivel vice.
CO3	Improve their technical communication skill in the form of communicative drawings using fundamental of Materials, Limit fits and tolerances and standards of surface.
CO4	Improve their visualization skills so that they can apply these skills in developing new products.
CO5	Gain the basic concepts of Auto- CAD and the methods of advance engineering drawing using intermediate geometry and comprehend the theory of projection.

Experiment No.	**Title of the Experiment**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Review	Orthographic projections, missing lines, interpretation of views and sectioning.	2	CO1
2	Part and Assembly Drawing	Introduction, assembly drawing of stuffing box, steam engine, cross head, air valve, lathe tailstock, gate valve, screw jack, connecting rods, spark plug, tool post, safty valves etc. Drawing exercise.	2	CO2
3	Specification of Materials	Engineering materials, code designation of steels, copper and aluminium and its alloys.	2	CO3
4	Limits, Tolerances and Fits	Introduction, limit systems, tolerances and fits, drawing and exercises	2	CO3
5	Surface Roughness	Introduction, surface roughness, maching symbols, indication of surface roughness, drawing exercises.	2	CO3
6	Production Drawing	Introduction to developing and reading of production drawing of simple machine eliments like helical gear, bevel gear, flange, pinion shaft, connecting rod, crankshaft, belt pully, piston details etc. Idea about tool drawing.	2	CO4
7	Production Drawing	Introduction to developing and reading of production drawing of simple machine eliments like helical gear, bevel gear, flange, pinion shaft, connecting rod, crankshaft, belt pully, piston details etc. Idea about tool drawing.	2	CO4
8	Computer Aided Drafting	Introduction, input, output devices, introduction to drafting software like. Auto CAD, basic commands and development of simple 2D and 3D drawing.	2	CO5

e-Learning Source:

http://vlabs.iitkgp.ernet.in/mr/exp6/index.html

	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	3	1	1				3	3	2	2
CO2	3	2	3	2	2	3	2	1				3	3	2	2
CO3	3	3	2	2	3	2	2	1				3	3	2	2
CO4	3	3	3	2	2	2	1	1				3	3	2	2
CO5	3	2	3	2	2	3	1	1				3	3	2	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:							
Course Code	EC218	**Title of the Course**	System and Automatic Control Lab	**L**	**T**	**P**	**C**
Year	II	**Semester**	IV	**0**	**0**	**2**	**2**
Pre-Requisite	Mathematics, Basic Electrical Engineering	**Co-requisite**					
Course Objectives	1. To determine the transfer function of a given system by conducting the experimental procedures. 2. Conduct experimental procedures to study the various types of signals used in control systems. 3. Conduct experimental procedures to study the various types of controllers. 4. To study the various types of signals used in control systems by MATLAB. 5. To analyze the stability of given transfer function using Bode/Root-locus/Nyquist plot using MATLAB.						

Course Outcomes	
CO1	By conducting the experimental procedures given a system, students shall be able to represent and solve the problems relating to modeling of linear system.
CO2	For a given system, student shall be able to conduct experimental procedures to analyze and evaluate the system in time domain and predict the performance in time domain for different standard input signals. Evaluate the steady-state error.
CO3	For a given system, student shall be able to analyze the system in frequency domain, Examine and analyze the stability by MATLAB.
CO4	For a given unstable system, students shall be able to conduct experimental procedures to identify and analyze and interpret the suitable compensator by using MATLAB to make the system stable select and design the suitable compensator for implementation.
CO5	For a given a system, student shall be able to use MATLAB for mathematical model called state-space representation and Solve the system to find the time response from state-space representation.

Unit No.	Experiment No.	Content of Unit	Contact Hrs.	Mapped CO
1	**1**	Plot the impulse, step and ramp response of a given transfer function using MATLAB. $\frac{10}{s^2+2s+10}$	2	1
2	2	Plot the Bode plot, root locus and Nyquist plot of a given transfer function using MATLAB. $\frac{10}{s\,(s^2+4s+8)}$	2	2
3	3	To find the value of ξ, $\omega_n, T_s, T_p, T_r, \%$ overshoot and plot the step response using MATLAB for second order system $T(s) = \frac{130}{s^2+15s+130}$ $T(s) = \frac{0.045}{s^2+0.025s+0.045}$	2	3
4	4	To find the response of PID controller by using Xcos simulator present in scilab when unit step input is applied to it.	2	4
5	5	To study the response of a control system in a plant by defining the transfer function for controller and plant.	2	1
	6	To find the response of first order system by using Xcos simulator when unit step applied to it.	2	3
	7	To analyze the stability of given transfer function using Bode/Root-locus/Nyquist plot	2	3

		and find the gain margin and phase margin using MATLAB. G(s) = $\frac{500}{s(1+0.4s)(1+0.25s)(1+0.1s)}$, G(s) = $\frac{K}{s(s^2+4s+10)}$		
	8	Draw a ladder logic for packaging of goods by conveyer system with given condition (i) Conveyer stays for half second for each box. (ii) After packaging of 10 boxes conveyer stay till reset for next cycle of 10 boxes.	2	5

Reference Books:

1. B.C Kuo, Automatic Control System, PHI
2. Katsuhiko Ogata, Modern Control Engineering, PHI
3. I.J.Nagrath & M.Gopal, Control System Engineering, New Age International Publisher
4. S.K. Bhattacharya, Control System Engineering, Pearson Education.
5. S. Hasan Saeed, Automatic Control System, Kataria and sons, New Delhi

e-Learning Source:

http://plc-coep.vlabs.ac.in/

coep.vlabs.ac.in

https://vlab.amrita.edu/

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	PSO4
CO1	**3**	**3**	**2**	**2**	**2**				**2**				**3**	**3**	**2**	**1**
CO2	**3**	**3**	**2**	**2**	**2**				**2**				**3**	**3**	**2**	**1**
CO3	**3**	**3**	**2**	**2**	**2**				**2**				**3**	**3**	**2**	**1**
CO4	**3**	**3**	**2**	**2**	**2**				**2**				**3**	**3**	**2**	**1**
CO5	**3**	**3**	**2**	**2**	**2**				**2**				**3**	**3**	**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: 2016-17							
Course Code	BM-226	**Title of the Course**	Human Values & Professional Ethics	**L**	**T**	**P**	**C**
Year	**II**	**Semester**	III	**3**	**0**	**0**	**0**
Pre-Requisite	None	**Co-requisite**	none				
Course Objectives	• To understand the moral values that ought to guide the Management profession, Resolve the moral issues in the profession, • To justify the moral judgment concerning the profession. • To create an awareness on Management Ethics and Human Values. • To inspire Moral and Social Values and Loyalty. Intended to develop a set of beliefs, attitudes, and habits that engineers should display concerning morality. • To create awareness about the important global issues: . Multinational corporations - Environmental ethics - computer ethics - weapons development						

Course Outcomes	
CO1	Development of moral and ethical values, right understanding and relationships
CO2	Knowledge of Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property rights and its laws.
CO3	Awareness about the Professional Responsibility of engineers, Responsibility of engineers related to risks, hazards and safety.
CO4	Development of Engineers Ethics. Understanding of variety of moral issues, moral judgment concerning the profession.
CO5	Understanding of various of global issues; Environmental ethics - computer ethics - weapons development.

Unit No.	**Title of the Unit**	**Content of Unit**	**Contact Hrs.**	**Mapped CO**
1	Human Value Education	Understanding the need, basic guidelines, content and process for Value Education, Self-Exploration. Its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly.	6	CO1
2	Introduction to Ethical Concept	Definition of industrial ethics and values, Ethical rules of industrial worker. Values and Value Judgments. Moral Rights and Moral rules, Moral character and responsibilities. Privacy, Confidentiality, Intellectual Property and the Law. Ethics as Law.	6	CO2
3	Professional Responsibility	The basis and scope of Professional Responsibility, Professions and Norms of Professional Conduct, Ethical Standards versus Profession, Culpable mistakes, the Autonomy of professions and codes of ethics. Employee status and Professionalism. Central Professional Responsibilities of Engineers: The emerging consensus on the Responsibility for safety among engineers, hazards and risks.	6	CO3
4	Engineers Ethics	Senses of 'Engineering Ethics' - variety of moral issues - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles theories about right action – Self-interest - customs and religion - uses of ethical theories. Valuing Time – Cooperation – Commitment.	6	CO4
5	A Glimpse of Life Stories, Global Issues	Life story of Prophet Mohammad, Mahatma Gandhi, Swami Vivekanand, Marie Curie and Steve Jobs. Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers consulting engineers-engineers as expert witnesses and advisors -moral leadership.	6	CO5

Reference Books:

1. R.S. Naagarazan 2006, "A Textbook on Professional Ethics and Human values" New Age International Publisher.
2. R R Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Value Education.
3. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York 1996.

e-Learning Source:

1. Value Education website, http://www.uptu.ac.in . 2. Story of Stuff, http://www.storyofstuff.com
2. **https://www.youtube.com/watch?v=nlh9V5gd8hg&list=PLbMVogVj5nJQ20ZixllzM69agBq-m8ndV**
3. **https://www.youtube.com/watch?v=9LSEBK03CiY&list=PLysZquKdjuWSv87TaE7pByn5TE_e46O2C**

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	3	3			3		2		2	2	2	3
CO2	3	3	2	3	3			2					2	3	3
CO3	2	3	2	3	2			3		3			3	3	3

CO4	2	3	2	3	2			2				1	3	3	2
CO5	3	2	3	3	2			3		2		1	2	2	3

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

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