Integral University, Lucknow

Effective from Session: 2012-13							
Course Code	DME-501	**Title of the Course**	KINEMATICS OF MACHINE	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**-**
Pre-Requisite	10th	**Co-requisite**	---				
Course Objectives	Ability to self-learn modern engineering tools, techniques, skills and contemporary engineering practice, necessary for engineering work.						

Course Outcomes	
CO1	Identify mechanism in real life application
CO2	Perform kinematic analysis of simple mechanisms
CO3	Perform statics and dynamics force analysis of slider crank mechanisms
CO4	Determine moment of inertia of rigid bodies experimentally
CO5	Analyze velocity and acceleration of mechanisms by vector and graphical method

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	**MECHANISMS AND MACHINES**	Definition, Kinematic pairs, types of mechanism, Special types of mechanism, Space mechanisms.	5	1
2	**KINEMATIC ANALYSIS**	Displacement, Velocity and Acceleration of plane mechanism, Graphical and analytical techniques.	7	2
3	**SYNTHESIS OF MECHANISMS**	Crank Rockers, Four Bar Mechanisms, Slider Crank Mechanisms.	6	3
4	**CAMS AND CAM FOLLOWER MECHANISMS**	Purpose of using cam- Follower mechanisms, types of cams and cam follower mechanisms, Nomenclature synthesis of disc cam profiles for prescribed follower motion, determination of basic dimension, Graphical and analytical approaches for different types of followers, Dynamics of cam – follower systems - Jump and crossover stock.	7	5
5	**GEARS AND GEAR DRIVES**	Power transmission by gears and fundamental law of gearing, Involute profile and conjugate action, Characteristics of involute tooth gear - Pinion to system, Under cutting and interference, Minimum number teeth, types of gears, Various gear drives - Spur, Helical, worm and Bevel gear, Gear train Simple compound and epicyclic gear trains, Differential gears	9	4

References Books:

1.Theory of Machines by : R.S. Khurmi

2.Theory of Machines by : S.S. Ratan

e-Learning Source:

https://www.youtube.com/watch?v=7WppBa-cLuk&list=PLhSp9OSVmeyJSYB4gKPL8UrmB_a3kfHYI

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	3	--	--	1	--	--	1	3	-	2
CO2	1	--	2	--	1	--	--	3	-	2	-
CO3	--	3	--	--	--	--	--	-	2	-	1
CO4	1	--	--	2	--	2	--	2	-	-	3
CO5	1		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: 2012-13							
Course Code	DME-502	**Title of the Course**	Machine Tool Technology & Maintenance	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	3	1	0	40
Pre-Requisite	10^{th}	**Co-requisite**	None				
Course Objectives	The course provides students with fundamental knowledge and principles in material removal processes						

Course Outcomes	
CO1	Students will be able to operate lathe machine
CO2	Students will be able to perform operations like shaping drilling, boring, grinding, threading, etc
CO3	Students will be able to understand the milling operation and indexing
CO4	Students will be able to demonstrate concepts and use of jigs and fixtures
CO5	Students will be able to understand concepts and applications of CNC and FMS.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	BASIC FEATURES AND KINEMATICS	Various types of machining operations and machine tools. Common features of all basic machine tools, work holding and tool holding devices, Drive systems, sources of power, Bed, body or frame.Mechanical drive system for providing reciprocating, oscillating and rotational movement. Systems of stepped and stepless, friction and positive drives. Principle of setting upper, Lower and Intermediate speeds. Mechanical methods of providing automaticity in machine tools	8	CO-1
2	CENTRE LATHE, SHAPING, PLANING & SLOTTING MACHINES	The centre lathe and its principle of working. Types of lathes, Lathe specification and size, Features of lathe bed. Head stock and tail stock. Feed mechanism and change-gears, carriage saddle, Cross slide, Compound rest, Tools post, Apron mechanism, lathe accessories, Chucks, Face plate, Angle plate, Driving plate, Lathe dogs, mandrills, Steady rest, Lathe attachments. Lathe operations-plane and step turning, Taper turning, Screw cutting, Drilling,Boring, reaming, Knurling, Parting off, Under cutting, Relieving. Types of lathe tools and their uses.Brief description of semi automatic and automatic lathes such as capstan and turret lathes, their advantages and disadvantages over centre lathe, types of job done on them. General and periodic maintenance of a centre lathe. Working principles of planer, shaper and slotter. Differences and similarities among them, quick return mechanism applied to the machines. Types of work done on them, types of tools used, their geometry . General and periodic maintenance of a shaper	8	CO-2
3	MILLING MACHINES	Types of milling machines, constructional features of horizontal milling M/C. general maintenance of the machine, types of milling cutters, milling operations like plane milling, space milling, angular milling form milling, straddle milling, gang milling, Negative rack milling, cutting speed and speed for different tools in up and down milling. Simple compound and Differential indexing, milling of spur gears and racks.General and periodic maintenance of milling machine	8	CO-3
4	DRILLING & BORING MACHINES GRINDING MACHINES BROACHING	Types of tools used in drilling and boring. Classification of drilling and boring machines, principle of working and constructional details of simple and radial drilling M/C and general and periodic maintenance. Operations like facing, counter boring , tapering. Common abrasive grinding wheel materials, Bonds, Grain or grits of abrasive, Grain structure and shapes of common wheels, various speeds and feeds, Use of coolants, Methods of grinding. Types of grinding machines, precision finishing operations like honing. Broaching- internal and external surface, Types of work done on broaching machine. Simple types of broaches and their uses, Types of broaching machines. Comparision of broaching with others processes.	8	CO-4
5	JIGS AND FIXTURES COOLING PROCESS AUTOMATION OF MACHINING CENTRES	Object of Jigs and Fixture. Difference between jigs and fixtures. Principle of location. Principle of clamping. Locating and clamping devices. Types of jigs -Simple open and closed (or box) jigs. Drill jigs- Bushes (Fixed liner, Renewal slip). Template. Plate jigs. Channel jigs, Leaf jigs. Simple example of milling, turning, grinding, horizontal boring fixtures and broaching fixtures. Welding fixtures. devices. Coolants and cutting fluids difference between coolant and cutting fluid, Function and action of cutting fluids. Requirement of good cutting fluids, their selection for different materials and operations. Introduction to CNC Machine tools (Computer Numerical Control Lathe) and FMS (Flexible Manufacturing System) Introduction only.	8	CO-5

References Books:

J.K. Kapoor : Bharat Bharti Prakashan

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc21_me04/preview

PO-PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4

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CO1	2	3		1	1				1		2
CO2	1		2	1		2				3	
CO3		2		1				1			1
CO4	2	1		2		2				2	
CO5		1		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: 2012-13							
Course Code	DME-503	**Title of the Course**	DESIGN AND ESTIMATION	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	
Pre-Requisite	10^{th}	**Co-requisite**	--				
Course Objectives	1. To understand about basic concepts of Designing. 2. Be able to learn modern engineering tools, techniques, skills and contemporary engineering practice, necessary for machine design.						

Course Outcomes	
CO1	Ability to apply knowledge of engineering graphics, machine drawing, basic science & basic applied mathematics, basic machining processes, material science, for design procedures of mechanical component use in industries & incorporated in machine design.
CO2	Understand different welded and riveted joint structure and able to apply its knowledge to analyze its strength.
CO3	Be able to apply knowledge subjected to twisting moment ,machine parts subjected to combined bending and twisting moment and able to apply its knowledge to analyze its strength.
CO4	Be able to apply knowledge of the stresses & strain of mechanical component & incorporated in gear design.
CO5	Ability to apply knowledge of engineering machine drawing basic machining processes, material science, for estimation of material requirement & estimation of time for different machining operations.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	INTRODUCTION TO DESIGN & MACHINE PARTS SUBJECTED TO DIRECT LOADS AND SHEAR LOADS	General design consideration in machine parts. Mechanical properties of materials of construction, steps in machine design. Factor of safety, Selection of materials. Threaded connections, core and nominal diameter of screw, boiler-Stay. Design for number of studs or bolts and their diameter for cylinder covers due to external forces. Punching and shearing. Design of cotter and Knuckle joints.	6	CO1
2	RIVETED AND WELDED JOINTS MACHINE PARTS SUBJECTED TO BENDING MOMENT	Types of riveted joints, possible failure of riveted joints. Strength and efficiency of riveted joint. Unwins formula. Determination of safe load and pitch of rivets. Design of lap and butt joints. Common type of welded joints, definition of leg length, throat thickness and size of weld. Simple design for 'V' butt welded joint, Transverse fillet and parallel filletwelded joints. Design for the diameter of railway-Wagon axle, axle used in road-vehicles.Semi-elliptic Laminated spring-Proof load and proof stress stiffness. Expression for max. stress and deflection.determination of different dimensions number of Laminations, Central deflection in a Laminated spring.	7	CO2
3	MACHINE PARTS SUBJECTED TO TWISTING MOMENT,MACHIN E PARTS SUBJECTED TO COMBINED BENDING AND TWISTING MOMENT	Springs. Maximum shear stress induced for given axial load. Expression for axial deflection, spring index, solid length and stiffness. Calculation for number of coils, mean coil dia and dia of spring wire for axial gradual loads. Simple cases of composite springs. Design of keys and coupling bolts for a rigid flanged coupling Theory of failures: (i) Maxm. Principal stress theory. (ii) Maxm. shear stress theory concept of equivalent bending moment, equivalent torque, Design of over hung crank pin. Design of shaft dia for over hung pulley in a belt drive.	7	CO3
4	MACHINE PARTS SUBJECTED TO COMBINED DIRECT AND BENDING STRESS ANDD ESIGN OF GEAR	Eccentric load and eccentricity. Max. and minimum stress intensities. Reversal of stress. Design for safe load on small columns. Design of brackets and clamps for eccentric loading. Selection of material, Design analyzing, Lewis equation, Stress concentration, Dynamic load, Surface compressive stress, Beam strength, Bending stress, check or plastic deformation, Design procedure for Spur gear and Helical gear.	6	CO4
5	ESTIMATION OF MATERIAL REQUIREMENT & ESTIMATION OF TIME FOR DIFFERENT MACHINING OPERATIONS	Estimation of weight of simple machine parts. Review of the area/volume of triangle, equilateral triangle, Hexagon, rectangle, Square rhomboid, parallelogram, Octagen, circle, Hollow circle, Sector of circle, Sector of Hollow circle circular, Semi circle, Cube prism, Square prism, general prism, Cylinders, Sphere, Hollow sphere segment of sphere, Zone of a sphere, Cones pyramids, Frustum of a pyramid, Frustum of a cone. Turning, Facing, Chamfering, Knurling, Taper Turning, Threading, Drilling, Boring, Shaping and planning, Milling, Broaching, Simple problems pertaining to above.	8	CO5

References Books:

1. Machine Design by : V.B. Bhandari
2. Machine Design by : Dr. Rajendra Kaur, Laxmi Publications.

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3. Machine Design by : R.S. Khurmi
e-Learning Source:
https://youtube.com/playlist?list=PL3D4EECEFAA99D9BE&si=2nw22IU8g_E1YaP5

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	3	--	2	---	--	1	3	-	2
CO2	1	1	--	2	---	---	--	3	-	2	-
CO3	--	3	1	1	1	2	--	-	2	-	1
CO4	1	---	--	--	--	--	--	2	-	-	3
CO5	1	1	--	--	---	--	-	-	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: 2012-13							
Course Code	DME- 505	**Title of the Course**	PRODUCTION TECHNOLOGY	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	3	1	0	-
Pre-Requisite	10^{th}	**Co-requisite**	--				
Course Objectives	To impart basic knowledge and understanding about the primary manufacturing processes such as casting, joining, forming and powder metallurgy and their relevance in current manufacturing industry						

Course Outcomes	
CO1	Demonstrate understanding of casting process
CO2	Illustrate principles of forming processes
CO3	Demonstrate applications of various types of welding processes.
CO4	Differentiate chip forming processes such as turning, milling, drilling, etc.
CO5	Illustrate the concept of producing polymer components and ceramic components.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	INTRODUCTION AND METAL FORMING PROCESSES	INTRODUCTION AND METAL FORMING PROCESSES: Concept of manufacturing processes, classification and application (a) FORGING: Hammer forging, drop-forging, dies for drop-forging, drop hammers, press forging, forging machines or up setters, forging tools, forging defects and remedies. Concept of losses in forging operation, estimation of stock required for hand forging considering scale and shear losses (b) ROLLING: Elementary theory of rolling, hot and cold rolling, types of rolling mills, rolling defects and remedies. (c) PRESS FORMING: Types of presses, working, selection of press dies, die-material. Press operation-Shearing, piercing trimming, shaving, notching guering or rubber forming, embossing, stamping, punching. (d) Drawing, extrusion, pipe and tube drawing. (e) Energy forming technique - Explosive forming, electromagnetic forming.	8	CO-1
2	CONVENTIONAL METAL CUTTING PROCESSES	CONVENTIONAL METAL CUTTING PROCESSES: (a) Gear manufacturing process- Gear hobbing, gear shaping gear shaving, gear generating, gear burnishing, forming 'V' generator, straight bevel gear manufacturing, spiral bevel gear manufacturing. (b) External threading process-Roll threads, thread milling, thread grinding, thread rolling, thread chasing, Die heads. (c) Machining of cylindrical holes - Multiple spindle drill press, gang drill press, drilling deep holes and small diameter holes, boring, coordinate method of locating holes, Jig boring machine.	8	CO-2
3	METAL FINISHING PROCESS,SURFACE TREATMENT & FINISHING	METAL FINISHING PROCESS,SURFACE TREATMENT & FINISHING: Grinding Process, Diamond machining, Honing, Lapping, Super finishing, Polishing and buffing.Meaning of the terms surface treatment and its purpose. Elements of surface treatment cleaning protecting, Coloring, Altering surface properties. Surface Treatment Processes- Wire brushing. Belt sanding. Alkaline cleaning, Vapour degreasing. Pickling. Ultrasonic cleaning. Solvent cleaning. Painting application by dipping. Hand spraying. Automatic spraying. Electrostatic spray finishing. Electro coating. Hot dip coating. Phosphate coating- Packerising and Bondersing. Buffing. Blackening, Anodising. Electro Nickle Plating. Nickle carbide plating. Sputtering.	8	CO-3
4	PLANT MAINTENANCE	PLANT MAINTENANCE: Maintenance, definition, scope of maintenance, maintenance strategies, economics and performance measures, objective of maintenance, concepts of general approach to eliminate Losses, classification of maintenance-corrective, scheduled, preventive, predictive and productive maintenance. Common techniques to monitor the conditions of systems-vibration based, radiographic, thermo graphic, ferro graphic, computer based diagnosis etc, forms of wear, wear on guide surfaces, breakdown and remedies of machine tools, repair cycle, installation and maintenance of machine tools, PERT in maintenance	8	CO-4
5	PLANT ORGANISATION	PLANT ORGANISATION: Objective of maintenance organization, function and duties of maintenance department, inspections and scheduling, routine-servicing and scheduled repair, maintenance planning, concepts of maintenance management.	8	CO-5

References Books:

Production Technology: R.K. Jain & S.C. Gupta.

Production Technology: M.I. Khan

e-Learning Source:

https://onlinecourses.nptel.ac.in/noc22_me99/preview

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PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1				1							
CO2				1							
CO3	2			1							
CO4	2			1							
CO5				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: 2012-13							
Course Code	DME-506	**Title of the Course**	AUTOMOBILE ENGINE	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**-**
Pre-Requisite	10th	**Co-requisite**	-				
Course Objectives	The course provides a comprehensive understanding of automotive engines and their systems. It begins with the classification and layout of automobiles, covering front, rear, and four-wheel drive vehicles, along with power unit selection based on torque and power requirements. The construction and components of I.C. engines, including multi-cylinder engines, valve mechanisms, and combustion chambers, are explored. It delves into fuel supply and ignition systems for petrol and diesel engines, carburetors, fuel injection, and alternative fuels like CNG. The course also covers engine cooling and lubrication systems, emphasizing their necessity, types, and components, ensuring thorough technical knowledge.						

Course Outcomes	
CO1	Illustrate the types and working of clutch and transmission system.
CO2	Demonstrate the working of different types of steering gears and braking systems.
CO3	Illustrate the constructional features of wheels, tyres and suspension systems.
CO4	Demonstrate the understanding of types of storage, charging and starting systems.
CO5	Identify the type of body and chassis of an automobile.

UnitNo.	Title of the Unit		Contact Hrs.	Mapped CO
UNIT-I	CHOICE OF POWER UNIT FOR AN AUTOMOBILE: GENERAL CONCEPT OF AUTOMOBILES:	**GENERAL CONCEPT OF AUTOMOBILES:** Their classification name and make of some India made automobiles. Layout of chassis. Meaning of the terms : Front wheel drive, Rear wheel drive, Four wheel drive, Front and Rear wheeled vehicles. Basic requirements of an automobile. Study of specifications of different engines used in Indian vehicles. **CHOICE OF POWER UNIT FOR AN AUTOMOBILE:** Torque and power requirements of an automobile in various conditions. Torque characteristics of some power units such as Gas turbine, Electric motor and I.C. engine; their suitability to automobile needs. Drawback of I.C. engine to meet these needs. Measures taken to make it suitable to these needs.	8	CO1
UNIT-II	I.C. ENGINE:	**I.C. ENGINE:** Multicylinder engine, Construction and material of its Piston and Connecting rod Assembly; Crank shaft, Fly wheel and Bearings; Engine valve and Valve operating mechanism (Cam shaft, Valve timing gears, Tappet, Push rod, Rocker and Valve springs). Advantage of multi-cylinder engine for automobiles use, Firing order, Arrangement of cylinders. Valve positions and design of combustion chamber cylinder head and gasket. Wankle rotary engine. Idea of super charging, its advantages phenomenon of knocking or detonation, its cause and effect on engine. Octane number and cetane number.	9	CO2
UNIT-III	FUEL SUPPLY AND IGNITION SYSTEM:	**PETROL ENGINE:** Fuel supply circuit components (fuel tank to engine), their function. Exhaust pipe and silencer. Construction and working of mechanical and electrical fuel pumps, carburettor, its function. Simple carburettor, its limitations. Modified carburettor-Zenith, Carter, Solex and S.U. carburettors, their construction and working. Carburettor Controls-Throttle, Choke (Conventional, Automatic). Air fuel ratio, its variation with speed. Magneto and Coil Ignition Systems-Working of coil ignition system for multi-cylinder engine and electronic ignition system, Ignition timing, Ignition advance and retard-Their need and factors on which they depend. Spark Plugs-their types as used in automobile engines. Location of spark plug. **DIESEL ENGINE:** Fuel supply circuit for Diesel engine, Primary and secondary fuel filter, their positioning in the circuit. Construction and working of fuel pump and fuel injection pump. Governor and injector, Solid and Air injection in Diesel engine. Distributor types of diesel Injection pump. Turbulence in filters wet and dry types. Inlet and exhaust manifolds arrangement. Exhaust pipe and silencer. Concept of fuel energy saving. **MULTI POINT FUEL SUPPLY FOR PETROL ENGINE :** Construction, Fuel Supply system and working.Introduction to other fuels - CNG, Battery, etc.	9	CO3

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UNIT-IV	COOLING SYSTEM:	Necessity for cooling the engine Air cooling Shapes of cooling fins. Field of application for air cooling. Water Cooling- Thermo syphon system, Pump circulated water cooling system. Details of water cooling system-Water jackets, Hose, radiators and fans. Thermostat, Water pump and pressure type radiator cap, Anti-freeze and anti-corrosive additives. Engine cooling liquids other than water and their characteristics.	7	CO4
UNIT-V	LUBRICATION SYSTEM OF AUTOMOBILE ENGINES:	Principle of lubrication on multi-cylinder petrol/diesel engine. Types of lubrication systems-Splash type, Pressure type and Combined. Types of lubrication pumps, pump drive, Relief valves, Oil pressure, Oil filters and their location in lubrication system, Crank case ventilation, Crank case dilution.	7	CO5

References Books:

AUTOMOBILE ENGINE: G.B.S NARANG.

AUTOMOBILE ENGINE: R.K. RAJPUT

e-Learning Source:

https://nptel.ac.in/courses/112104033

https://archive.nptel.ac.in/courses/107/106/107106088/

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1
CO1	3	1	-	-	1	2	2	1	2	-	-	-	-
CO2	3	-	-	-	1	1	2	2	1	-	-	-	-
CO3	3	1	-	-	1	1	2	2	1	-	-	-	-
CO4	3	2	1	3	2	2	1	1	1	-	-	-	-
CO5	3	2	2	3	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: 2015-16							
Course Code	DME-507	**Title of the Course**	COMPUTER AIDED DESIGN AND MANUFACTURING	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	**3**	**1**	**0**	**-**
Pre-Requisite	10^{th}	**Co-requisite**	--				
Course Objectives	Creating 2D and 3D models Understanding CAD concepts Creating engineering drawings Understanding 3D modeling concepts Understanding CAM concepts						

Course Outcomes	
CO1	Students learn how to create 2D drawings and 3D models of products using CAD software.
CO2	Students learn the basics of CAD software, such as AutoCAD, Solid Works, and Fusion 360
CO3	Students learn how to create engineering drawings using part and assembly models
CO4	Students learn about wireframe, surface, and solid modeling.
CO5	Students learn how CAM systems can be used to monitor and regulate production.

Unit No.	Title of the Unit		Contact Hrs.	Mapped CO
1	Introduction	Introduction to CAD and CAM. Need, Scope & Importance of CAD in Industries, Design Steps & Reasons for Implementing CAD System, Salient Features, Benefits & Functional Areas of CAD. Introduction to CAM, Functions of CAM, Benefits of CAM, Integrated CAD/CAM Organization-Concept, Necessity of CAD/CAM Integration, Computer Integrated Production System-Features & Advantages.	07	CO03
2	Hardware & software	Hardware & Software In CAD SYSTEM, Input & output devices- types, configuration, applications &Installation. Graphic packages: Types, features, system requirements & applications; GUI-concept, meaning & features; Graphic standards such as GKS, PHIG, IGES. 2D & 3D geometric transformations, translation, sealing, rotation, Mirror, zooming. Geometric modeling; types, features & applications, Animation concepts, need applications	10	CO02
3	Modeling	3D modeling, Difference between 2D & 3D, Axes nomenclature. Surfaces- types & applications. Solid modeling- methods & applications, Feature based modeling-concept, meaning & applications. Parametric modeling- concept, meaning & applications. Constraints – concept, meaning, common. Constraints & their utilities. Dimensional relationships- concept, meaning & utility. Model tree- concept, applications & benefits.	08	CO04
4	CNC machines	CNC Machines, components and part programming. Numerical control: Introduction, features, Advantages & limitations, Layout of CNC system, functions of each component of NC system, manufacturing methodology of NC system, Development of CNC& DNC Systems. Computer numerical control (CNC): Introduction, types &classification, features, specifications, benefits & applications, Salient construction features of CNC machines differing from conventional machines. CNC tooling-types, working & applications. Working of Automatic Tool Changer (ATC) & Automatic Pallet Changer (APC), Work holding & loading devices.	07	CO03
5	Manufacturing	CNC axes, motion nomenclature & coordinate system, Various positions like machine zero, home position, work piece zero, program zero . Machine control systems- types & applications. Preparatory functions (G codes) & miscellaneous functions (M codes). APT programming, tool nose radius compensation, linear &circular interpolation methods-coding. Macros, subroutines, fixed cycles, canned cycles. Programming practice problems on plain, step & taper turning. Recent trends in CAD/CAM. Adaptive control-Definition, meaning, block diagram& applications. Direct Numerical Control -Definition, meaning, block diagram, applications. Flexible Manufacturing System- Concept, evaluation, main elements, layout, importance & applications. Robotics- Definition of robot, classification, types of robot, elements of robot & applications. Computer Integrated Manufacturing- Concept, definitions, area covered benefits.	08	CO02

References Books:

CAD/CAM/CIM by R. Radhakrishnan, S. Subramanain, New Age International Ltd.

CAD/ CAM by Ibrahim Zeid, Mastering TMH Publishing Company Ltd.

CAD/CAM by Mikell P. Groover, Emory Zimmens, Jr. Prentice Hall of India

Computer Integrated Design and Manufacturing, McGraw Hill-Bedworth David. D

Computer Integrated Manufacturing, PHI-Paul G. Ranky

e-Learning Source:

https://www.youtube.com/watch?v=3qEK7Lnk2TI

https://www.youtube.com/watch?v=a9dyeCl6Ejc&list=PLvBMRJ-z4QC9H3kuJzOqBxe_LPf9f3b-Y

https://www.vssut.ac.in/lecture_notes/lecture1530947994.pdf

https://mrcet.com/downloads/digital_notes/ME/IV%20year/CAD%20CAM%20Digital%20Notes.pdf

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PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	1	1	1	2	3	1	1	2
CO2	1	2	2	1	1	1	2	3	1	1	2
CO3	1	1	1	1	1	2	1	1	1	1	1
CO4	1	1	1	2	2	1	2	1	2	2	1
CO5	1	1	2	2	2	2	1	2	2	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: 2012-13							
Course Code	DWS-551	**Title of the Course**	Mechanical Workshop	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	0	0	3	-
Pre-Requisite	10th	**Co-requisite**	---				
Course Objectives	To understand and compare the shaping/machining/treatment of various materials by different processes. To impart the knowledge of machines and tools used in different mechanical Processes.						

Course Outcomes	
CO1	To acquire skills in basic engineering practice.
CO2	To identify the hand tools and instruments.
CO3	To acquire measuring skills.
CO4	To acquire practical skills in the trades
CO5	To provides the knowledge of job materials in various shops.

Exp No.	Title of the Experiment	Content of the Experiment(Any Ten)	Contact Hrs.	MappedCO
1.	Making utility jobs on lathe involving	Step turning, Parallel Turning, Taper turning and Knurling	3	1
2.		Drilling, Boring, Counter boring and Internal taper turning under cutting, Chamfering & Facing.	3	5
3.		V. thread cutting (Internal and External)	3	1
4.		Square thread Cutting (internal and external)	3	1
5.	Making utility jobs on	Planer - Planing of C.I Block & finish it on surface grinder togiven specification	3	2
6.		Shaper - 'V' Block of different size	3	2
7.	Group work on milling machine involving down and climb Milling	Slab Milling	3	1
8.		Groove Cutting(Dovetail, Square, T-slot and Radius)	3	5
9.	Fitting shop	To make different types of keys.	3	2
10.		Making male and female fitting jobs.	3	2

References Books:

Workshop Technology: R S Khurmi and J K Gupta

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	1	-	-	1	-	2	-	-	-	-	-	-	-	1	1	-	1	-
CO2	1	-	-	1	-	2	-	-	-	-	-	-	-	2	1	-	2	-
CO3	1	-	-	1	-	2	-	-	-	-	-	-	-	1	1	-	2	-
CO4	1	-	-	1	-	2	-	-	-	-	-	-	-	1	1	-	1	-
CO5	2	-	-	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: 2012-13							
Course Code	DME-554	**Title of the Course**	COMPUTER AIDED DESIGN LAB	**L**	**T**	**P**	**C**
Year	III	**Semester**	VI	**0**	**0**	**2**	**-**
Pre-Requisite	10^{th}	**Co-requisite**	--				
Course Objectives	Creating 2D and 3D models Understanding CAD concepts Creating engineering drawings Understanding 3D modeling concepts Understanding CAM concepts						

Course Outcomes	
CO1	Students learn how to create 2D drawings and 3D models of products using CAD software.
CO2	Students learn the basics of CAD software, such as AutoCAD, SolidWorks, and Fusion 360
CO3	Students learn how to create engineering drawings using part and assembly models
CO4	Students learn about wireframe, surface, and solid modeling.
CO5	Students learn how CAM systems can be used to monitor and regulate production.

No.	Title of the Unit		Contact Hrs.	Mapped CO
1	EXPERIMENT-01	Development of simple graphic package using 2-D and 3-D transformation and algorithms for generation of lines and circles (programming using C)	02	CO-3
2	EXPERIMENT-02	Development of wire frame models of simple 3-D objects like box , cylinder, cone, pyramids, prisms and sphere (programming using C).	02	CO-5
3	EXPERIMENT-03	FEM Mesh generation	02	CO-4
4	EXPERIMENT-04	Stress analysis / heat conduction analysis using standard FEM package.	02	CO-3
5	EXPERIMENT-05	Stress analysis of cantilever using U.D.L.	02	CO-2
6	EXPERIMENT-06	Stress analysis of simply supported beam using point load.	02	CO-3
7	EXPERIMENT-07	Benching of circular plate and analysis of stress and strain	02	CO-1
8	EXPERIMENT-08	Heat conduction analysis using circular bar	02	CO-4
9	EXPERIMENT-09	Design and analysis of crank shaft.	02	CO-1

References Books:

CAD/CAM/CIM by R. Radhakrishnan, S. Subramanain, New Age International Ltd.

CAD/ CAM by Ibrahim Zeid, Mastering TMH Publishing Company Ltd.

CAD/CAM by Mikell P. Groover, Emory Zimmens, Jr. Prentice Hall of India

Computer Integrated Design and Manufacturing, McGraw Hill-Bedworth David. D

Computer Integrated Manufacturing, PHI-Paul G. Ranky

e-Learning Source:

https://www.youtube.com/watch?v=3qEK7Lnk2TI

https://www.youtube.com/watch?v=a9dyeCl6Ejc&list=PLvBMRJ-z4QC9H3kuJzOqBxe_LPf9f3b-Y

https://www.vssut.ac.in/lecture_notes/lecture1530947994.pdf

https://mrcet.com/downloads/digital_notes/ME/IV%20year/CAD%20CAM%20Digital%20Notes.pdf

PO-PSO / CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3	PSO4
CO1	1	2	2	1	1	1	2	3	1	1	2
CO2	1	2	2	1	1	1	2	3	1	1	2
CO3	1	1	1	1	1	2	1	1	1	1	1
CO4	1	1	1	2	2	1	2	1	2	2	1
CO5	1	1	2	2	2	2	1	2	2	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: 2012-13							
Course Code	DME-556	**Title of the Course**	AUTOMOBILE ENGINE LAB	**L**	**T**	**P**	**C**
Year	III	**Semester**	V	0	0	2	-
Pre-Requisite	10^{th}	**Co-requisite**	None				
Course Objectives	This is a discipline which finds many applications in our daily life.						

Course Outcomes	
CO1	Learn basics of automobiles.
CO2	Students learn how electrical components of an automobile works.
CO3	Students learn how accessories of an automobile works.
CO4	Learn basics of using stroboscope and tachometer.
CO5	Students learn about fault finding and wheel alignment.

Experiment no	Experiment	Contact Hrs.	Mapped CO
Experiment no-1	Study and Sketch of Battery Ignition System and Magnetic Ignition System.	2	CO1
Experiment no-2	Study and sketch of Head Light Model and Wiper and Indicator.	2	CO2
Experiment no-3	Study and sketch of Radiator, Water Pump , Oil Pump and Shock absorber.	2	CO3
Experiment no-4	Study and sketch of A.C.Pump ,S.V. Pump ,Master Cylinder.	2	CO4
Experiment no-5	Study and Sketch Of: Rear axle, Differential Steering System, Bendix Drive.	2	CO5
Experiment no-6	Checking and setting of ignition on timing using timing light advance and retard.	2	CO1
Experiment no-7	Charging of Automobile battery and measuring cell voltage and specific gravity of electrolyte.	2	CO2
Experiment no-8	Determination on of gear ratio of an auto engine tachometer/stroboscope.	2	CO3
Experiment no-9	Cleaning and adjustment a carburetor.	2	CO4
Experiment no-10	Changing of wheels and checking the alignment of wheels.	2	CO5

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

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

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