LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY

(An autonomous institution under JNTU Kakinada)

(Approved by A.I.C.T.E & Affiliated to JNTUK, Kakinada)

(Accredited by NAAC with A Grade & NBA)

Jonnada, Denkada (Mandal), Vizianagaram Dist – 535 005

Phone No. 08922-241111, 241666

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DEPARTMENT OF MECHANICAL ENGINEERING

Course Outcomes

R19 REGULATION			
II YEAR – I SEMESTER			
C201	Numerical Methods and Multi variable Calculus	C201.1	Solve non-linear equations using various numerical methods.
		C201.2	Construct interpolation polynomials for a given data using Lagrange's and Newton's Interpolation formulae.
		C201.3	.Apply numerical methods to find derivatives, integrations and solutions of ordinary Differential equations
		C201.4	Evaluate the surface area of solids using multiple integrals and apply the properties of Beta, Gamma functions to evaluate the integrals.
		C201.5	Estimate the work done against a field, circulation and flux using vector integral theorems.
C202	MechanicsofSolids	C202.1	Apply the concepts of stress and strain to machine numbers.
		C202.2	Determine,shear forces,and bending moment sin beams.
		C202.3	Demonstrate the shear stress and bending stress distribution in different cross section of beams
		C202.4	Estimate the stress in machine members such as shafts and springs.

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		C202.5	Analyse columns for buckling loads and estimate the stresses in thin cylinders due to internal pressure.
C203	MaterialScience&Metallurgy	C203.1	Explain the principles of binary phases.
		C203.2	Apply heat treatment to different applications.
		C203.3	Select steel and cast iron materials for a given application.
		C203.4	Utilize nonferrous metals and alloys in engineering.
		C203.5	Choose composites for various applications.
C204	FluidMechanics&Hydraulic Machines	C204.1	Define fluid properties and their behavior in static and dynamic states.
		C204.2	Analyse the type of fluid flow patterns and use Continuity equation to one dimensional Fluid flow situations.

		C204.3	Analyse the impact of jet on the vanes.
		C204.4	Analyse the various components of turbines and study their characteristics curves and Power output from turbines. Introduce the concepts of boundary layer
		C204.5	Evaluate Performance Of Hydraulic Machines
C205	Thermodynamics	C205.1	.Identify concepts of heat,work,energy and governing rules for conversion of one form To others.
		C205.2	Explain relationships between properties of matter and basic laws of thermodynamics.
		C205.3	Explain the concept of available energy for maximum work conversion

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		C205.4	Analyse the steam properties to understand working of steam power plants.
		C205.5	To enable the students to Provide fundamental concepts of thermodynamics Cycles used in steam power plants, IC engines and gas turbines
C206	MachineDrawing	C206.1	Identify conventional representation of machine components.
		C206.2	Draw the sectional views of various machine parts
		C206.3	Construct the engine parts like Fuel pump, PetrolEngine connecting rod,piston assembly.
		C206.4	Draw the machine parts like Screws jacks, Machine Vices Plummer block, Tailstock.
		C206.5	Draw theValves like spring loaded safety valve, feed check valve and aircock.
C207	Metallurgy & Mechanics of Solids Lab	C207.1	Identify various micro structures of steels, castiron.
		C207.2	Evaluate the hardness of treated and untreated steels.
		C207.3	Understand the study of the stress-strain relations of different materials.
		C207.4	.Evaluate the hardness of different materials.
		C207.5	evaluate the Modulus of rigidity of different materials.
C208	Fluid Mechanics & Hydraulic Machines Lab	C208.1	Apply laws of conservation in verification of principles of fluid flow
		C208.2	Perform measuring of pressure,discharge and velocity of fluid flow
		C208.3	Evaluate major and minor losses in a pipe flow
		C208.4	Analyze the performance characteristics curves of different turbines and pumps

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		C208.5	Analyze experimental results using formulas of work done, discharge power, efficiency, Data tables,and graphs
C209	Essence of Indian Tradition Knowledge	C209.1	Knowledge about the concept of traditional knowledge and analyze social context
		C209.2	.Apply significance of traditional knowledge protection
		C209.3	Analyze various enactments related to the protection of plant varieties.
		C209.4	Evaluate desired concepts of Intellectual property to protect the traditional knowledge
		C209.5	Compare the traditional knowledge in various sectors

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			II YEAR – II SEMESTER
C210	Complex Variables,Probability Statistics	C210.1	Examine the analyticity of complex functions.
		C210.2	Evaluate complex integration using Cauchy's theorems and Cauchy's Residue theorem.
		C210.3	Compute probabilities, theoretical frequencies using discrete and continuous Probability distributions Of or real data.
		C210.4	Apply the concept of hypothesis test to large samples
		C210.5	Apply statistical inferential methods to small samples.
C211	Kinematics ofMachinery	C211.1	Demonstrate the fourbar,single slider and double slider mechanisms.
		C211.2	Demonstrate the lower pair mechanisms
		C211.3	Analyse the fourbar, single slider and double slider mechanisms kinematically,cam Profile by considering different types of velocities.
		C211.4	Design gears for power transmission
		C211.5	Analyze various power transmission systems such as belts, ropes, chain drives and geartrains.
C212	AppliedThermodynamics	C212.1	Familiarize the developments in ICengines & understand combustion process in SI and CI engines
		C212.2	Understand different types of compressors.
		C212.3	Familiarize concepts of thermodynamics cycles used in steam power plants and Gas turbines

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		C212.4	Impart knowledge on the working of nozzles,turbines, refrigeration and air conditioning.
		C212.5	Understand the Principles of Psychrometry, Air Conditioning and basic cycles of various refrigerating systems, their performance evaluation along with details of System components and refrigerant properties.
C213	ProductionTechnology	C213.1	Explain different metal casting processes and gating systems.
		C213.2	Evaluate the forces and power requirements in the rolling process.
		C213.3	Apply the principles of various forging operations.
		C213.4	Classify working of various welding processes and outline the manufacturing methods Of plastics, ceramics.
		C213.5	Demonstrate the application of plastics and power metallurgy.
C214	Instrumentation & ControlSystems	C214.1	Explain the principles of measurements.
		C214.2	Measure the temperature and pressure of various instruments.
		C214.3	Measure the flow, speed of various instruments
		C214.4	Calibrate the strain using strain gauge.
		C214.5	Explain the elements of control systems.
	Design of	C215.1	Apply the design procedure to engineering problems ,including the consideration of Technical and manufacturing constraints.
		C215.2	.Select suitable materials and significance of tolerances and fits in critical design applications.

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C215	MachineMembers	C215.3	Design the elements for strength, stiffness and fatigue.
		C215.4	Identify the loads,the machine members subjected and calculate static and dynamic Stresses to ensure safe design.
		C215.5	Identify various types of stresses induced in couplings and ensure a safe design.
C216	ProductionTechnologyLab	C216.1	.Exercise for Strength and Permeability for sand.
		C216.2	Design the Gating and pouring time and solidification time calculations.
		C216.3	Fabricate different types of components using various welding techniques
		C216.4	Perform Blanking and Piercing operation with Simple, Compound and Combination dies.
		C216.5	.Perform the Plasma arc cutting, Wire cut EDM and exercise Additive manufacturing with reverse engineering.
C217	Instrumentation & ControlSystems Lab	C217.1	Measurement of various linear,angular dimensions of the products and flatness of the Surface by using precision measuring instruments.
		C217.2	Learn how to check various parameters of the threads and gears.
		C217.3	Selection of the appropriate measuring instruments
		C217.4	Knowledge of their requirement of calibration and errors in measurement and perform accurate measurements
		C217.5	Alignment various machines used in manufacturing
		C218.1	Aims to help learners develop their English language skills, particularly those planning to appear for Competitive Exams that test their English Language abilities.

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C218	English for Competitive Exams	C218.2	Present wider scope for gaining the power of expression through rich Vocabulary To get placed well.
		C218.3	Imparts critical reading strategies for comprehension of complex texts
		C218.4	Provides training and opportunities to develop fluency in English through Participation in formal group discussions and Self Introductions.
		C218.5	Demonstrates good writing skills for effective ParagraphWriting,EssayWritingand Formal correspondence through Emails.

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Course Outcomes

R19 REGULATION		
III YEAR - I SEMESTER		
R19MEC-PC3101	Dynamics of Machinery	Explain the stabilization of sea vehicles, aircrafts and automobile vehicles.
		Solve the problems of frictional losses, torque transmission of mechanical systems.
		Analyse the concept of slider crank mechanism, flywheel and governors.
		Demonstrate the methods of balancing of rotating masses and balancing of reciprocating masses as well.
		Identify the methods to calculate the natural frequencies of undamped and damped systems.
R19MEC-PC3102	Design of Power Transmission Elements	Choose the suitable bearing depending upon the application and predict life of that bearing.
		Solve Problems on curved beams.
		Evaluate different I.C Engine parts under the action of forces.
		Analyze the power transmission using power screws.

		Analyze the load concentration factor, dynamic load factor, surface compressive strength, bending strength of spur & helical gear drives.
R19MEC-PC3103	Metal Cutting & Machine Tools	Understand the mechanism of orthogonal and oblique cutting, the cutting forces developed.
		Discuss the Lathe operations Using Lathe Machine, Learned how to Use Lathe Tools and Importance of Lathe Machines.
		Analyze the Usage, operation s and Applications of Shaping, Slotting, Planning, Drilling and Boring Machines and their Tools.
		Explain the Usage, operations and Applications of Milling Machines and their Tools.
		Describe the operations and Applications of Grinding Machines and their Tools, Importance Of Jigs, Fixtures and CNC Machines.
R19BSH-HM3101	Managerial Economics and Industrial Management	Analyze macro, micro economic concepts useful for business units and determine influences of demand and supply analysis
		Understand the production functions, types of costs and solving engineering problems by applying knowledge of economics
		Analyze the consciousness about market structures and pricing methods of industries. Identify suitable form of business and understand different stages of business cycle
		Comprehend financial accounting process and Evaluation of financial statements
		Interpretation of financing methods, their applicability in decision making and problem-solving skills according to new trends.
R19MEC-PC3104	IC Engines &Turbo Machinery	develop the concepts of principle of operation, working of IC Engines and carburetor .
		analyze the combustion phenomena in SI and CI engines and factors influencing combustion process.

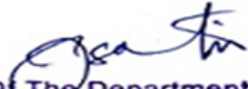|		
		outline the need and working of injection, ignition, cooling, lubrication and governing systems.
		evaluate various engine performance characteristics with load and speed test on I.C. Engines.
		explain the principle of operation and power and efficiencies of turbo machines.
R19MEC-PE3101.3	Advanced Machining Processes	Identify the modern manufacturing process with respect to productivity economic.
		Explain the trends in development of manufacturing process selection of suitable process for metal cutting and non-traditional manufacturing.
		Illustrate electrical discharge machining processes and applications.
		Distinguish between chemical and electrical machining processes and limitations
		Compare different welding processes.
R19MEC-PC3105	Thermal Engineering Lab	Outline the valve and port timing diagram of SI engine & CI engine.
		Determine the performance parameters for 4-stroke C.I engine&4-stroke S.I engine.
		Evaluate and Prepare heat balance sheet for twin cylinder C.I engine.
		Apply the concept of Morse test on SI engine.(multi cylinder).
		Analyse the efficiency of reciprocating air compressor.
R19MEC-PC3106	Machine Tools Lab	Explain the lathe working principle and can perform various operations to prepare different shapes of products.
		Experiment with drilling machines and can perform various operations to prepare different shapes of products.
		Make use of shaper, slotting and planing machine and can perform various operations to prepare different shapes of products.

		Explain the surface grinding machine and can perform various operations to prepare different shapes of products.
		Experiment with a milling machine, with understanding working principle and can perform various operations to prepare different shapes of products.
R19BSH-MC3103	Advanced Communication Skills Lab	understand the grammatical forms of English and the use of these forms in specific communicative and career context.
		use a wide range of reading comprehension strategies appropriate to texts, to retrieve information.
		strengthen their ability to write paragraphs, essays, emails and summaries ➢improve their speaking ability in English both in terms of fluency and comprehensibility by participating in Group discussion and oral assignments
		prepare their own resume and answer interview related questions unhesitatingly with acceptable soft skills
R19BSH-SD3101	MATLAB For Computational Methods	Construct and apply small programs in MATLAB to mathematical problems
		Develop a program to find a real root of an equation using various numerical methods.
		Develop programs to find the interpolation values using Lagrange's and Newton's interpolation formulae for a given set of points.
		Develop programs to find solutions of ordinary differential equations using various numerical methods.
		Develop programs to solve system of linear equations.
III YEAR – II SEMESTER		
R19MEC-PC3201	CAD/CAM	Apply the basics of geometric transformations in CAD/CAM.

		Distinguish various geometric modelling methods for building CAD models.
		Identify the concepts of parametric representation to curves and surfaces, create surfaces such as Coons, Bezier and B-spline.
		Select NC, CNC and DNC machines.
		Summarize the principles of robotics and Computer Integrated Manufacturing.
R19MEC-PC3202	Heat Transfer	Apply principles of Conductive heat transfer to basic engineering systems and develop equation for fins and solve the problems related to one dimensional transient heat conductions.
		Understand the concept of free and forced convection applied to the different types of flows.
		Apply Convection laws for boiling, condensation equipment's.
		Apply Convection laws to design the heat exchangers.
		Develop the concept radiative heat exchange between surfaces of different geometries.
R19MEC-PC3203	Finite Element Methods	To learn basic principles of finite element analysis procedure.
		Apply the basics of FEM to relate stresses and strains for structural elements.
		Identify the applications and characteristics of FEA elements for trusses & beams.
		Apply the formulation techniques to solve 2D problems using triangle, axi – symmetric elements and quadrilateral elements.
		Able to identify how the finite element method expands beyond the structural domain, for problems involving dynamics, heat transfer and fluid flow.
R19MEC-PE3201.1	Refrigeration & Air Conditioning	Analyze various refrigerating cycles.
		Evaluate the performance of various cycles.
		Evaluate cooling load calculations.
		Examine various refrigerant properties and psychrometric processes.

		Select the appropriate process and equipment for the required comfort and industrial air-conditioning.
R19EEE-OE3202	Energy Conservation and Management	Design energy efficient lighting systems.
		Design suitable power factor correcting equipment for an electrical system and energy monitoring system to analyze the energy consumption in an organization.
		Explain energy conservation of HVAC systems.
		Understand the concept of energy audit, conservation schemes and consumption.
		Calculate payback period, NPV, IRR etc. on an investment/project/technology.
R19CSE-OE3203	Data Base Management System	Understand File System Vs Databases.
		Design and implement ER-model and Relational models.
		Construct simple and Complex queries using SQL.
		Analyze schema refinement techniques.
		Design and build database system for a given real world problem.
R19BSH-OE3204	Statistical Quality Control	Comprehend the importance of quality & role of statistical quality control.
		Build knowledge of theoretical and practical aspects of process capability.
		Analyse the philosophy of statistical process control to interpret results.
		Develop an understanding on quality control charts philosophies and frameworks.
		Identify accepting sampling plans to meet producer and consumer requirements.
R19CSE-OE3201	OOPs through JAVA	Understand the environment of JRE and Control Statements.
		Implement real world objects using class Hierarchy.
		Implement generic data structures for iterating distinct objects.
		Implement error handling through exceptions and file handling through streams.

		Design thread-safe GUI applications for data communication between objects.
R19MEC-PC3204	Heat Transfer Lab	Evaluate heat transfer through lagged pipe, insulating powder and Drop and Film wise condensation.
		Experiment the Thermal conductivity of a given metal Rod and Determine the overall heat transfer coefficient for a composite slab.
		Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection.
		Design the Fins and Heat Exchangers.
		Test Emissivity, Stefan Boltzmann Constant.
R19MEC-PC3205	Computer Aided Engineering Lab	Classify the types of Trusses (Plane Truss & Spatial Truss) and Beams (2D & 3D) with various cross sections to determine Stress, Strains and deflections under static, thermal and combined loading.
		Determine Plane stress, plane strain conditions & axisymmetric loading on inplane members to predict the failure behavior and finding the SCF.
		Analyse connecting rod with tetrahedron and brick elements, performing static analysis on flat & curved shells to determine stresses, strains with different boundary conditions.
		Predict the natural frequencies and modes shapes using Modal, Harmonic analysis. Also finding the critical load using Buckling analysis.
		Evaluate various part programming methods using different NC or CNC packages.
R19MEC-PC3206	Theory of Machines Lab	Evaluate critical speed of shaft, by varying different speeds at which the shaft tends to vibrate i.e. at which resonance occurs.
		Determine the working of different governors. And determine the different characteristic curves for the governor.

		Assess the effect of Gyroscopic couple , velocity of precision at precise angles and its moments using gyroscope experimentation setup.
		Measure the frequency of damped and undamped at free and forced vibration of an equivalent spring mass system.
		Formulate balancing mass for rotating mass systems in static and dynamic condition.
		Determine the mechanical advantage, velocity ratio and efficiency of screw jack.
		Analyze various types of cam and followers with different kinds of follower motion.

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Course Outcomes

R19 REGULATION		
IV YEAR -I SEMESTER		
R19MEC-PC4101	**Robotics**	Understand the basic components of robots
		Differentiate types of robot grippers
		Explain the manipulator kinematics
		Illustrate robot actuators and feedback components
		Elucidate the robot applications in manipulator
R19MEC-PC4102	**Engineering Metrology**	Design tolerances and fits for selected product quality.
		Understand the standards of length, angles, taper measurement
		Various optical measuring instruments and interferometry can be studied.
		The evaluation of surface finish and different comparators can be known.
		Various gear elements and thread elements can be inspected by choosing appropriate method and instruments.

		The machine tool alignment can be performed.
R19MEC-PC4103	**Operations Research**	Construct a mathematical model for allocation problems.
		Test for optimality to arrive at the optimal solution for transportation, assignment and sequencing models.
		Solve the problems of waiting lines and scheduling to arrive the optimal decisions.
		Apply the concepts of PERT and CPM for project management.
		Develop simulation model of discrete systems under uncertainties.
R19MEC-PE4101.2	**Power Transmission in Hybrid and Electric Vehicles**	Explain the Working of Hybrid and Electric Vehicles.
		Develop a Suitable Drive Scheme for Hybrid and Electric Vehicles Depending on Resources.
		Develop the Electric Propulsion Unit and its Control for Application of Electric Vehicles.
		Identify Proper Energy Storage Systems for Vehicle Applications.
		Compare Basic Schemes of Electric Vehicles and Hybrid Electric Vehicles.
R19MEC-PE4101.3	**Automation in Manufacturing**	Understand the characteristics of Automated Systems.
		Illustrate operational aspects of flowlines.
		apply the methods to balance the assembly line

		Compare conventional and automate material transport, storage system
		Explainthelevelofautomationincontinuousanddiscretemanufacturingindustries.
R19BSH-OE4101.2	Total Quality Management & Six Sigma	comprehend the importance of quality & role of statistical quality control
		analyze the assignable causes of variations in the process
		apply tools and techniques of Total Quality Management
		develop the frame-work of Six Sigma programme
		understand the Quality Systems in practice
R19CSE-OE4101.3	Internet of Things (IoT)	Summarize the IoT characteristics, principles and design methodology.
		Examine the typical connectivity and networking protocols typically used in a IoT design.
		Demonstrate design and development of embedded applications using Arduino and Raspberry Pi platforms.
		Recognize the importance of data processing and cloud services for IoT.
		Illustrate the different domains and applications of IoT eco-system.
R19MEC-PC4104	Engineering Metrology Lab	Understand the quality standards of engineering products in industries.
		Analyze the measurement of the surface roughness and perform alignment tests
		Develop the ability to apply the principles in instruments and measuring technique
		Demonstrate thread inspection with two wire/ three wire metho
		Demonstrate angle and taper measurements with bevel protractor, Sine bar, rollers and balls.(L2)

R19MEC-PC4105	Computational fluid Dynamics Lab	Solve problems of fluid mechanics and heat transfer with C program and MATLAB.
		Develop Programs in solving Transcendental, Tri-diagonal and algebraic equations using numerical techniques with C program and MATLAB
		Apply numerical differentiation, integration functions and methods in C and MATLAB.
		Analyze steady-state, Transient and radiation problems in heat transfer with ANSYS FLUENT
		Evaluate convective heat transfer in internal and external flow for different flow conditions with ANSYS-FLUENT.
R19MEC-SD4101	Skill Development Course -2 Hyper Meshing and Analysis	develop the concepts of HyperMesh, and its application to various Engineering Problems
		analyze the engineering problems using HyperMesh and factors influencing analysis process.
		outline the need and application of HyperMesh Tools depending on the type of Analysis (Structural/Thermal/Fluid flow)
		evaluate various results under different boundary conditions (Geometry/ Material properties/ loads)
		explain the domain of operation of Hypermesh for advanced applications (Dynamic analysis/Impact analysis
IV YEAR -II SEMESTER		
R19MEC-PE4201.2	Nano Materials	Understand historical developments and milestones in the field of nanomaterials.
		Apply basic mathematical and scientific principles to calculate and predict nanomaterial properties.

		Apply knowledge of synthesis methods to design and propose approaches for creating specific nanomaterials.
		Analyze characterization data from various techniques to determine the structure and properties of nanomaterials.
		Evaluate the ethical implications of widespread nanomaterial applications, considering issues related to safety, privacy, and societal impact.
R19MEC-PE4201.4	**Production Planning and control**	Summarize the production planning and control functions.
		Apply quantitative techniques for demand forecasting in manufacturing firms.
		Compare inventory management systems applicable to optimize cost to control different types of inventories.
		Analyze factors affecting in preparation of route sheets to make the product.
		Evaluate Scheduling methodologies applicable to job order and mass production system. (Level 4)
		Illustrate the Dispatching procedure
R19MEC-PE4202.2	**Non-Destructive Evaluation**	understand non-destructive destructive testing methods and radiographic testing in industries.
		explain ultrasonic testing and its effectiveness and limitations
		illustrate Liquid penetrate testing and types of penetrates used in die penetrating testing.
		identify internal flaws of the work piece using magnetic particle testing.
		apply knowledge of non-destructive testing techniques to test equipment/work pieces in various industrial/automobile sectors.
		Understand the Role, Applications, Benefits of NC/ CNC
		Explain the Methods of part Programming and Apply APT and its variations

R19MEC-PE4202.4	CNC and Adaptive Control	Explain tool offsets and work offsets.
		Apply the principle of gain scheduling controllers.
		Understand deterministic self-tuning regulators.

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