LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
(Approved by A.I.C.T.E & Affiliated to JNTUK,Kakinada,
Accredited by NAAC with "A" Grade & NBA)
Jonnada ,Denkada (Mandal), VizianagaramDist – 535 005
Phone No. 08922-241111, 24166
E-Mail: lendi_2008@yahoo.comWebsite: www.lendi.org

DEPARTMENT OF MECHANICAL ENGINEERING

COURSE OUTCOMES (COs)

ACADEMIC YEAR 2021-22

R20 REGULATION		
I Year - I Semester		
COURSE CODE	**COURSE NAME**	**COURSE OUTCOMES**
R20BSH-EN1101	Communicative English	Understand the value of Human Conduct for career development through life skills: Ethics & Values and use root words and Prepositions without errors. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Enhance pronunciation with befitting tone for clarity in a speech to communicate language effectively.
		Observe the significance of imagery in poetry to use it in real-time contexts and learn to use and misuse of Articles, Prefixes, Suffixes, and Punctuations. Gain reading skills for

		comprehension, specific information, gist, and pleasure through extensive reading. Participate in short conversations in routine contexts on topics of interest and ask questions and make requests politely.
		Acquire conversation skills through drama and enhance the correct use of Nouns, Pronouns, Verbs and Concord to write paragraphs effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading. Listen for specific information, gist, note-taking, note-making and comprehension and develop convincing and negotiating skills through debates
		Develop reading for inspiration, interpretation & innovation and learn to use modifiers, synonyms and antonyms to write essays effectively. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading.
		Learn meaningful use of language by avoiding meaningless cliches, bureaucratic euphemisms and academic jargon in order to acquire the skill of summarising. Gain reading skills for comprehension, specific information, gist, and pleasure through extensive reading.
R20BSH MA1101	Numerical Method and Ordinary Differential Equations	Solve non-linear equations using various numerical methods and apply numerical methods to find interpolation polynomial for a given data
		Apply numerical methods to evaluate derivatives and integration of a function and find the solutions of ordinary differential equations.
		Solve the first order ordinary differential equations related to various engineering fields
		Solve the higher order differential equation and analyze physical situations
		Apply the Laplace transform for solving differential equations and integral equations.
R20BSH-CH1103		Illustrate the properties and applications of polymers

	Engineering Chemistry	Design the metallic materials to prevent the corrosion.
		Assess the quality of fuels and identify the suitable one.
		Analyze the suitable method for industrial water treatment.
		Demonstrate the preparation, properties and applications of nano materials and importance of green chemistry.
R20CSS-ES1101	Computer Programming in C ES	Illustrate the Fundamental concepts of Computers and basics of computer programming
		Use Control Structures and Arrays in solving complex problems.
		Develop modular program aspects and Strings fundamentals.
		Demonstrate the ideas of pointers usage.
		Solve real world problems using the concept of Structures, Unions and File operations
R20MEC-ES1102	Engineering Graphics	Apply the basics of Engineering Graphics to construct the polygon, curves and orthographic projections of points.
		Draw the orthographic projections of straight lines inclined to both the planes.
		Draw the projections of planes in various conditions.
		Draw the projections of regular solids, its axis inclined to one of the principle plane.
		Develop 3D isometric views from 2D orthographic views and vice versa.
R20BSH-CH1106	Engineering Chemistry Lab	Prepare polymers and nano materials.
		Explain the functioning of the instruments such as Conductivity meter, pH meter, Viscometer, Cleveland’s apparatus.
		Analyze the quality of ground water sample.
		Compare kinematic viscosity, acid number, and flash and fire points of different lubricating oils.

		Identify the safety precautions to carry out the experiments in the laboratory using chemicals.
R20MEC-ES1103	Engineering Workshop & IT Workshop Lab	Apply wood working skills in real world applications.
		Build different parts with fitting in engineering applications
		Develop various basic prototypes in black smith & tiny smith applications.
		Apply different types of basic electric circuit connections.
		Understand the basic components, peripherals and basic operations of a computer.
R20CSS-ES1103	Computer Programming in C Lab	Implement basic programs in C and design flowcharts in Raptor.
		Use Conditional and Iterative statements to solve real time scenarios in C
		Implement the concept of Arrays and Modularity and Strings.
		Apply the Dynamic Memory Allocation functions using pointers.
		Develop programs using structures.
R20BSH-MC1101	Environmental Science	Understand about the environment and natural resources
		Understands about various attributes of different types of pollution and their impacts on the environment and control methods along with waste management practices.
		Illustrate about the ecosystem and know the importance of conservation of biodiversity
		Relate the current environmental impacts with societal problems.
		Identify the current population explosion and their impacts on the environment
I Year –II Semester		
R20BSH-MA1201	Linear Algebra and Multivariable Calculus	Apply the matrix algebra techniques to engineering applications.
		Apply the concepts of eigenvalues and eigenvectors to free vibration of a two mass system
		Apply partial differentiation to find maxima and minima of functions of several variables
		Evaluate the volume and surface area of solids using multiple integrals.

		Apply vector differential operators to find potential functions and estimate the work done against a field, circulation and flux using vector integral theorems.
R20MEC-ES1203	Material Science and Engineering	Explain basic concepts of bonds in metals and alloys.
		Understand the Iron-Iron-carbide diagram and Cooling curves.
		Explain the principles of surface hardening methods.
		Classify various types of steels, cast irons and their properties and applications.
		Explain the importance of non-ferrous metals and alloys in engineering applications.
R20BSH-PH1203	Engineering Physics	Interpret the interaction of optic energy with matter on the basis of interference & polarization 2. 3. 4. 5
		Explain the various types of crystal systems
		Apply the principles of Lasers and Acoustics to mechanical systems
		Describe the properties and applications of Ultrasonic'.
		Identify the fundamentals of modern engineering materials
R20MEC-ES1202	Engineering Mechanics	Find the resultant for any number of forces in mechanical system with (or) without application of concept of friction.
		Analyze the simple Structures& estimation of the work done by the forces.
		Determine the centroid /centre of gravity/moment of inertia for composite sections.
		Analyze the motion of the bodies with (or) without the application of force.
		Determine the displacement, velocity &acceleration relations in dynamic systems.
R20EEE-ES1201	Basic Electrical & Electronics Engineering	Apply concept of KVL/KCL and network theorems in solving electrical circuits 2. 3. 4. 5
		Understand the principle of operation of different DC Machines.
		Measure the performance quantities such as losses, efficiency of transformers
		Understand the importance and applications of p-n junction diode, Zener diode and rectifiers.

		Apply different modes of op-amps in different applications.
R20BSH-EN1201	Communicative English Lab	Acquire Listening skills for answering questions, make formal presentations without graphical elements, prioritize information from reading texts, paraphrase short academic texts and get awareness about plagiarized content and academic ethics.
		Comprehend academic lectures by taking notes,, make formal presentations on academic topics using PPT slides with relevant graphical elements, distinguish facts from opinions while reading, write formal letters and emails and use a range of vocabulary in formal speech and writing.
		Participate in group discussions using appropriate language strategies, comprehend complex texts, produce logically coherent argumentative essays and use appropriate vocabulary to express ideas and opinions..
		Draw inferences and conclusions using prior knowledge and verbal cues, express thoughts and ideas accurately and fluently, develop advanced reading skills for a deeper understanding of texts, prepare a CV with a cover letter to seek internship/ job, and understand the use of passive voice in academic writing.
		Develop advanced listening skills for an in-depth understanding of academic texts, make presentations collaboratively, understand the structure of Project Reports and use grammatically correct structures with a wide range of vocabulary.
R20BSH-PH1205	Engineering Physics Lab	Apply the working principles of laboratory experiments in optics, mechanics and acoustics.
		Compute the required parameter by suitable formula using experimental values in mechanics, optics & acoustic experiments.
		Analyze the experimental results through graphical interpretation.

		Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory.
		Demonstrate the working principles, procedures and applications.
R20EEE-BS1204	Basic Electrical and Electronics Engineering Lab	Prove the laws and theorems
		Analyze the characteristics of DC Machines
		Identify the performance of a Transformer
		Analyze the V-I characteristics of diode
		Develop Inverting and Non-Inverting Amplifier using PSPICE
R20 REGULATION		
II YEAR – I SEMESTER		
R20BSH-MA2101	Calculus and Partial Differential Equations	Apply mean value theorems to real world problems.
		Find the Fourier series of functions
		Evaluate Fourier integral, Fourier transform and inverse Fourier of a given function.
		Solve partial differential equations of first order using analytical methods.
		Solve wave equation and heat equations by using partial differential equation methods.
R20MEC-PC2101	Mechanics of solids	Understand basic concepts of stress and strain in solids and apply this knowledge during the analysis of thermal stresses and statically indeterminate structures.
		Analyse the shear force and bending moment develops in a beam while solving complex problems.
		Determine the bending stress, shear stress and deflection in beams to select the appropriate geometry of beam for the requirement.

		Calculate the torsional strength of a machine members such as shafts and calculate the shear strength and deflections produced in the springs.
		Compute the buckling load for columns with different end conditions and compute the stresses in thin cylinders due to internal pressure.
R20MEC-PC2102	Machine Drawing	Identify conventional representation of machine components.
		Draw the sectional views of various machine parts
		Construct the engine parts like Fuel pump, Petrol Engine connecting rod,piston assembly
		Draw the machine parts like Screws jacks, Machine Vices Plummer block, Tailstock.
		Draw the Valves like spring loaded safety valve, feed check valve and aircock.
R20MEC-ES2101	Engineering Thermodynamics	Identify concepts of heat, work, energy and governing rules for conversion of one form to other.
		Explain relationships between properties of matter and basic laws of thermodynamics.
		Explain the concept of available energy for maximum work conversion.
		Analyze the steam properties for working of steam power plants.
		Provide the fundamental concepts of thermodynamics cycles used in steam power plants, IC engines and gas turbines.
R20MEC-PC2103	Kinematics of Machinery	Demonstrate the fourbar,single slider and double slider mechanisms.
		Demonstrate the lower pair mechanisms
		Analyse the fourbar, single slider and double slider mechanisms kinematically,cam Profile by considering different types of velocities.
		Design gears for power transmission
		Analyze various power transmission systems such as belts, ropes, chain drives and geartrains

R20MEC-PC2104	Computer Aided Engineering Drawing	Apply the various commands in AutoCAD for drafting the geometrical entities.
		Draw the orthographical projections of solids.
		Analyze the intricate details of solid parts through sectional views.
		Develop the surfaces of solids for optimization of material requirement.
		Model the 2D and 3D objects using CAD software.
R20MEC-PC2105	Mechanics of Solids Lab	Understand the study the stress-strain relations of different materials
		Identify the hardness of different materials.
		Evaluate the Modulus of rigidity of different materials.
		Assimilate impact strength on various engineering materials.
		Identify stiffness and rigidity on springs of various types.
R20MEC-ES2102	Material Science and Engineering Lab	Identify various microstructures of steels and cast irons.
		Evaluate hardness of treated and untreated steels.
		Analyze the hardenability of steels.
		Examine the microstructure of heat treated steels.
		Identify the microstructure of non-ferrous alloys.
R20BSH-SC2101	Employability Skills (Skill Oriented Course)	Enable students to identify Parts of Speech and use them flawlessly, write Emails in formal correspondence effectively, participate confidently by introducing oneself in any formal discussion.
		Attain Language Proficiency & Accuracy through Contextualized Vocabulary, Verb forms, Tense and subject verb agreement, produce coherent expressions for professional writing, introduce themselves unhesitatingly with Task-Based Activities.

		Develop the fluency and accuracy to write Technical Reports and Emails for professional communication by using appropriate vocabulary and participate confidently in any formal discussion.
		Assimilate lifelong reading habit to comprehend a passage for its gist. Avoid the errors in both Speech & Writing and write Letters and Emails for official communication.
		Realise the technical communicative competence and attainment of grammatically correct structures for formal communication.
R20BSH-MC2102	Essence of Indian Traditional Knowledge	Knowledge about the concept of traditional knowledge and analyze social context
		Apply significance of traditional knowledge protection
		Analyze various enactments related to the protection of plant varieties
		Evaluate desired concepts of Intellectual property to protect the traditional knowledge
		Compare the traditional knowledge in various sectors
II YEAR – II SEMESTER		
R20BSH-MA2201	Complex Variables and Statistical Methods	Examine the analyticity of complex functions.
		Evaluate complex integration using Cauchy's theorems and Cauchy's residue theorem.
		Compute probabilities, theoretical frequencies using discrete and continuous probability distributions for real data.
		Apply the concept of hypothesis test to large samples.
		Apply statistical inferential methods to small samples.
R20MEC-PC2201	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.
R20MEC-PC2202	Fluid Mechanics& Hydraulic Machinery	Analyze the type of fluid properties, flow patterns and use Continuity equitation to one dimensional fluid flow situations.
		Imparting the Fluid equations (Energy, Momentum and Bernoulli's) in practical applications.
		Describe the importance of impulse momentum equation to calculate impact of jet on different types of vanes.
		Analyze the various components of turbines and study their characteristics curves and power output from turbines.
		Analyze the various problems related to pumps and study their performance characteristics.
R20MEC-PC2203	Production Technology	Develop the fundamental Concept of the casting along with the various issues related to patterns.
		Analyze the different bulk forming techniques.
		Understand the principles of various forging operations.
		Summarize the applications, advantages of various welding processes.
		Explain various plastic deformation processes.
R20BSH-HM2203	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.
R20MEC-PC2204	Production Technology Lab	Exercise for Strength and Permeability for sand.
		Design the Gating and pouring time and solidification time calculations.
		Fabricate different types of components using various welding techniques
		Perform Blanking and Piercing operation with Simple, Compound and Combination dies
		Perform the Plasma arc cutting, Wire cut EDM and exercise Additive manufacturing with reverse engineering
R20MEC-PC2205	Fluid Mechanics& Hydraulic Machinery Lab	Apply laws of conservation in verification of principles of fluid flow.
		Perform measuring of pressure, discharge and velocity of fluid flow
		Examine the water supply pipe networks, by evaluating the losses incurred in pipes.
		Identify suitable pumps and turbines for different working conditions.
		Analyze the performance characteristics of Hydraulic Machines.
R20MEC-PC2206	Theory of Machines Lab	Evaluate critical speed of shaft, by varying different speeds, balancing of masses and also moment of inertia of flywheel.
		Determine the working of different governors and coefficient of friction between belt and pulley.
		Analyze the effect of Gyroscopic couple, efficiency of screw jack and velocity, accelerations of slider crank mechanism.

		Measure the frequency of damped and undamped at free and forced vibration of an equivalent spring mass system.
		Explain the types of gears- Spur, Helical, Worm and Bevel Gears.
R20BSH-SC2201	MATLAB For Computational Methods (Skill Oriented Course)	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.
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.
R16 REGULATION		
IV YEAR - I SEMESTER		
C401	Mechatronics	Understand the concept of mechatronics systems.
		Explain the functioning of solid-state electronics devices.
		Illustrate the hydraulic and pneumatic actuating systems.
		Apply PLCs for controlling systems.
		Develop the data acquisition systems.
		Identify the future trends in design of mechatronics systems.
C402	CAD/CAM	Explain history of CAD/CAM hardware, and importance of computer graphics in industries.
		Classify the Geometric modelling, drafting and modelling systems.
		Understand the part programming for NC Machine tools.
		Classify techniques used in group technology and their relevant application in industries.
		Explain the importance of computer aided quality control techniques in the industries.
		Illustrate activities in the Computer Integrated Manufacturing Systems.
C403		Apply the concepts of variational methods and weighted residual methods.

	Finite Element Methods	Identify the application and characteristics of various finite elements such as Bars.
		Analyze the application and characteristics of various finite elements such as Beams, Trusses.
		Apply the characteristics of constant strain triangle and axi symmetric problems with iso parametric representation.
		Make use of the characteristics of 4 node quadrilateral element with iso parametric representation.
		Identify the application of FEM beyond the structural domain for problems of dynamics, heat transfer analysis and fluid flow.
C404	Power Plant Engineering	Understand the working of steam power plants.
		Compute the internal combustion and gas turbine power plants.
		Explain the operational aspects of hydroelectric power plants and hydro projects.
		Outline the types of reactors in nuclear power plants.
		Illustrate the combined operations of different power plants.
		Apply the economical aspects in operation of power plants.
C405	Additive Manufacturing	Understand the importance of AMF in Rapid Prototyping and liquid based rapid prototyping systems.
		Outline solid based rapid prototyping systems.
		Explain powder based rapid prototyping systems.
		Differentiate Direct & Indirect Rapid Tooling Techniques.
		Understand the rapid prototyping data formats and software's.
		Apply the concept of additive manufacturing for real-life applications.
C406	Advanced Materials	Explain basic concepts of composite Materials and their properties.

		Outline manufacturing methods of different composites.
		Illustrate the basic Manufacturing methods of Polymer matrix composite materials and practical applications.
		Explain the effect of Macro Mechanical Analysis of a Lamina Used In Practical Applications.
		Describe properties of functionally graded materials and shape memory alloys.
		Understand the properties and applications of Nano Materials.
C407	CAD/CAM Lab	Use analytical tools ANSYS and FLUENT for engineering simulation.
		Understand the procedure to write manual part programming using APT language.
		Develop part drawings for the components.
		Construct various 3D models.
		Determine deflection and stresses in 2D, 3D trusses, beams and shell structures.
		Develop CNC programming for turned components and milled components.
C408	Mechatronics Lab	Measure load, displacement and temperature using analogous and digital sensors.
		Develop PLC programs for control of traffic lights, water level, lift and conveyor belts.
		Analyse PID controllers for a physical system using MATLAB.
		Construct pneumatic and hydraulic circuits using Automation studio.
		Create simulation model of PID controller using SIMULINK.
		Develop programs on MATLAB.
IV YEAR - II SEMESTER		
C409	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.
		Illustrate the Dispatching procedure
C410	Unconventional Machining Processes	Illustrate the working principles of various modern manufacturing processes.
		Understand the metal removal rate and issues related with unconventional machines.
		Identify the process parameters in the unconventional machining processes.
		Examine the economic implications when the unconventional machines are used.
		Identify the unconventional machines of plasma machining for machining different materials.
		Calculate the material removal, MRR in different abrasive jet machines.
C411	Automobile Engineering	Illustrate the construction features of automobile engines and parts.
		Analyze parts/modules in transmission system.
		Explain types of steering mechanisms.
		Outline the working /features of suspension, braking and electrical systems.
		Identify the need and types of safety systems in automobiles.
		Analyze the methods for emission control of engine.
C412	Non-Destructive Evaluation	Explain non-destructive destructive testing methods and radiographic testing in industries.
		Understand Ultrasonic testings and their characteristics.
		Illustrate Liquid penetrate testing and types of penetrants used in die penetrating testing.
		Identify internal flaws of the workpiece using magnetic particle testing.

		Examine deterioration in assets and plant sites using thermal testing.
		Apply knowledge of non-destructive testing techniques to test equipment's/workpieces in various industrial/automobile sectors.