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
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E-Mail: lendi_2008@yahoo.com Website: www.lendi.org

DEPARTMENT OF MECHANICAL ENGINEERING
ACADEMIC YEAR - 2020-21

	R20 Regulation		
	I Year - I Semester		
CODE	**COURSE NAME**	**CO'S**	**DESCRIPTION**
C1O1	Communicative English	C101.1	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.
		C101.2	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.
		C101.3	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

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			negotiating skills through debates.
		C101.4	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.
		C101.5	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.
C1O2	Numerical Method and Ordinary Differential Equations	C102.1	Solve non-linear equations using various numerical methods and apply numerical methods to find interpolation polynomial for a given data
		C102.2	Apply numerical methods to evaluate derivatives and integration of a function and find the solutions of ordinary differential equations.
		C102.3	Solve the first order ordinary differential equations related to various engineering fields.
		C102.4	Solve the higher order differential equation and analyze physical situations.
		C102.5	Apply the Laplace transform for solving differential equations and integral equations.
C1O3	Engineering Chemistry	C103.1	Illustrate the properties and applications of polymers.
		C103.2	Design the metallic materials to prevent the corrosion.
		C103.3	Assess the quality of fuels and identify the suitable one.

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		C103.4	Analyze the suitable method for industrial water treatment.
		C103.5	Demonstrate the preparation, properties and applications of nano materials and importance of green chemistry.
C1O4	Computer Programming in C ES	C104.1	Illustrate the Fundamental concepts of Computers and basics of computer programming.
		C104.2	Use Control Structures and Arrays in solving complex problems.
		C104.3	Develop modular program aspects and Strings fundamentals.
		C104.4	Demonstrate the ideas of pointers usage.
		C104.5	Solve real world problems using the concept of Structures, Unions and File operations.
C1O5	Engineering Graphics	C105.1	Apply the basics of Engineering Graphics to construct the polygon, curves and orthographic projections of points.
		C105.2	Draw the orthographic projections of straight lines inclined to both the planes.
		C105.3	Draw the projections of planes in various conditions.
		C105.4	Draw the projections of regular solids, its axis inclined to one of the principle plane.
		C105.5	Develop 3D isometric views from 2D orthographic views and vice versa.
C1O6		C106.1	Prepare polymers and nano materials.

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	Engineering Chemistry Lab	C106.2	Explain the functioning of the instruments such as Conductivity meter, pH meter, Viscometer, Cleveland's apparatus.
		C106.3	Analyze the quality of ground water sample.
		C106.4	Compare kinematic viscosity, acid number, and flash and fire points of different lubricating oils.
		C106.5	Identify the safety precautions to carry out the experiments in the laboratory using chemicals.
C1O7	Engineering Workshop & IT Workshop Lab	C107.1	Apply wood working skills in real world applications.
		C107.2	Build different parts with fitting in engineering applications.
		C107.3	Develop various basic prototypes in black smith & tiny smith applications.
		C107.4	Apply different types of basic electric circuit connections.
		C107.5	Understand the basic components, peripherals and basic operations of a computer.
C1O8	Computer Programming in C Lab	C108.1	Implement basic programs in C and design flowcharts in Raptor.
		C108.2	Use Conditional and Iterative statements to solve real time scenarios in C.
		C108.3	Implement the concept of Arrays and Modularity and Strings.

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		C108.4	Apply the Dynamic Memory Allocation functions using pointers.
		C108.5	Develop programs using structures.
C1O9	Environmental Science	C109.1	Understand about the environment and natural resources.
		C109.2	Understands about various attributes of different types of pollution and their impacts on the environment and control methods along with waste management practices.
		C109.3	Illustrate about the ecosystem and know the importance of conservation of biodiversity.
		C109.4	Relate the current environmental impacts with societal problems.
		C109.5	Identify the current population explosion and their impacts on the environment

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I Year –II Semester			
C1O10	Linear Algebra and Multivariable Calculus	C110.1	Apply the matrix algebra techniques to engineering applications.
		C110.2	Apply the concepts of eigenvalues and eigenvectors to free vibration of a two mass system.
		C110.3	Apply partial differentiation to find maxima and minima of functions of several variables
		C110.4	Evaluate the volume and surface area of solids using multiple integrals.
		C110.5	Apply vector differential operators to find potential functions and estimate the work done against a field, circulation and flux using vector integral theorems.
C1O11	Material Science and Engineering	C111.1	Understand the principles of binary phases.
		C111.2	Analyze heat treatment to manufacturing applications.
		C111.3	Select steel and cast irons for a given application.
		C111.4	Explain nonferrous metals and alloys in engineering.
		C111.5	Choose composites for various applications.
C1O12	Engineering Physics	C112.1	Interpret the interaction of optic energy with matter on the basis of interference & polarization 2. 3. 4. 5
		C112.2	Explain the various types of crystal systems

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		C112.3	Apply the principles of Lasers and Acoustics to mechanical systems
		C112.4	Describe the properties and applications of Ultrasonic'.
		C112.5	Identify the fundamentals of modern engineering materials
C1O13	Engineering Mechanics	C113.1	Find the resultant for any number of forces in the mechanical system.
		C113.2	Apply equilibrium conditions on different force systems with or without application of friction.
		C113.3	Determine centroid, centre of gravity, area moment of inertia and mass moment of inertia of simple and composite sections.
		C113.4	Determine the displacement, velocity & acceleration relations in dynamic systems.
		C113.5	Analyze the motion of the bodies with (or) without the application of force.
C1O14	Basic Electrical & Electronics Engineering	C114.1	Apply concept of KVL/KCL and network theorems in solving electrical circuits 2. 3. 4. 5.
		C114.2	Understand the principle of operation of different DC Machines
		C114.3	Measure the performance quantities such as losses, efficiency of transformers
		C114.4	Understand the importance and applications of p-n junction diode , Zener diode and rectifiers

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		C114.5	Apply different modes of op-amps in different applications
C1O15	Communicative English Lab	C115.1	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.
		C115.2	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.
		C115.3	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.
		C115.4	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.
		C115.5	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.
C1O16		C116.1	Apply the working principles of laboratory experiments in optics, mechanics and acoustics.

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	Engineering Physics Lab	C116.2	Compute the required parameter by suitable formula using experimental values in mechanics, optics & acoustic experiments.
		C116.3	Analyze the experimental results through graphical interpretation.
		C116.4	Recognize the required precautions to carry out the experiment and handling the apparatus in the laboratory.
		C116.5	Demonstrate the working principles, procedures and applications.
C1O17	Basic Electrical and Electronics Engineering Lab	C117.1	Prove the laws and theorems
		C117.2	Analyze the characteristics of DC Machines
		C117.3	Identify the performance of a Transformer
		C117.4	Analyze the V-I characteristics of diode
		C117.5	Develop Inverting and Non-Inverting Amplifier using PSPICE

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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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R16 Regulation III YEAR - I SEMESTER			
Course Code	**Course Name**	**CO**	**CO Statement**
C301	Dynamics of Machinery	C301.1	Analyze the stabilization of sea vehicles, aircrafts and automobile vehicles.
		C3012	Compute frictional losses, torque transmission of mechanical systems.
		C301.3	Enumerate dynamic force analysis of slider crank mechanism and design of flywheel.
		C301.4	Understood various concepts on design of various types of governors along with other topics such as sensitiveness and hunting.
		C301.5	Understood the methods of balancing of rotating masses and balancing of reciprocating masses as well.
		C301.6	Analyze the basics of vibration as well as to find out the methods to calculate the natural frequencies of different systems.
C302	Metal Cutting & Machine Tools C301	C302.1	Solve problems related To Cutting Forces, Tool Life and Tool Angles
		C302.2	Understand Lathe operations Using Lathe Machine, Learned how to Use Lathe Tools and

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			Importance of Lathe Machines.
		C302.3	Analyze the Usage, operation s and Applications of Shaping, Slotting, Planning, Drilling and Boring Machines and their Tools
		C302.4	Understand the Usage, operations and Applications of Milling Machines and their Tools like Cutters etc…
		C302.5	Understand the operations and Applications of Grinding Machines and their Tools like Grinding Wheels etc…
		C302.6	Understand the Importance Of Jigs, Fixtures and CNC Machines
C303	Design of Machine Members–II	C303.1	Understand the design procedure to engineering problems, including the consideration of technical and manufacturing constraints and also Select suitable materials and significance of tolerances and fits in critical design applications
		C303.2	Utilize the design data hand book and can design the elements for strength, stiffness and fatigue and also Identifying the loads, the machine members subjected
		C303.3	Learn and understand different types of failure modes and criteria of riveted , bolted and welded joints and also can design the boiler shells and ship hulls etc.
		C303.4	Impart the procedure for designing different machine elements such as shafts, cotter joints,

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			keys and axial loaded joints and understand the failures if these elements in real life application.
		C303.5	Understand the Procedure for designing different types of shaft couplings also should be able to understand the failures of these elements in real life application.
		C303.6	Analyze the Procedure for designing different types Mechanical springs also to understand the failures of these elements in real life application.
C304	Operation Research (C304)	C304.1	Develop formulation of the linear programming problem (LPP) from the real world problems and be able to apply the suitable method for solving LPP.
		C304.2	Distinguish the importance among the procedure of solving the Transportation Problems, Assignment Problems and solving the Sequential Problems
		C304.3	Analyze the application of the Replacement problems.
		C304.4	Formulate and Solve the Game Theory problems.
		C304.5	Examine and Identify the inventory models and stochastic models and solve them
		C304.6	Interpret and select , the sequencing various jobs and solving various queuing problems.
		C305.1	Evaluate the fundamentals as well as basics for power cycles.

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C305	Thermal Engineering II (C305)	C305.2	Describe various types of boilers as well as their corresponding classifications with necessary advantages and disadvantages
		C305.3	Classify types of turbines that are in use, also enumerates the velocity diagrams for the turbines, along with the necessary current day applications
		C305.4	Understand the difference between steam turbine and gas turbines, along with the various classifications and their limitations as well.
		C305.5	Analyze the principle involved in jet propulsion, enumerated along with schematic diagrams, along with their corresponding thrust power and propulsive efficiency.
		C305.6	Evaluate the difference between various types of liquid propellants that are in use to initiate a rocket engine.
C306	Theory of Machines Lab (C306)	C306.1	Calculate critical speed of shaft, by varying different speeds at which the shaft tends to vibrate i.e. at which resonance occurs.
		C306.2	Determine the working of different governors. And determine the different characteristic curves for the governor.
		C306.3	Determine the frequency of undamped free vibration of an equivalent spring mass system
		C306.4	To do dynamic analysis of mechanical systems such as planar four-bar mechanism, reciprocating mechanism, flywheel, gear trains, governor and rotary systems
		C306.5	Determine the mechanical advantage, velocity ratio and efficiency of screw jack

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		C306.6	Selecting gear and gear train depending on application
C307	Machine Tools Lab	C307.1	Understand lathe working principle and can perform various operations to prepare different shapes of products**.**
		C307.2	Operates drilling machine and can perform various operations to prepare different shapes of products**.**
		C307.3	Operate shaper, slotting and planning machine and can perform various operations to prepare different shapes of products**.**
		C307.4	Understand the surface grinding machine and can perform various operations to prepare different shapes of products**.**
		C307.5	Operate milling machine, with understanding working principle and can perform various operations to prepare different shapes of products**.**
		C307.6	Understand tool and cutter grinding machine and can perform various operations to prepare different shapes of products**.**
C308	Thermal Engineering Lab	C308.1	Determine the valve and port timing diagram of SI engine & CI engine
		C308.2	Determine the performance parameters for 4-stroke C.I engine&4-stroke S.I engine.

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		C308.3	Evaluate and Prepare heat balance sheet for twin cylinder C.I engine.
		C308.4	Apply the concept of Morse test on SI engine.(multi cylinder).
		C308.5	Analyse the efficiency of reciprocating air compressor.
		C308.6	Evaluate the difference between various types of liquid propellants that are in use to initiate a rocket engine
C309	IPR & Patents	C309.1	Gain Knowledge on basic concepts of Intellectual Property , Innovations and Inventions of Intellectual Property Law
		C309.2	Evaluate the principles and rights afforded by Copyright, its infringement and International Copyright Law.
		C309.3	Analyze Patent registration requirements, infringement and Litigation, new developments and international laws
		C309.4	Understand Registration Process of Trade Marks, Interparties proceedings, litigations , claims and global factors related to trade marks
		C309.5	Understand trade Secrets, Employee Confidentiality Agreement, Trade Secret Litigation and breach of law
		C309.6	Elucidate Cyber Law and Cyber Crimes , E- commerce, International aspects of Computer and Online Crime

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III YEAR - II SEMESTER			
C310	Metrology	C310.1	Design tolerances and fits for selected product quality.
		C310.2	Understand the standards of length, angles, taper measurement
		C310.3	Study various optical measuring instruments and interferometry
		C310.4	Evaluate the surface finish and different comparators
		C310.5	Inspect various gear elements and thread elements by choosing appropriate methods and instruments.
		C310.6	Perform machine tool alignment
C311	Instrumentation & Control Systems	C311.1	Understand with the techniques and use of measuring systems
		C311.2	Select appropriate device for the measurement of parameters like temperature, pressure, speed, stress, humidity, flow velocity etc
		C311.3	Calibrate various instruments and how to apply them in various fields
		C311.4	Gain working knowledge for dealing with basic problems of control system fundamentals

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		C311.5	Give justification for the use of instruments through characteristics and performance.
		C311.6	Understand which instrument to be used under various circumstances
C312	Refrigeration & Air-conditioning	C312.1	Analyze various refrigerating cycles and evaluate their performance.
		C312.2	Knowledge on vapour compression refrigeration systems and can analyze the performance of the system.
		C312.3	Understand the difference between CFC, HCFC and HFC refrigerants and their effect on the environment.
		C312.4	Gain knowledge on vapour absorption and steam jet refrigeration systems and can analyze the performance of the system.
		C312.5	Perform cooling load calculations and select the appropriate process and equipment for the required comfort and industrial Air-conditioning. Students have knowledge on the difference between refrigeration and air conditioning systems & sensible and latent heat.
		C312.6	Understand various components of the air conditioning system and their working.

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C313	Heat Transfer	C313.1	Ability to evaluate the amount of heat exchange for plane, cylindrical & spherical geometries in various modes of heat transfer.
		C313.2	Explains the importance of extended surfaces for heat transfer process and to calculate the effectiveness of fins.
		C313.3	Ability to understand and solve conduction, problems using Fourier's law, Newton's law of cooling , non dimensional numbers.
		C313.4	Ability to understand and solve radiation problems using Stefan Boltzmann constant.
		C313.5	Ability to design and analyze the performance of heat exchangers.
		C313.6	Ability to design and analyze the performance of boilers and condensers.
C314	Interactive Computer Graphics	C314.1	Use the principles and commonly used paradigms and techniques of computer graphics.
		C314.2	Design programs to display graphic images to given specifications
		C314.3	understand basic graphics application programs including animation
		C314.4	Possess in-depth knowledge of display systems, image synthesis, shape modeling, and interactive control of 3D computer graphics applications
		C314.5	Understand write line drawing, polygon filling programs
		C314.6	Write complex graphics application programs AND Simulation programs
	Heat Transfer Lab	C315.1	Ability to evaluate the amount of heat exchange for

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C315			plane, cylindrical & spherical geometries in various modes of heat transfer.
		C315.2	Explains the importance of extended surfaces for heat transfer process and to calculate the effectiveness of fins.
		C315.3	Ability to understand and solve conduction, problems using Fourier's law, Newton's law of cooling , non dimensional numbers.
		C315.4	Ability to understand and solve radiation problems using Stefan Boltzmann constant.
		C315.5	Ability to design and analyze the performance of heat exchangers.
		C315.6	Ability to design and analyze the performance of boilers and condensers.
C316	Metrology & Instrumentation Lab	C316.1	Measurement of various linear, angular dimensions of the products and flatness of the surface by using precision measuring instruments.
		C316.2	Learn how to check various parameters of the threads and gears.
		C316.3	Selection of the appropriate measuring instruments
		C316.4	Knowledge of the requirement of calibration and errors in measurement and perform accurate measurements
		C316.5	Alignment various machines used in manufacturing
		C316.6	Understand the construction and working of various instruments
C317	Computational Fluid Dynamics Lab	C317.1	Solving Problems of fluid mechanics and heat transfer by writing programs in C-language and MATLAB
		C317.2	.Using ANSYS-FLUENT build a geometry, mesh that geometry, Perform CFD method

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			on the mesh, perform the calculation, and post-process the results.
		C317.3	Understanding the validation of the numerical result by comparison with known analytical results.
		C317.4	Understanding the numerical result by invoking the physical principles of fluid mechanics and heat transfer
C318	Professional Ethics & Human Values	C318.1	It gives a comprehensive understanding of a variety of issues that are encountered by every professional in discharging professional duties.
		C318.2	It provides the student the sensitivity and global outlook in the contemporary world to fulfill the professional obligations effectively

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IV YEAR - I SEMESTER			
C401	Mechatronics	C401.1	understand about technologies behind modern mechatronics systems
		C401.2	Explain about fundamentals of Solid state electronic devices
		C401.3	Elaborate about fundamentals of actuating systems
		C401.4	Analyse about Digital electronics and systems
		C401.5	Apply System interfacing and data acquisition
C402	CAD/CAM	C402.1	Improves the basic idea on the history of CAD/CAM hardware, and importance of CAD/CAM in industries.
		C402.2	Learn the mathematical techniques for representation of geometric entities including points, lines, and parametric curves, surfaces and solid, and the technique of transformation of geometric entities using transformation matrix.
		C402.3	To get the knowledge on procedure to write manuscript for a part to be manufactured. Having basic ideas on APT language in computer aided part programming for the product development.
		C402.4	Classification of different parts into part families, which are manufacturing in any industry with the knowledge on group technology and learning different techniques which are widely applying in industries
		C402.5	Having basic knowledge in Process Planning help in understanding the importance in

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			manufacturing industries. And the learning of computer aided quality control enhances their knowledge in applying or using these techniques in the industries.
		C402.6	Can identify various elements and their activities in the Computer Integrated Manufacturing Systems
C403	Finite Element Methods	C403.1	Understanding the concepts of variational methods and weighted residual methods
		C403.2	Identify the application and characteristics of various finite elements such as Bars
		C403.3	Analyze the application and characteristics of various finite elements such as Beams, Trusses
		C403.4	Analyze the characteristics of constant strain triangle and axi symmetric problems with iso parametric representation
		C403.5	Understanding the characteristics of 4 node quadrilateral element with iso parametric representation
		C403.6	Identify the application of FEM beyond the structural domain for problems of dynamics, heat transfer analysis and fluid flow.
C404	Power Plant Engineering	C404.1	To describe various energy resources and types of power plants and types of material handling systems.
		C404.2	To Analyze different types of steam cycles and estimate efficiencies in a steam power plant
		C404.3	To study basic working principles of gas turbine and diesel engine power plants.

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		C404.4	To study the working principle of hydro electric power plant and defines the performance characteristics and components of such power plants.
		C404.5	To study the principal components and types of nuclear reactors
		C404.6	To calculate present worth depreciation and cost of different types of power plants and estimates the cost of producing power per kW.
C405	Elective I. Additive Manufacturing	C405.1	Importance of AMF in Rapid Prototyping Photo polymerization: SLA-Photo curable materials – Process – Advantages and Applications.
		C405.2	Explanation of Material Extrusion & Sheet Lamination principle, process, case studies & models.
		C405.3	Illustration of Powder Bed Fusion & Powder Bed Technology: SLS & 3DP Ink Jet-Process description – powder fusion mechanism – Process Parameters – Typical Materials and Application.
		C405.4	Understanding Rapid Tooling with difference of Direct & Indirect RT Techniques
		C405.5	Understanding different File Formats & Software's used
		C405.6	Explain different applications of Additive manufacturing in different sectors.
C406	Elective II. Advanced Materials 2.	C406.1	Demonstrate the polymer, metal matrix, ceramic and fiber reinforced composites for Engineering Applications.
		C406.2	Demonstrate the polymer, thermosetting and thermoplastic composites for Engineering Applications
		C406.3	Select the best manufacturing methods for manufacturing of composite.

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		C406.4	Analyse macro mechanically for a lamina
		C406.5	Demonstrate the best suitable materials for propulsions, Human body parts and machine structures
C407	CAD/CAM Lab	C407.1	Learning 2D modeling tools by using AutoCAD will improves knowledge using different tools which helps in solving real time problems and day to day problems.
		C407.2	To improve various skills in use different tools for drafting while drawing sectional views of different mechanical components and assemble drawings in 2D modeling packages using AUTOCAD.
		C407.3	CATIA Part modeling tools will help in representing various components in more realistic way and can use of these tools for any engineering and real time applications.
		C407.4	Students acquires knowledge on ANSYS will improves their analyzing skills in different areas. Can utilize these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.
		C407.5	To understand the basic procedure to write manual part programming using APT language.
		C407.6	Learning the basics in using G and M codes for simple operations like turning and point to point.
C408	Mechatronics Lab	C408.1	1. Measure load, displacement and temperature using analogue and digital sensors

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		C408.2	2. Develop plc programs for Control of traffic lights and water level
		C408.3	3. Develop plc programs for Control of lifts and Conveyor belts
		C408.4	4. Simulate and analyse pid Controllers for a physical system using mat lab
		C408.5	5. Develop pneumatic and hydraulic circuits using automaton studio

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IV Year - II Semester			
C409	Production Planning and Control	C409.1	Understand the types of production, service systems and organization of the Production Planning and Control department.
		C409.2	Apply the principles and techniques for planning and control of the production and service systems to optimize/make best use of resources.
		C409.3	Identify the importance and function of inventory and to be able to apply selected techniques for its control and management under dependent and independent demand circumstances.
		C409.4	Understand the concepts of scheduling and concepts of bill of material as industrial needs.
		C409.5	Analyze various scheduling methods, line balancing and aggregate planning.
		C409.6	Identify the process of dispatching and follow-up concepts as per industrial needs.
C410	Unconventional Machining Processes	C410.1	Understand the mechanics of material removal process parameters and their applications of Ultrasonic machining process
		C410.2	Identify and utilize fundamentals of metal cutting as applied to the Electro chemical machining.
		C410.3	Develop the skills of effective utilization of the cutting fluids and applications for better productivity
		C410.4	Identify and utilize fundamentals of metal cutting as applied to the Electron Beam Machining, Laser Beam Machining

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		C410.5	Understand Basic fundamentals of the metal removal mechanism in Plasma Machining process
		C410.6	Can enumerate the fundamentals of mechanics of material removal in Abrasive jet machining, Water jet machining and abrasive water jet machining.
C411	Automobile Engineering	C411.1	learn this topic basic introduction to automobiles can be easily analyzed, so as for better understanding of concepts further.
		C411.2	Design of various types of transmission systems can be classified along with their working principle, advantages and disadvantages.
		C411.3	The topic describes basic terminology of how a steering system works and also explains various types of steering gear mechanisms that are in use.
		C411.4	Design of major necessities in an automobile such as electrical system, braking system and suspension system can be easily understood from this unit , along with their limitations.
		C411.5	Analyzes the importance of safety system in an automobile and also it evaluates the latest updates in the field of automobile industry. Classifies various types of automobile engines that are in use along with their detailed specifications.
		C411.6	Explains how the emissions/pollutants from automobiles are harmful for humans and also for the environment. What are all the necessary steps to be taken to

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			overcome them. national and international pollution standards.
C412	Non Destructive Evaluation	C412.1	Comprehensive, theory based understanding of the techniques and methods of non destructive testing
		C412.2	Apply methods and knowledge of non destructive testing to evaluate products of railways, automobiles, aircrafts, chemical industries etc
		C412.3	Ability to communicate their conclusions clearly to specialist and non-specialist audiences.
		C412.4	Calibrate the instrument and inspect for in-service damage in the components
		C412.5	Differentiate various defect types and select the appropriate NDT methods for better evaluation
		C412.6	Sound knowledge of various types of testing methods
C413	Seminar	C413.1	Students will demonstrate the ability to perform close and critical readings.
		C413.2	Students will demonstrate the ability to consider critically the motives and methods of scholarship and the relationship between them.
		C413.2	Students will demonstrate the ability to distinguish opinions and beliefs from researched claims and evidence and recognize that kinds of evidence will vary from subject to subject. For instance, some fields call for quantitative support while others work more commonly with quoted, textual evidence.
		C413.3	Students will demonstrate the ability to ask disciplinarily appropriate questions of the material and recognize when lines of inquiry fall outside of disciplinary

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			boundaries.
		C413.4	Students will demonstrate the ability to evaluate, credit, and synthesize sources.
		C413.5	Students will demonstrate the ability to perform close and critical readings.
C414	PROJECT	C414.1	To provide Technical Knowledge on the fundamental aspects and understand the importance,which in turn helps in analyzing the problem
		C414.2	To understand the importance of the present work from the post researches and literatures.Identifying the gaps and techniques to achieve better results
		C414.3	From the identified metholodoligies,advanced techniques can be learnt of design environmental friendly systems and relate cost effectiveness in design and manufacturing
		C414.4	Provides hands on experience with an understanding of design manufacturing aspects
		C414.5	The works carried out can identify suitable applications, leading to enhanced knowledge and building up collective responsibilities
		C414.6	Understand modern manufacturing operations, including their capabilities a limitations

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