



## EINSTEIN ACADEMY OF TECHNOLOGY AND MANAGEMENT

At: Baniatangi, PO: Bajapur, Khurdha, Bhubaneswar, PIN: 752060

Department of Mechanical engineering

### Course Outcomes of Subjects

#### C101-ENGLISH COMMUNICATION SKILL

CO1	Define the role of communication in the present day world.
CO2	Understand the fundamentals of Grammar for error free written communication.
CO3	Use basic knowledge in Phonetics and Pronunciation skills for better Communication.
CO4	Illustrate the diversified traditions and cultures through interpersonal communication.
CO5	Evaluate student's competency through various writing skills.
CO6	Develop the confidence to make communication in all the situations with knowledge on soft skills.

#### C123-APPLIED MATHEMATICS-I

CO1	Apply the knowledge of calculus, Gamma and Beta functions for analyzing engineering problems.
CO2	Analyze the first order differential equations using standard methods and its application in engineering fields.
CO3	Demonstrate various physical models through higher order differential equation
CO4	Explain linear differential equations with variation of parameters.
CO5	Describe series solution of differential equations and explain application of Bessel's function.
CO6	Develop the essential tool of different matrices with matrix algebra and to compute eigen values and eigen vectors required for matrix diagonalization process.

#### C124-APPLIED PHYSICS

CO1	Solve the classical and wave mechanical problems.
CO2	Demonstrate various types of oscillation and their application in various processes
CO3	Formulate and solve the engineering problems on electromagnetism.
CO4	Correlate the different ideas in solving the problems of classical physics in their parent streams.
CO5	Learn physics behind various types of lasers and their characteristics.
CO6	Analyze the quantum physics and their importance in engineering platform

#### C129-BASICS OF CIVIL ENGINEERING

CO1	Understand the property, use, advantage and disadvantage of different material used for construction.
CO2	Analyse different types of materials will be used for construction, their proportions, different types of test & experiments and importance of quality.
CO3	Analyse the importance of surveying, its requirements and applications in civil engineering.
CO4	Differentiate the types of soil and its classifications, their properties, strengths and Types of foundations.
CO5	Explain the ideas of Irrigation engineering and types of irrigation structures like: canals, siphons, weirs, dams etc.
CO6	Learn about construction materials, role of transportation as well as of water and its conservation.

#### C125-ENVIRONMENTAL STUDIES & HEALTH CARE ENGINEERING

CO1	Understand the ecological system along with the processes involved in it
CO2	Evaluate the effect of the pollutants on the atmosphere, water and soil.
CO3	Analyze strategies to control, reduce and monitor pollution

CO4	Apply the knowledge gained by studying the sources, properties to manage the solid and hazardous wastes.
CO5	Understand the occupational health and safety measures taken in some industries
CO6	Summarize the causes, prevention and control of some diseases.

#### C113-ENGLISH COMMUNICATION SKILL LAB

CO1	Explain and facilitate computer-aided multi-media instruction enabling individualized and independent language learning.
CO2	Interpret the students to the nuances of English speech sounds, word accent, intonation and rhythm.
CO3	Change a consistent accent and intelligibility in their pronunciation of English by providing an opportunity for practice in speaking.
CO4	Develop the fluency in spoken English and neutralize mother tongue influence.
CO5	Compare the abilities of students with real life situations faced by the students.
CO6	Modify students to use language appropriately for interviews, group discussion and public speaking.

#### C132-APPLIED PHYSICS LAB

CO1	Explain the value of g on various places.
CO2	Summarize the elasticity of various materials.
CO3	Analyses the characteristics of various diode.
CO4	Interpret the law of string.
CO5	Determine the wavelength of light.
CO6	Illustrate the viscosity of liquid.

#### C133-BASICS OF CIVIL ENGINEERING LAB

CO1	Determine the shape, size and Compressive strength of brick.
CO2	Learn the testing of chain and measurement of correct length of the line, Bearing of a line.
CO3	Know the importance of total station and its application.
CO4	Determine Setting time of cement
CO5	Evaluate the tensile strength of reinforcing steel.
CO6	Calculate Compressive strength of concrete.

#### C134-COMPUTER LAB-I

CO1	Analyze problems, design and implementing algorithmic solutions.
CO2	Understand and trace the execution of programs written in C language.
CO3	Write the C code using a modular approach and recursive concepts.
CO4	Explain the dynamics of memory by the use of pointers and create/update basic data files.
CO5	Design C Programs for problems.
CO6	Write and execute C programs for simple applications.

#### C121-ENGINEERING WORKSHOP

CO1	Get a good knowledge and experience about the working conditions at shop floor level.
CO2	Practice on fabrication of components through various operations in fitting and welding.
CO3	Identify and apply suitable tools for various operations in lethe machine.
CO4	Get the knowledge of working in machine shop such as milling machine, shapper etc.
CO5	Study and practice on machine tools and their operations
CO6	Acquire the Knowledge about safety in workshop and industry.

#### C126-PROFESSIONAL ETHICS

CO1	Analyze the basic terms of moral ethics and ethical delemma by reading the theories of kohlberg and piaget.
CO2	Differentiate between profession and Professionalism.

CO3	Correlate the role and responsibilities of professionals and their duties towards organization
CO4	Plan the safety risk by discussing the risk benefit analysis with different case studies
CO5	Identifying the causes of an accident and preventive measures to be taken
CO6	Rewrite the meaning and significance of ethical code and its limitation.

#### C127-APPLIED MATHEMATICS-II

CO1	Apply the knowledge of Laplace transformation and its use in getting solution to differential equations.
CO2	Use of periodic functions and Fourier series, Fourier integral
CO3	Describe Fourier transform to analyze circuit and system communication.
CO4	Illustrate the concept of vector differential calculus to understand the solenoidal and irrotational vectors
CO5	Illustrate the concept of tangent and arclength, gradient.
CO6	Solve the Vector differential and integral calculus problem.

#### C128-APPLIED CHEMISTRY

CO1	Understand the basics of quantum mechanical concept.
CO2	Apply the principles of spectroscopy in predicting absorption and relative terms in diatomic molecule.
CO3	Evaluate the phase diagram of some one and two component systems by applying Phase Rule.
CO4	Classify the organometallics .
CO5	Analyse the quantitative aspects of fuel combustion by understanding the fundamental concepts of fuels.
CO6	Evaluate the corrosion of a material by using the the fundamental concepts of corrosion chemistry.

#### C130-BASICS OF MECHANICAL ENGINEERING

CO1	Understand basics of thermodynamics
CO2	Application of basics of thermodynamics
CO3	Illustrate basics of heat transfer, refrigeration and internal combustion engine
CO4	Understand basics of Robotics
CO5	Understand the basics of Mechanical measuring instruments
CO6	Mechanism of power transfer through belt, rope, chain and gear drives

#### C131-ELECTRICAL & ELECTRONICS ENGINEERING

CO1	Analyze the basic properties of electrical circuit elements and evaluate circuit parameters using network theorems.
CO2	Explain the fundamentals relating to AC circuit and solve AC circuit problems along with resonating conditions.
CO3	Explain the basic properties of electromagnetic circuit and their applications.
CO4	Apply the basic concept of MOS FET, biasing of BJT and FET for analysis and design of the basic transistor amplifier circuits, FET circuits.
CO5	Implement knowledge of OP-AMP with basic circuits.
CO6	Apply basic knowledge of Boolean algebra, basic gates, logic circuits.

#### C135-APPLIED CHEMISTRY LAB

CO1	Determine the amount of a compound / ion present in a given mixture / compound.
CO2	Understand the Iodometric titrations.
CO3	Analyse water sample to know some of its characteristics.
CO4	Evaluate the suitability of a lubricant/fuel by determining some general property.
CO5	Create a drug.
CO6	Apply the knowledge gained to determine the strength of a solution.

**C136-BASICS OF MECHANICAL ENGINEERING LAB**

CO1	Study the fundamental of IC engine
CO2	Demonstrate pressure measuring instruments of fluid.
CO3	Study on analytical knowledge about refrigerator and air conditioner.
CO4	Demonstrate fundamental knowledge of automobile transmission system.
CO5	Understand about the construction and function of gear and gear train.
CO6	Understand the working and construction of steam power plant.

**C137-COMPUTER LAB-II**

CO1	Design a document using MS_WORD.
CO2	Demonstrate and compute the data using Spread Sheet
CO3	Implement the basic elements of a C program including arithmetic and logical operators, functions, control structures, and arrays
CO4	Execute a walk-through of a program containing pointers, Structures, Unions and File Concepts.
CO5	Design a program related to challenging questions.
CO6	Write and execute C programs for simple applications

**C138-ENGINEERING GRAPHICS LAB**

CO1	Develop adequate competence in visualization, interpretation and expression of drawing of engineering parts and objects.
CO2	Perform free hand sketching of basic geometrical constructions and multiple views of objects.
CO3	Gain knowledge on universally accepted conventions and symbols for their usage in technical drawings.
CO4	Draw orthographic projection of lines and plane surfaces.
CO5	Draw projection of solids and perform development of surfaces.
CO6	Gain knowledge about Computer aided drafting.

**C139-NSS**

CO1	Understand themselves in relation to their community.
CO2	Identify the needs and problems of the community and involve them in problem solving process.
CO3	Develop among themselves a sense of social and civic responsibility.
CO4	Utilize their knowledge in founding practical solution to individual and community problems.
CO5	Acquire leadership qualities and democratic attitude.
CO6	Develop capacity to meet emergencies and natural disasters.

**C203-ENGINEERING ECONOMICS**

CO1	Define the basic concept of micro and macroeconomics, engineering economics and their application in engineering economy.
CO2	Understand the law of demand and law of supply.
CO3	Understand the environment and financial systems of the country and its impact on business, society and enterprise.
CO4	Analyze time value of money using engineering economy factors.
CO5	Gain knowledge of economics and engineering principles to solve engineering problems and to evaluate engineering projects considering upon depreciation, taxes and inflation.
CO6	Apply depreciation methods for individual/industrial/ public alternatives

**C207-MECHANICS OF SOLIDS**

CO1	Explain the fundamental concepts of rigid and deformable solids in the perspective of stress, strain and modulus of elasticity.
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CO2	Apply the principles of bi-axial state of stresses in various problems, analysis of thin cylinder.
CO3	Calculate the loads in beams, shear forces and bending moments associated with different sections.
CO4	Illustrate the theory, principles associated to torsion in solid, hollow shafts, helical springs.
CO5	Evaluation of deflection in beams by using by different methods.
CO6	Analysis of different columns under different end conditions.

#### C208-INTRODUCTION TO PHYSICAL METALLURGY AND ENGINEERING MATERIAL

CO1	Understand how materials are formed and their classification based on atomic arrangement.
CO2	Describe the mechanical behavior of metallic systems and testing methods of materials.
CO3	Acquire acquaintance with types of fracture and failure and methods of protection against the fractures.
CO4	Know about the phase transformation of material.
CO5	Understand different optical properties of Materials and description about plastics, ceramics and composite materials.
CO6	Gain knowledge in various class of materials and their applications

#### C209-FLUID MECHANICS AND HYDRAULIC MACHINES

CO1	State and explain various fluid properties in rest and in transit.
CO2	Understand concepts related to fluid statics.
CO3	Apply the concepts of fluid kinematics to various types of fluid flow and flow lines also determine various flow parameters.
CO4	Apply conservation laws to fluid flow problems in engineering applications.
CO5	Analyses the fluid flow problems like flow through pipes, ducts and nozzles.
CO6	Evaluate performance parameters of hydraulic machines like turbines and pumps.

#### C210-KINEMATICS & DYNAMICS OF MACHINES

CO1	Understand various mechanisms, which can be used under different situations in different machines.
CO2	Analyze and plot displacement, velocity and acceleration of different components of machines.
CO3	Study of different mechanisms of gears and gear trains.
CO4	Analyze and decide the type of drives to be used for different machinery applications.
CO5	Determination of power for different clutches
CO6	Evaluate the force analysis and power calculation of brakes & dynamometers.

#### C211-ENGINEERING THERMODYNAMICS

CO1	Demonstrate an understanding of the concepts of first law of thermodynamics to identify closed and open systems .
CO2	Apply the concept of second law to understand fundamental concepts of unsteady Flow, Entropy Generation and Property relations
CO3	Develop a fundamental understanding of Reversible work, Exergy balance and Second Law Efficiency applied to various real life applications.
CO4	Analyze the performance of gas and vapor power cycles and identify methods to improve thermodynamic performance.
CO5	Solve problems based on the Brayton cycle; the Brayton cycle with regeneration; and the Brayton cycle with intercooling, reheating, and regeneration.
CO6	Explain working principle of air compressors and their applications in engineering industry.

#### C221-MECHANICS OF SOLIDS LAB

CO1	Compute the tensile strength , compressive strength, shear strength of the specimen using different testing methods (UTM, Impact Test)
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CO2	Predict the bending stress, modulus of rigidity, fatigue strength of the given specimen using different testing methods
CO3	Perform compression tests on spring and wood.
CO4	Determine elastic constants using flexural and torsion tests
CO5	Determine hardness of metals
CO6	Perform strain and stress measurements using strain rosettes.

#### C222-FLUID MECHANICS AND HYDRAULIC MACHINES LAB

CO1	Determine stability of floating bodies.
CO2	Determine flow coefficients of flow measuring devices.
CO3	Analyze flow patterns occurring in pipe.
CO4	Calculate force acting on vanes by using momentum conservation principle.
CO5	Calculate head loss occurring in a pipe network.
CO6	Evaluate performance parameters of turbines and pumps.

#### C223-KINEMATICS & DYNAMICS OF MACHINES LAB

CO1	Determination of radius of gyration of compound pendulum and connecting rod.
CO2	Study of different clutches and brakes.
CO3	Determination of power by different dynamometers.
CO4	Demonstrate journal bearing apparatus
CO5	Study of different gear trains.
CO6	Evaluation of Coriolis component of acceleration.

#### C224-ENGINEERING THERMODYNAMICS LAB

CO1	Study of Cut-Sections of 2 stroke and 4 stroke Diesel Engine and Petrol engine
CO2	Study of steam power plant, gas turbine power plant and refrigeration system
CO3	Study of refrigeration system
CO4	Perform analysis of reciprocating air-compressor.
CO5	Perform analysis of Centrifugal / Axial Flow compressor.
CO6	Determine performance characteristics of gear pump

#### C219-MECHANISM & MACHINES

CO1	Understand different mechanisms of lower pairs, higher pairs and construct diagram of different mechanisms.
CO2	Interpret dynamic analysis of flywheel for engines as well as for different machines.
CO3	Explain dynamic force analysis of gear mechanism.
CO4	Develop concepts of speed control systems for engines, and gyro-stabilizers for ships and aeroplanes.
CO5	Develop knowledge of analytical and graphical methods for calculating balancing of rotary and reciprocating masses.
CO6	Develop understanding of vibrations and its significance on engineering design.

#### C303-IC ENGINE & GAS TURBINE

CO1	Demonstrate a basic understanding of engine function, performance, design methodology and perform thermodynamic analysis of different IC Engine cycles.
CO2	Describe the Air and Fuel induction techniques for SI and CI Engines.
CO3	Explain ignition and combustion characteristics for SI and CI Engines.
CO4	Understand the effect of supercharging, turbo charging on power output and carry out performance analysis of internal combustion engines.
CO5	Develop an understanding of real world engine design issues related to Cooling, Lubrication and engine emission.
CO6	Analyze working gas turbines and compressors.

**C220-MECHANICAL MEASUREMENT, METROLOGY AND RELIABILITY**

CO1	Identify and select suitable instruments for measuring parameters of mechanical systems and design and develop feedback control systems for different engineering applications.
CO2	Understand the concept of experimental stress analysis on different mechanical components.
CO3	Measure mechanical parameters such as displacement, force, torque, speed and vibration using suitable instruments and measure temperature, pressure and flow with suitable instruments as required in different engineering applications
CO4	Explain different terminologies of screw thread, gears and its measurement methods.
CO5	Understand standards of measurement, methods to determine geometry and surface finish as well as dimensions of industrial components and design Go and No Go gauges based on principles of limits, fits and tolerance.
CO6	Analyze reliability data and predict reliability of individual components and select and design an acceptance sampling plan for sampling inspection.

**C204-ORGANISATIONAL BEHAVIOUR**

CO1	Demonstrate the applicability of the concept of organizational behavior to understand the behavior of people in the organization.
CO2	Demonstrate the applicability of analyzing the complexities associated with management of individual behavior in the organization.
CO3	Analyze the complexities associated with management of the group behavior in the organization.
CO4	Demonstrate how the organizational behavior can integrate in understanding the motivation (why) behind behavior of people in the organization.
CO5	Evaluate the impact of different cultures within an organization
CO6	Develop a new technique to implement organizational change for the achievement of organizational goal.

**C201-APPLIED MATHEMATICS - III**

CO1	Identify, formulate formula and analyze complex engineering problems and they can solve it.
CO2	Understand the processes of Interpolation of a polynomial by Lagrange, Newton divided, forward and backward difference.
CO3	Gain knowledge to analyze and formulate the formula to compare the exact and approximate value of an integral by different rules.
CO4	Solve an ordinary differential equation and a system of ordinary differential equations by using numerical Methods and extract the value of variables.
CO5	Evaluate the probabilistic problems by defining the probability formula and use them to solve Probability problems.
CO6	Gain knowledge about the Statistical hypothesis and analyze the regression and related them into estimate

**C212-BASIC MANUFACTURING PROCESSES**

CO1	Select materials, types and allowances of patterns used in casting and analyze the foundry components.
CO2	Study different arc, gas, solid state and resistance welding processes.
CO3	Understand various non destructive testing methods.
CO4	Describe different powder metallurgy processes.
CO5	Develop process-maps for metal forming processes using plasticity principles.
CO6	Explain various coating and deposition methods.

**C225-MECHANISM & MACHINES LAB**

CO1	Determination of gyroscopic couple using gyroscopic test rig and performance of spring loaded governor.
CO2	Determination of critical speed of rotating shaft.

CO3	Perform static and dynamic balancing.
CO4	Determination of natural frequencies of un-damped as well as damped vibrating systems.
CO5	Study of interference and undercutting for gear drives
CO6	Study of various cam and follower mechanisms.

#### C226-IC ENGINE LAB

CO1	Draw and study valve timing diagram of IC engine.
CO2	Study of modern carburetor and fuel injection system.
CO3	Study of different cooling and lubrication systems.
CO4	Demonstrate the load test for 2 stroke/4 stroke CI and SI engine.
CO5	Demonstrate Morse Test on multi-cylinder S.I. or C.I. engine.
CO6	Determination of heat balance sheet of 2 stroke S.I. Engine.

#### C227-MECHANICAL MEASUREMENT, METROLOGY AND RELIABILITY LAB

CO1	To understand principle, working of various measuring instruments
CO2	Selection of proper instruments for measurement
CO3	Setting the instruments for zero error adjustment & Calculation of least count of instrument
CO4	Use a variety of equipment and techniques to measure force, flow, pressure, temperature, speed, strain, rotational position.
CO5	Collection, recording and analysis of data
CO6	Apply analytical and experimental methods to make measurements and to find and correct defects in measurement systems.

#### C228-BASIC MANUFACTURING PROCESSES LAB

CO1	Test the properties of moldings sands.
CO2	Study on different foundry practices.
CO3	Determine strength of brazed and soldered joints.
CO4	Fabricate joints using different welding practices.
CO5	Perform different sheet metal operations.
CO6	Perform different forming processes.

#### C229-SKILL PROJECT AND HANDS ON

CO1	Identify and define problems in the area of mechanical engineering
CO2	Explain the Product Development Process
CO3	Aware of current scenario of skill development in India
CO4	Understand the concept of skill development
CO5	Understand skill training, employment (both wage / self) and livelihood improvement
CO6	Prepare a technical report of the project and execute a Project solely or with a teamwork

#### C310-HEAT TRANSFER

CO1	Gain knowledge about the principles and mechanism of heat transfer in solids and fluids and solve problems on conduction, convection and radiation heat transfer.
CO2	Analyze the mechanism of heat transfer through conduction mode and apply the knowledge of conduction heat transfer in designing of various heat transfer systems for industrial applications.
CO3	Understand the mechanism of forced and free convection in fluids and apply the knowledge of convection heat transfer for evaluation of heat transfer coefficients in case of natural convection and forced convection over surfaces and inside ducts.
CO4	Illustrate the real time applications of radiation mode of heat transfer.
CO5	Comprehend the phenomena of heat transfer in boiling liquids and condensing Vapours and apply the knowledge in solving problems related to the industrial applications.
CO6	Analyze the performance and develop the design skills of heat exchangers.

**C320-MACHINING SCIENCE AND TECHNOLOGY**

CO1	Understand various tool geometries, their inter-relations and theories involved in metal cutting.
CO2	Evaluate various machining parameters used in conventional machining processes.
CO3	Apply concepts of kinematics in various machining processes to determine kinematic parameters.
CO4	Explain mechanisms, of various conventional machining processes along with work and tool holding devices.
CO5	Understand construction and working principle of various production machine tools.
CO6	Understand the working principles, applications and importance of modern machining processes over conventional machining processes.

**C302-OPTIMIZATION IN ENGINEERING**

CO1	Analyze the real life systems with limited constraints
CO2	Depict the systems in a mathematical model form
CO3	Apply knowledge of optimization to formulate and solve engineering problems.
CO4	apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems
CO5	solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software
CO6	Understand variety of real industrial problems such as resource allocation, production planning, assignment, transportation, travelling salesman etc. and solve these problems using linear programming approach using software

**C306-DESIGN OF MACHINE ELEMENTS**

CO1	Explain basic concepts and principles in the design of machine elements & apply them effectively from material selection to design analysis
CO2	Interpret standardized data by using design data book to analyze life of components under various loading conditions..
CO3	Explain and design permanent and temporary joints under various loading conditions.
CO4	Design and analyze couplings and power transmission shafts for different conditions.conditions.
CO5	Design helical compression spring and laminated spring
CO6	Analyze operating conditions of Journal bearings, and use manufacturer's catalogue for selection of rolling contact bearings.

**C402-MARKETING MANAGEMENT**

CO1	Identify the scope and significance of Marketing In Domain Industry
CO2	Examine marketing concepts and phenomenon to current business events In the Industry
CO3	Coordinate the various marketing environment variables and interpret them for designing marketing strategy for business firms
CO4	Illustrate market research skills for designing innovative marketing strategies for business firms
CO5	Practice marketing communication skills relevant to the corporate world
CO6	Construct written sales plans and professional interactive presentations

**C324-HEAT TRANSFER LAB**

CO1	Analysis of heat transfer by conduction in various commonly used materials.
CO2	Measurement of the fin performance under natural/ forced convection.
CO3	Measure the amount of heat transfer taking place between fluids flowing within heat exchangers.
CO4	Analyze free and forced convection phenomenon.

CO5	Demonstrate the concept of pool boiling.
CO6	Demonstrate fundamental concepts of radiative heat transfer.

#### C325-MACHINING SCIENCE AND TECHNOLOGY LAB

CO1	Perform various operations in lathe machine.
CO2	Perform various operations in shaper, planner and grinding machine.
CO3	Evaluate cutting force by using lathe tool dynamometer.
CO4	Evaluate cutting force by using lathe drill dynamometer.
CO5	Study various non conventional machining methods.
CO6	Prepare jobs by using CNC machine.

#### C326-DESIGN OF MACHINE ELEMENTS LAB

CO1	Design and make any working model from cotter and knuckle joint and another working model from shaft, spring and bearing.
CO2	Design and draw a riveted joint, cotter joint and knuckle joint using either Auto-cad/Pro-E/Catia/Ansys
CO3	Design and analyze shafts subjected to combined loading using either Auto-cad/Pro-E/Catia/Ansys
CO4	Design and draw flange coupling using either Auto-cad /Pro-E/Catia/Ansys
CO5	Design of spring using either Auto-cad/Pro-E /Catia/ Ansys
CO6	Design of bearing using either Auto-cad/Pro-E /Catia/ Ansys

#### C327-ADVANCE LAB - I

CO1	Understand basics of Computer Graphics for development of CAD models
CO2	Develop different types of surfaces with the help of different curves
CO3	Select suitable manufacturing method for different mechanical components using CAM software.
CO4	Implement proper Rapid Prototyping methods for designing particular components
CO5	Design, Analysis and Manufacture of different components using different CAD, CAM, and CAE softwares
CO6	Select the proper automation and robotic structure for particular system

#### C409-PRODUCTION AND OPERATION MANAGEMENT

CO1	Identify Various types of production systems
CO2	Understand the fundamentals of facility locations, demand forecasting.
CO3	Obtain knowledge about production planning, capacity planning.
CO4	Apply concepts of scheduling and sequencing to various job flow problem.
CO5	Solve inventory problems and to be able to apply selected techniques for its control and management under dependent and independent circumstances.
CO6	Know production monitoring and control techniques to improve quality.

#### C408-REFRIGERATION AND AIR CONDITIONING

CO1	Apply the concepts of thermodynamics to solve problems related to air refrigeration cycles.
CO2	Analyze vapour compression refrigeration system and identify methods for performance improvement.
CO3	Study the working principles of vapour absorption and thermoelectric refrigeration systems.
CO4	Present the properties, applications and environmental issues of different refrigerants.
CO5	Analyze the air conditioning processes using principles of Psychrometry
CO6	Evaluate cooling and heating loads in an air-conditioning system.

#### C404-PRODUCT DESIGN AND PRODUCTION TOOLING

CO1	Illustrate Product Design, design considerations, planning, development, Role of computer in product design.
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CO2	Design various dies,tools for forging.
CO3	Develop various parameters for sheet metal work.
CO4	Design jigs and fixtures.
CO5	Design single point cutting tool.
CO6	Design of limit gauges.

### C333-GREEN TECHNOLOGIES

CO1	Understand the principles of green chemistry and engineering
CO2	Enlist different concepts of green technologies in a project
CO3	Understand the principles of Energy efficient technologies
CO4	Estimate the carbon credits of various activities
CO5	Identify the importance of life cycle assessment
CO6	Recognize the benefits of green fuels with respect to sustainable development.

### C307-AUTOMOBILE ENGINEERING

CO1	Analyze the basic concepts and working principles of various automobile components.
CO2	Distinguish between various types of transmissions systems, and rear axles.
CO3	Explain the need of various conventional and automatic steering and braking systems.
CO4	Understand the principles of different gear boxes and tyre geometry.
CO5	Understand automotive electronics.
CO6	Study latest developments in automobiles.

### C328-PRODUCTION AND OPERATION MANAGEMENT LAB

CO1	Do work Sampling of any work situation to determine time spent in value addition, inspection /checking, communication and idleness
CO2	Design layout of any industry/ institute to be constructed on a different site as compared with the existing one.
CO3	Select two or more possible locations for setting up of an industry/ institute and do comparative evaluation with respect to different parameters.
CO4	Optimize Inventory of collected sample data about stock of different items, their consumption pattern and price from any type of business firm
CO5	Practice on any Manufacturing Execution System (MES) software/ ERP suit such as NetSuite Manufacturing,
CO6	Practice on simulation software for manufacturing/ supply chain/logistics, such as Arena, Witness, Plant Simulation, etc.

### C329-REFRIGERATION AND AIR CONDITIONING LAB

CO1	Determine C.O. P of vapour compression and vapour absorption refrigeration system
CO2	Evaluate performance parameters of window air conditioning system.
CO3	Evaluate performance parameters of duct type air conditioning system.
CO4	Evaluate performance parameters of heat pump.
CO5	Evaluate performance parameters of ice plant.
CO6	Analyze performance parameters of cooling tower.

### C330-BUSINESS COMMUNICATION & SKILL FOR INTERVIEW

CO1	Understand the purpose of professional interviews.
CO2	Identify the different types of professional interviews that leads to get a good job.
CO3	Obtain important tips on preparing for the professional interview.
CO4	Articulate the importance of oral-presentation.
CO5	Identify key principles in public speaking for business communication.
CO6	Create various types of business reports for corporate transactions.

### C331-INDUSTRIAL LECTURE

CO1	Generate a report based on the experiences and projects to be carried out
CO2	Demonstrate the ability to apply knowledge of Mathematics, Science, and Engineering Fundamentals.
CO3	Demonstrate competency in relevant engineering fields through problem identification, formulation and solution
CO4	Implement skills effectively in communication, in writing and using multimedia tools.
CO5	Organise and manage as an effective team member
CO6	Develop the ability to work as an individual and in group

#### C418-INTRODUCTION TO MANAGEMENT AND FUNCTION

CO1	Recognize the role of a manager and how it relates to the organization's mission.
CO2	Define management, its four basic functions and skills.
CO3	Know critical management theories and philosophies and how to apply them.
CO4	Recognize the concept of social responsiveness and its benefits.
CO5	Explain the relationship between strategic, tactical, and operational plans
CO6	Identify the stages of team development and the skills a team must acquire to become effective.

#### C419-INTELLECTUAL PROPERTY RIGHTS

CO1	Recognize the fundamental of intellectual property Rights, Types, Need & importance of IPR.
CO2	Understand the Registration Process of different IPs, legal and practical steps needed to ensure the different intellectual property rights remain valid and enforceable.
CO3	Review ownership rights and marketing protection under intellectual property law as applicable to information, ideas
CO4	Able to learn new products and product marketing to maintain Trade secret.
CO5	Analyze the current and emerging issues relating to the intellectual property protection, GI, Unfair competition
CO6	Development and reform of intellectual property rights and their likely impact on creativity and innovation.

#### C420-ROBOTICS

CO1	Understand the fundamentals of robots and robotics.
CO2	Develop the mathematical modeling in positioning the end effectors and establish the kinematic relationships between links.
CO3	Explain the inverse kinematic operations of a robot's manipulator by using various kinematic models and incorporate different dynamic modeling concepts to control the movements of the manipulator.
CO4	Understand the applicability of different sensors used in controlling the robot movements and study the robots performance.
CO5	Gain knowledge about different types of actuators used for controlling the movements and functions of a robot.
CO6	Visualize the applications of robots in diversified fields and its impact in flexible automation.

#### C406-MECHANICAL VIBRATION

CO1	Model & analyze single DoF systems: undamped & damped free vibrations, forced vibrations
CO2	Use vibration measuring instruments for vibration analysis.
CO3	Model & analyze two DoF systems without damping: amplitude and modes of vibration.
CO4	Model & analyze multi DoF systems without damping using different theoretical techniques
CO5	Analyze continuous systems for their amplitude of vibration and mode shapes for various boundary conditions

CO6	Explain noise, its measurement & noise reduction techniques for industry and day today life problems
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#### C401-ENTERPRENEURSHIP DEVELOPMENT

CO1	Communicate effectively both orally and in writing.
CO2	Demonstrate knowledge of the legal and ethical environment impacting business organizations and exhibit an understanding and appreciation of the ethical implications of decisions.
CO3	Demonstrate an understanding of and appreciation for the importance of the impact of globalization and diversity in modern organizations.
CO4	Demonstrate an ability to engage in critical thinking by analyzing situations and constructing and selecting viable solutions to solve problems.
CO5	Demonstrate an ability to work effectively with others.
CO6	Demonstrate knowledge of current information, theories and models, and techniques and practices in all of the major business disciplines including the general areas of Accounting and Finance, Information Technologies, Management, Marketing, and Quantitative Analysis.

#### C412-SEMINAR-I

CO1	Select topics on modern technology, prepare slides for power point presentation
CO2	Gain good knowledge on modern technology by referring the journals/magazines
CO3	Improvement in presentation skill viz. clarity of voice, proper body language, interaction with audience.
CO4	Development of communication skills.
CO5	Improve in demonstration knowledge, skills and in development of attitudes of a professional engineer.
CO6	Learn to compile a detail report about presentation in the prescribed format.

#### C413-MINOR PROJECT

CO1	Identify & undertake projects which is feasible, cost effective, ecofriendly and safe.
CO2	Analyze the relation of the project to the literature and how much the project is applicable to the society.
CO3	Plan properly to complete the project within the schedule time.
CO4	Conduct all relevant testings after execution of the project and analyze the test results for future research.
CO5	Execute any project with proper methodology and in a team spirit.
CO6	Compile project report as per standard norm.

#### C417-COMPREHENSIVE VIVA VOCE

CO1	Demonstrate the understanding of engineering knowledge learnt in four year graduation course.
CO2	Defend any type of interviews, viva-voce, and aptitude tests both at the academic and the industry sector.
CO3	Perform well in group discussions and enhance the communications skills and interaction.
CO4	Apply knowledge in developing their career in particular fields.
CO5	Apply the principles and phenomena, and their applications in solving engineering problems.
CO6	Exhibit professional etiquette suitable for career progression

#### C415-INTERNSHIP / MAJOR PROJECT

CO1	Identify & undertake projects which is feasible, cost effective, ecofriendly and safe.
CO2	Analyze the relation of the project to the literature and how much the project is applicable to the society.
CO3	Plan properly to complete the project within the schedule time.

CO4	Conduct all relevant testings after execution of the project and analyze the test results for future research.
CO5	Execute any project with proper methodology and in a team spirit.
CO6	Develop confidence for self-education and ability for lifelong learning