DEPARTMENT O F MECHANICAL ENGINEERING

SUBJECTWISE CO STATEMENT – A18 BATCH

S. NO	Course Code	Course Name	CO No.	CO Statement
1	7HC04	APPLIED PHYSICS	1	To understand basic fundamentals of crystallography, crystal structures, their properties
			2	To understand the various defects of a crystal and X-ray diffraction techniques to analyze a crystal structure.
			3	To make the students to widen the conceptual understanding of the fundamental principles of interference and diffraction (wave optics)
			4	To understand the basic concepts of normal light, Laser and its applications and to know about the fundamentals of radioactivity and its applications.
			5	To know the various types of vibrations like periodic, vibrating strings, ultrasonics, magnetostriction, piezo-electricity, NDT.
			6	To discuss about the nano-technology, preparation techniques and characterization (XRD, SEM & TEM), CNTs
2	7B103	ENGINEERING MECHANICS	1	Understand and tackle the problems associated to Resultants and Equilibrium of system of forces.
			2	Analysis of forces in the structures by using method of joints sections and Principle of virtual work.
			3	Analysis and solve the real world problems related to friction.
			4	To Locate the centroid of various geometric shapes from basic principles.
			5	To determine the area moment of inertia and mass moment of inertia for evaluating the strength and to analysis the rigid body motion. To Analyze and solve the motion parameters

				under the action of system of forces.
			6	Able to apply various energy methods for solving kinetic problem.
3	7HC06	Engineering Mathematics -1	1	Solve the problems using special functions; evaluate surface areas and volumes of revolutions.
			2	Verify the mean value theorems and also express the given function in series form using Taylor's theorem.
			3	Determine the convergence, divergence or oscillating nature of a series and express the function as trigonometric series.
			4	Compute the extreme values of a function defined with and without constraints.
			5	Check the consistency or inconsistency of a linear system and ability to solve real time problems.
			6	Calculate the Eigen values and Eigen vectors of a matrix and their application for orthogonal transformation.
4	7BC02	ENGINEERING GRAPHICS & DESIGN	1	Get familiar to use the instruments to solve the engineering problem and draw various type of curves used in engineering
			2	Understand and Implement Orthographic projections and draw projections of simple drawing entities such as points Lines, and Planes
			3	Draw projections of different types of regular solids in various positions wrt principal planes of projection
			4	Draw Sections of various Solids including Cylinders, cones, prisms and pyramids and draw the developments of these solids and their sections.
			5	Construct Isometric Scale, Isometric Projections

				and Views and convert 3D views to 2D orthographic views
			6	Understand from basic sketching through 2D and 3-D solid modeling using computer aided design (CAD) software
5	7HC02	ENGLISH	1	understand, analyze and respond to the audience by listening effectively
			2	acquire the articulation of different types of sentences by practicing pause patterns and question tags.
			3	translate and demonstrate self, participate effectively in activities like JAM, extempore
			4	express and deliver a presentation on the given topic through role plays and situational dialogues
			5	implement English language to meet the standards of corporate and real world in a group.
			6	present and communicate effectively by facing mock interviews by experts from industry and academy.
6	7HC64	APPLIED PHYSICS LAB	1	Understand and search to apply the fundamentals of magnetic induction, Ampere's law, Oersted's law and the Biot-Savart law.
			2	Analyze the concept and application parts of radius of gyration and periodic vibrations.
			3	Summarize the fundamentals of modulus-types, stress, strain, elasticity, plasticity and Hook's law.
			4	Understand the concept of radiation, ionizing radiation, radiological protection and inverse square law.
			5	Demonstrate the resonance phenomenon and verify the transverse laws of stretched strings by using Sonometer.
			6	Describe the types of waves like longitudinal, transverse, stationary and progressive waves.

				Electromagnetic induction and its applications.
7	7HC62	ENGLISH (Oral Communication Skills) Lab	1	understand, analyze and respond to the audience by listening effectively
			2	acquire the articulation of different types of sentences by practicing pause patterns and question tags.
			3	translate and demonstrate self, participate effectively in activities like JAM, extempore
			4	express and deliver a presentation on the given topic through role plays and situational dialogues
			5	implement English language to meet the standards of corporate and real world in a group.
			6	present and communicate effectively by facing mock interviews by experts from industry and academy.
8	7B191	TECHNICAL SEMINAR-I	1	Identify current general, political and technology related topics.
			2	Arrange and present seminar in a effective manner
			3	Collect, survey and organize content in presentable manner
			4	Demonstrate oratory skills with the aid of Power Point Presentations
			5	Exhibit interview facing skills and team leading qualities
9	7HC20	HUMAN VALUES AND PROFESSIONAL ETHICS IN HIGHER EDUCATION	1	Learns Being a human, understands human values and purpose of education
			2	Understands the importance of different harmony levels needed.
			3	Understand Self and being in the current moment are the sources of happiness.
			4	Improves Learning capabilities and communication skills.

			5	Understands and appreciate the importance of personality development and yoga for a holistic life.
			6	Understands the essence of Morals, Ethics, Values and Social responsibilities for successful life.
10	**7HC03**	**CHEMISTRY**	1	Understand and analyse microscopic chemistry in terms of atomic orbitals, molecular orbitals and intermolecular forces.
			2	Identify and differentiate conductivity of polymers, thermoplastic, thermosetting plastics and various lubricants.
			3	Recognize and select the domestic and industrial problems caused by hard water and also learn about the municipal water treatment using various methods.
			4	Understand and interpret the important fundamental concepts of electrochemistry and solve the problems related to batteries.
			5	Differentiate the types of corrosion and methods used to prevent the corrosion.
			6	Learn and implement synthesis of drug molecules and learn fundamentals of analytical techniques like electronic, vibrational and rotational spectroscopy.
11	**7FC01**	**Problem Solving using C**	1	To formulate simple algorithms for arithmetic, logical problems and to translate the algorithms in to programs using C language
			2	To test and execute the programs and correct the logical errors if any, to implement Conditional branching, iteration
			3	To analyze and decompose a problem into functions and synthesize a complete program using divide and conquer approach.
			4	Students will be able to learn, understand and apply the concept of arrays in various

				applications.
			5	To impart the knowledge about pointers this is the backbone of effective memory handling techniques.
			6	Students will be able to express the advantages of user defined data types and issues related to file organizations, which provide flexibility for application development.
12	7HC08	Engineering Mathematics -II	1	Multiple integration and its applications also acquire knowledge on curvilinear coordinate system.
			2	Various analytical methods to solve first order first degree and also the equations not of first degree ordinary differential equations.
			3	Methods to solve higher order ordinary differential equations.
			4	Series solution of second order ordinary differential equations with variable coefficients.
			5	Basic concepts of Complex Analysis and conformal mapping and their properties.
			6	Series expansion of a function using Taylor's and Laurent's series. Evaluation of definite integrals and improper integrals.
13	7BC01	WORKSHOP/ MANUFACTURING PRACTICES	1	To understand various basic tools to perform simple joints using metal.
			2	To understand the principle of various electrical and electronic appliances and their applications.
			3	To understand the basic wooden joints, their prepartation methods and applications.
			4	To understand the fabrication processes and tools used for Plastic components and Glass.
			5	To have basic understanding of various manufacturing processes like casting, welding and press tools and their applications
			6	To gain knowledge of basic machining processes and their applications

14	7HC01	ENGLISH - (Reading, Listening and Writing)	1	understand and differentiate different types of listening techniques used to interact with real world problems
			2	differentiate the speech sounds and improve their accent and modulation while speaking
			3	understand and illustrate different word roots, word derivatives – synonyms, antonyms and word inflections
			4	discriminate a variety of sentence types, their structure and use punctuations
			5	get acclimatized to reading strategies and note making.
			6	develop proficiency in writing and preparing resume
15	7HC63	CHEMISTRY LABORATORY	1	Methods to prepare inorganic complexes.
			2	The process to determine surface tension of different liquids using stagnometer
			3	The process to determine viscosity of lubricants by using redwood viscometer.
			4	How to find acid value of an oil.
			5	The principle and determination of Hardness of a water sample.
			6	The methods to estimate amount of chlorine in water
16	7FC71	Problem Solving using C LAB	1	To convert the given problems to programs using expressions, conditions, loops.
			2	To do basic programs with arrays and do searching and sorting techniques with arrays.
			3	To implement the concept of modularity by using functions.
			4	To implement programs by using pointers and pointer arithmetic.
			5	To create and implement user defined data types such as structures and unions.

			6	To be able to create, read and write simple files.
17	7BC61	WORKSHOP/ MANUFACTURING PRACTICES (LAB)	1	Use various types of conventional manufacturing Processes
			2	Manufacture components from wood, MS flat, GI Sheet etc. – hands on experience
			3	manufacturing of components by machining like shafts, holes & threaded holes, surface finishing of components etc.
			4	Produce small devices / products /appliances by assembling different components
18	7HC61	ENGLISH LAB (Reading, Listening and Writing)	1	understand and differentiate different types of listening techniques used to interact with real world problems
			2	differentiate the speech sounds and improve their accent and modulation while speaking
			3	understand and illustrate different word roots, word derivatives – synonyms, antonyms and word inflections
			4	discriminate a variety of sentence types, their structure and use punctuations
			5	get acclimatized to reading strategies and note making.
			6	develop proficiency in writing and preparing resume
19	7B292	TECHNICAL SEMINAR II	1	Identify current general, political and technology related topics.
			2	Arrange and present seminar in a effective manner
			3	Collect, survey and organize content in presentable manner
			4	Demonstrate oratory skills with the aid of Power Point Presentations
			5	Exhibit interview facing skills and team leading qualities

20	7HC12	Engineering Mathematics–III (Partial differential equations, Probability and Statistics)	1	Form partial differential equations and find the solution to first order linear and nonlinear partial differential equations.
			2	Applications of PDE.
			3	Learn basic concepts of probability and able to evaluate probability.
			4	Will able to solve problems on discrete and continuous probability distributions.
			5	Learn basic concepts of sampling distribution and able solve problems on estimation.
			6	Learn basic concepts of test of hypothesis and able solve problems.
21	7B306	THERMODYNAMICS	1	The students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions
			2	Students can evaluate changes in thermodynamic properties of substances
			3	The students will be able to evaluate the performance of energy conversion devices
			4	The students will be able to differentiate between high grade and low grade energies.
			5	The students will be able to use property table and Mollier charts to evaluate properties of steam at different states.
			6	The students will be able to analyze and evaluate the performance of basic thermodynamics cycles
22	7B307	MECHANICS OF SOLIDS	1	To Understand simple stresses and strains of uniform bars, cross- section varying bars, compound bars and statically in-determinate bars
			2	To Understand principle stresses, strains and torsion of circular shafts

			3	To Understand Shear Force Diagrams (SFD) and Bending Moment Diagrams(BMD) for various types of beams
			4	To Understand bending stresses and shear stresses of different types of beams
			5	To Understand how to determine deflections of various beams and buckling load of slender columns.
			6	To Understand how to find out various stresses that are developed in thin and thick cylinders
23	**7B308**	**MATERIALS ENGINEERING**		Student will be able to identify crystal structures for various materials and understand the defects in such structures.
				Understand how to tailor material properties of ferrous and non-ferrous alloys
				How to quantify mechanical integrity and failure in materials
24	**7B310**	**MACHINE DRAWING AND COMPUTER AIDED DRAWING PRACTICE**	1	Understand the principles and requirements of the machine drawings.
			2	Understand the various symbols used in machine drawing.
			3	Understand the principles and requirements of various Assembly drawings.
			4	Drawing of different machine components
			5	Imagine and drawing the assembly by seeing the components given.
			6	Ability to understand the existing geometric modeling and develop a geometric modeling for a new component in design process
25	**7B362**	**METALLURGY LAB & MECHANICS OF SOLIDS LAB**	1	acquire the knowledge of preparation of samples for metallurgical study.
			2	acquire the knowledge of preparation of sample for metallurgical study of a plain carbon steel,

				cast iron, alloy steel, heat treated steel and their interpretation.
			3	acquire the knowledge of preparation of sample for metallurgical study of nonferrous metal/alloy and interpretation
			4	know how to measure the hardness and impact strength of given materials
			5	measure the modulus of rigidity of given spring, and shaft.
			6	find the deflection of beams theoretically and paracticaly.
26	7B363	FUELS AND LUBRICANTS LAB		
				To determine the flash and fire point using Abels Apparatus
				To determine the flash and fire point using Pensky Martens Apparatus
				To determine the Viscosity using Saybolt Viscometer
				To determine the Calorific value using Bomb Calorimeter
27	7B364	FLUID MECHANICS AND HYDRAULIC MACHINERY LAB	1	compute the performance of pelton wheel under working conditions
			2	compute the performance of francis turbine under working conditions
			3	compute performance of reciprocating pump under working conditions
			4	compute the Performance of centrifugal pump under working conditions
			5	compute the Performance of multistage pump under working conditions
			6	compute the coefficient of discharge of venturimeter of orifice meter under working conditions

28	7HC21	ENVIRONMENTAL SCIENCE AND ECOLOGY	1	Understand about ecosystem and energy flow among the organisms.
			2	Know the resources available, use of them and overexploitation of the resources in the nature.
			3	Learn the value, use and value of biodiversity.
			4	Understand the causes and effect of pollution and implement measures in control of pollution.
			5	Understand the sustainable development and implement green technology for sustainable development..
			6	Learn and implement policy to protect the environment.
29	7B393	TECHNICAL SEMINAR III	1	Deliver lecture on emerging technologies.
			2	Explain domain knowledge to resolve real time technical issues
			3	Demonstrate ability to lead and explain concepts and innovative ideas.
			4	Demonstrate team leading qualities.
			5	Demonstrate public speaking skills.
			6	Exchange new information that would not have been available otherwise.
30	7B411	MANUFACTURING PROCESSES	1	Select moulding material, pattern and calculate pattern allowances used in casting and design the gating system and Design a suitable riser for the casting and decide specific casting type for a defect free product
			2	Distinguish between different forming processes and Analyze the forces and power consumed in rolling operation
			3	Decide the specific forging/ extrusion process for making a part and identify the specific defects if any in the process
			4	Suggest the sheet metal process for making a part and decide the processing technology for a

				particular type of plastic.
			5	Propose the type of welding joint and specific welding process for an application and estimate the effect of process variables on arc welding
			6	Choose appropriate technique for making discrete parts and opt the specific plastic processing method based on type of plastic.
31	7B412	APPLIED THERMODYNAMICS – I	1	Compare the air standard, actual and the fuel-air cycles of Internal Combustion Engines.
			2	Classify IC Engines, understand the working principles of 2-stroke and 4-stroke cycles, draw valve and port timing diagrams and explain different engine subsystems.
			3	Understand the combustion process in S.I and C.I Engines, the phenomenon of knocking, factors affecting knocking, and different types of combustion chambers for S.I and C.I Engines,
			4	Understand the performance parameters, methods of measurement of brake and friction power and Draw the heat balance diagram.
			5	Understand the working principles of Roots blower, vaned blower, reciprocating compressor- single stage and multi-stage compression with inter cooling.
			6	Understand the working principles of centrifugal and axial compressors and draw the velocity diagram and calculate the Compressor Power input and efficiency.
32	7B413	KINEMATICS OF MACHINES	1	Understand the basic concepts of mechanism, types of mechanisms and inversions difference between machine mechanism and structure.
			2	Understand velocity and acceleration diagram in order to evaluate the inertia forces in mechanism and machines.

			3	Understand the concept of steering gear mechanism, types and Hooke's joint with respect to an automobile
			4	In order to understand and design complex motions possible out of Cam's and Followers.
			5	Understand the concept of toothed gears and selection different types of gear trains in order obtain required velocity ratios.
			6	Understand transmission power by various means like belts, rope and chains and their advantages and limitations.
33	**7AC48**	**Electrical and Electronics Engineering**	1	Understand the fundamentals of electrical engineering and DC machines.
			2	Understand the principles of AC circuits.
			3	Understand the principle and operation of three phase induction motor and measuring instruments.
			4	Understand the principle and operation of diode.
			5	Understand the principle and operation of transistor.
			6	Understand the principles of digital electronics
34	**7EC02**	**(Open Elective-I) DATA STRUCTURES**	1	Explain Abstract data type, stack and Queues with their applications
			2	Write programs on Singly linked lists, Doubly linked lists, Circular list and explain their operations.
			3	Explain concepts of Trees, AVL Trees and Graphs with examples and applications.
			4	Describe and solve problems of searching and sorting and evaluate the time complexity of each algorithm.
			5	Explain concepts of OOPs and implement programs using objects, classes, constructors and destructors.

			6	Explain and apply concepts of oops , write programs implementing functions ,
35	7ZC22	(Open Elective-I) BASICS OF ENTREPRENEURSHIP	1	The students' will acquire basic knowledge on Skills of Entrepreneurship.
			2	The students' will understand the techniques of selecting the customers through the process of customer segmentation.
			3	Business Models and their validity are understood by the students'.
			4	The basic cost structure and the pricing policies are understood by the students'.
			5	The students' will acquire knowledge about the project management and its techniques.
			6	The students' get exposure on marketing strategies for the Start up.
36	7ZC25	(Open Elective-I) BASICS OF INDIAN ECONOMY	1	Gain knowledge relating to Economics, various sectors and its growth
			2	Will gain knowledge relating to various concepts of National income and related aggregates
			3	Students will learn about Indian Industrial policy and benefits of LPG to India
			4	Comprehend knowledge relating to Fiscal policy & Taxation system in India
			5	Learn about inflation & business cycles.
			6	Know about the BoP and its influence on economy.
37	7ZC20	(Open Elective-I) PRODUCT & SERVICES	1	The students will be introduced to basic concepts of product .
			2	Will enlighten the students with the process of new product development and stages in the process.
			3	Will help the students understand the concept of product testing, product planning and the

				preparatory groundwork for launching a new product
			4	Will help the students to understand the nature of services, its differences with the goods and the application of marketing principles for services.
			5	Will enlighten the students to understand the attributes of a good service design and the tools for producing and distributing the services.
			6	To make the students understand about the importance of quality of services and also introduce some measurement scales to evaluate the service quality.
38	**7ZC05**	**(Open Elective-I) BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**	1	Describe the new dimensions and products served by the banking system in INDIA.
			2	Explain the credit control system and create awareness on NPA's
			3	Apply the knowledge of Insurance concepts in real life scenarios
			4	Recognize the importance of regulatory and legal frame work of IRDA
			5	Identify the risk management process and methods.
			6	Calculate the diversity of risk and return
39	**7BC51**	**Smart Materials (Open Elective-I)**	1	Apply the knowledge for developing/producing sensors, devices based on the assimilated know-how of composites, ceramics, electro-magnetic materials, shape memory alloys, and their properties.
			2	Develop/process new sensing and actuating smart devices based on the assimilated knowledge on the principles of phase transformations.
			3	Evaluate shape memory materials, electro rheological fluids and develop newer applications.

			4	Comprehend the principles of operation of optical fibers, actuators, and methods of analyses employed in smart materials.
			5	To apply the principles for developing smart skins for aerospace and transportation vehicles.
			6	To develop or process sensors and actuators for MEMS using shape memory alloys, PZT actuators.
40	**7CC54**	**Fundamental of Digital Circuits and Microprocessors (Open Elective-I)**	1	an ability to understand number systems and apply the rules of Boolean algebra to simplify Boolean expressions.
			2	an ability to simplify of Boolean expressions using K-map.
			3	an ability to design MSI combinational circuits such as fullaadders, multiplexers, decoders, encoders. Code converters.
			4	an ability to design basic memory units (latches and flip-flops) and sequential circuits such as counters and registers
			5	Understands the Architecture of 8086.
			6	Able to write the Assembly Language Programs using 8086 instruction set and DOS interrupts.
41	**7ZC01**	**MANAGEMENT SCIENCE AND FINANCIAL ACCOUNTING (MSFA)**	1	Outlines the significance of management, defines the basic concepts and applicability of management principles in changing paradigms.
			2	Helps in understanding organization behavior, personality determinants and other key aspects
			3	Infers the need to understand the importance of Strategic management and Business environment in particular
			4	Enrich students with basic concepts of Financial Accounting.
			5	Understand basic concepts of Depreciation and need for preparing trial balance.

			6	Helps in preparation of Financial Statements (final accounts).
42	7AC95	Electrical and Electronics Engineering Lab		Understand the fundamentals of electrical engineering and DC machines.
				Understand the principles of AC circuits.
				Understand the principle and operation of three phase induction motor and measuring instruments.
				Understand the principle and operation of diode.
				Understand the principle and operation of transistor.
				Understand the principles of digital electronics
43	7B465	MANUFACTURING PROCESSES LAB	1	Make a pattern preparation of sand mould and cast the part
			2	Perform welding operation under different conditions and test the quality of the weld
			3	Make use of plasma technique for accurately cutting metals and also perform brazing operation
			4	Identify the various press working operations and various parts of hydraulic press and perform operations
			5	Choose the appropriate plastic moulding method to manufacture a plastic product
			6	
44	7B494	TECHNICAL SEMINAR-IV	1	Deliver lecture on emerging technologies.
			2	Explain domain knowledge to resolve real time technical issues
			3	Demonstrate ability to lead and explain concepts and innovative ideas.
			4	Demonstrate team leading qualities.

			5	Demonstrate public speaking and lifelong learning skills for higher studies and to pursue professional practice.
			6	Exchange new information that would not have been available otherwise.
45	7B466	COMPREHENSIVE VIVA VOCE - I	1	Comprehend the concepts in the core and elective courses.
			2	Exhibit technical knowlegde to face interviews.
			3	Exhibit life long Learning skills for higher education and to persue Professional practice.
46	7B514	APPLIED THERMODYNAMICS – II	1	Understand steam power plants and the Rankine cycle on p-v, T-S and h-s diagrams and working principles and basic design parameters of different types boilers.
			2	Understand the function of steam nozzle, Wilson line
			3	Understand the difference between impulse and reaction turbines, draw velocity diagrams and understand the Principle of operation of reaction turbine, features of Parsons reaction turbine and to draw the velocity diagrams for the same
			4	Understand the working principles of different condensers and understand the gas turbine power plants
			5	Understand the working principle of jet propulsion and rocket engines
			6	Understand the working of refrigeration and air conditioning
47	7B515	DESIGN OF MACHINE MEMBERS – I	1	Use different theories of failure for designing machine members subjected to steady loads and fatigue loads.
			2	Use different criteria of failure for designing machine members subjected to fatigue loads.
			3	Develop ability to analyze, design and select

				shafts, keys, couplings, cotter and knuckle joints.
			4	Able to analyze and design the helical coiled and leaf springs.
			5	Identify the applications where Temporary (threaded and bolted) joint and permanent (riveted) joints are used for various applications - with attention to design requirements.
			6	able to design and analyze various Welded joints
48	7B516	METAL CUTTING & MACHINE TOOLS	1	Understand the basic metal cutting process and parameters, Forces in metal cutting ,various chips, tool materials, basic relations in metal cutting
			2	Understand the thermal aspects of metal cutting, tool wear, tool life, various cutting tool materials and economic analysis of machining
			3	Understand the principle and working of lathe, shaping, planning, slotting machines and Drilling machines and estimate the machining time
			4	Understand the principle and working of Milling machine and Broaching machine
			5	Understand the principle and working of Grinding machine, Lapping and Honing machine
			6	Understand the principle of Jigs & Fixtures and the principles of advanced machining processes
49	7B517	DYNAMICS OF MACHINERY	1	Understand the phenomenon of friction and in developing different applications like, brakes, clutches and dynamometers etc.
			2	Understand the effect of precession motion on the stability of moving vehicles.
			3	Understand and development of speed controlling devices like flywheel.

			4	Understand how to control speed in engines or turbines by governors.
			5	Understand how to balance different systems, machines and engines.
			6	Understand how to do analysis of different vibrating systems.
50	7ZC23	ADVANCED ENTREPRENEURSHIP (Open Elective-II)	1	The Students' gain knowledge on the stages of Startup and the turbulence environment it undergoes and the stages related to growth of the Startup.
			2	The Students are exposed to the various business models and critically evaluating the effectiveness of the business models.
			3	The students understand the method of business traction and the need of customer relationship management.
			4	The students understand the various channels of revenue building and exploration of new revenue avenues.
			5	The students understand the need of sales planning and sales management and also financial modeling
			6	The students are exposed to the legal implications effecting the company's prospects and the issues related to intellectual property rights.
51	7ZC26	BASICS OF POLITY AND ECOLOGY (Open Elective-II)	1	Gain knowledge relating to the Indian Constitution and the Preamble to the Constitution.
			2	Gain knowledge relating to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
			3	Students will learn about the federal structure and judiciary of India.
			4	Comprehend knowledge relating to the conservation of the environment.

			5	Learn about bio-diversity and climatic changes occurring in the environment.
			6	Know about the international treaties, conventions and organizations active in the field of environmental protection.
52	7ZC19	ENTREPRENEURSHIP, PROJECT MANAGEMENT AND STRUCTURED FINANCE (Open Elective-II)	1	Students will understand the nature of Entrepreneurship and its importance
			2	Will gain knowledge regarding project, its life cycle and organization
			3	Will gain knowledge relating to project formulation and implementation
			4	Comprehend the components of structured finance
			5	Establish a framework of CMBS
			6	Students will gain knowledge relating to the CRE Servicing
53	7ZC21	GENERAL MANAGEMENT AND ENTREPRENEURSHIP (Open Elective-II)	1	Describe the necessary managerial skills and tactics required for an emerging Entrepreneur.
			2	Distinguish various methods for business process and product development
			3	Demonstrate the skills required for the project planning, implementing and controlling
			4	Outline the legal aspects and applying for Intellectual Property Rights
			5	Illustrate the various sources of finance for venturing a business project.
			6	Designing production plant and quality management system.
54	7FC03	PYTHON PROGRAMMING (Open Elective-II)	1	Gains exposure towards Python versions and their specifications.
			2	Build programs using primitive data types.
			3	Write applications that include functions, modules, packages along with respective exceptional handling mechanism.

			4	Writes applications using OO features of Python
			5	Write applications using Files.
			6	Hands on exposure on NumPy/Tkinter/Plotpy modules.
55	7EC65	JAVA PROGRAMMING (Open Elective-II)	1	Understand the concept of OOP as well as the purpose and usage of principles of inheritance, Identify classes, objects, members of a class and the relationships among them needed for a specific problem.
			2	Understand and implement concepts of polymorphism, encapsulation and method overloading.
			3	Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identifiers, automatic documentation through comments)
			4	Students understand and implement error exception handling and multi-threading.
			5	Understand the advantages of GUI over CUI and write GUI programs
			6	Students learn to create GUI and write programs for event-handling using various user interface components on applets.
56	7AC46	Control System Engineering (Open Elective-II)	1	Learn basic concepts of control systems.
			2	Study about time response analysis.
			3	Learn basic concepts of stability and root locus method.
			4	Study about frequency response analysis.
			5	Learn basic concepts stability analysis in frequency domain.
			6	Learn fundamentals of state space analysis.

57	**7CC38**	**Introduction to VLSI & Embedded System (Open Elective-II)**	1	Understand levels of design description, concurrency, simulation and synthesis.
			2	Apply language constructs, data types, operators available in verilog HDL.
			3	Design combinational logic and sequential logic in gate level modeling.
			4	Demonstrate the use of development software for a particular application and choosing appropriate OS.
			5	Understanding and building basic embedded system using 8051.Understanding its design
			6	Design of embedded systems and implementation of switch reading.
58	**7H518**	**QUANTITATIVE APTITUDE**	1	The questions given on testing divisibility, prime number and questions of HCF and LCM .
			2	The questions given on averages, percentage and profit and loss.
			3	The questions given on ratio and proportion.
			4	The questions given on simple and compound interest.
			5	The questions given on time and work, time and distance.
			6	The questions given on mensuration and data sufficiency.
59	**7FC20**	**Cyber Security**	1	The students will be able to understand cyber-attacks, types of cybercrimes.
			2	Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
			3	Get familiar of cyber forensics.
			4	Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
			5	Cyber laws and also how to protect them self and ultimately the entire Internet community

				from such attacks.
			6	Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.
60	7B567	APPLIED THERMODYNAMICS LAB	1	Performance test on air compressor will make the student to analyze the performance of the compressor
			2	Disassembly and assembly of I.C engine and Valve timing diagram will make the student understand the internal components and their functionality and study of boilers
			3	Heat balance test and performance of four stroke single cylinder diesel engine and will make the student understand have the energy supplied to the engine
			4	Vapour compression Refrigeration system and Air conditioning system will make the student understand the components and working of a refrigeration cycle
			5	computerized IC engine and variable compression ratio engine performance will make the student understand have the energy supplied to the engine in distributed in a cycle.
			6	Performance of four stroke petrol engine and Morse test will make the student understand have the energy supplied to the engine.
61	7B568	MACHINE TOOLS LAB	1	Make simple products using lathe and covering various machining operations as per drawing
			2	Produce jobs as per drawing using shaper, Planer and Slotter machines
			3	Understand the principle and working of Drilling machine and conduct various machining operations as per drawing
			4	Work on Tool & Cutter Grinding, Milling machine and conduct various machining operations as per drawing

			5	Perform surface grinding operation and conduct alignment test on lathe and drilling machines
			6	
62	7B569	Kinematics & Dynamics of Machines Lab	1	Understand the concept of vibrations, able to calculate the acceleration due to gravity and stiffness of the spring.
			2	Understand concept of radius of gyration
			3	Draw the displacement diagram of cam and follower and study the characteristics of governor
			4	Understand the torsional vibrations
			5	Understand the gyroscopic effects and balancing of rotating masses
			6	Understand the pressure distribution in a journal bearing and critical speeds of shafts.
63	7B595	TECHNICAL SEMINAR-V	1	An ability to utilize technical resources
			2	An ability to write technical documents and give oral presentations related to the work completed.
64	7B618	HEAT TRANSFER	1	To demonstrate basic knowledge of heat transfer by understanding: differences between conduction, convection and radiation; Students shall be able to formulate basic differential equations for heat transfer; Students must able to understand the importance of thermal conductivity of materials.
			2	To deal with problems like conduction through walls and composite walls; critical radius of insulation; heat transfer in fins; Transient heat transfer.
			3	To Calculate of heat transfer coefficient; overall heat transfer coefficient; log-mean temperature differences.

			4	To differentiate forced and natural convection problems correlations; and demonstrate the use of Biot, Nusselt, Reynolds, Grashof, Rayleigh and Prandtl numbers; basic radiative heat transfer, basic principles of mass transfer.
			5	To make the students capable of employing the heat transfer principles during phase change processes in heat exchangers; To bring in confidence to apply the principles in industrial appliances and machinery like Power Plants, Heat Exchangers, coolers etc
			6	To understand basic principles of radiation heat transfer and radiation heat exchange between surfaces.
65	**7B619**	**DESIGN OF MACHINE MEMBERS-II**	1	Design bearings and select appropriate bearings using bearing catalogs.
			2	design parts of internal combustion engine
			3	derive design expression for spur and bevel gears
			4	design helical and worm gears
			5	gain skills to design various pressure vessels.
			6	Learn the application of statistical mathematics for machine design subject.
66	**7B620**	**METROLOGY AND INSTRUMENT ATION**	1	Understand the concept limits,fits,and tolerances and their practical applications,different linear measurements and angular measuring instruments.
			2	Understand and design the limit gauges, evaluate surface roughness & its measurement
			3	Understand screw threads and gear metrology and application of interferometry to flatness measurement
			4	Understand the features of basic measurement system and various static and dynamic characteristics of instruments

			5	Understand the principle of various instruments to measure pressure and temperature
			6	Understand the principle of various instruments to measure the displacement, force, torque and vibrations
67	**7B621**	**CAD/CAM and FEA**	1	Identify the importance of CAD/CAM in modern manufacturing systems and explain the hardware used for CAD/CAM systems.
			2	Describe different geometric modelling techniques to represent the surface and solid models and transformation of geometric entities using transformation matrices
			3	Asses the difference between conventional and NC technologies and develop part programs for manufacturing simple components
			4	Formulate mechanical problems such as trusses and beams into finite elements
			5	Understand the basic terminologies of finite element method and able to derive finite element equilibrium equations for 1D finite element problems.
			6	Derive finite element equation for 2D and axi-symmetric, isoperimetric problems and structural dynamic problems in engineering applications.
68	**7FC23**	**Data Base Systems (Open Elective - III)**	1	Students will learn basics of databases and understand the architecture of database management systems.
			2	Students will learn about good database design techniques and database theories behind.
			3	Understand conceptual database designs, and functional dependencies and normalization.
			4	Students will understand the Mathematical foundation for relational databases.

			5	Student will be able to understand concept of Constraints, Views and will be able to create dynamic databases.
			6	Learn transaction management, concurrency controls.
69	**7ZC24**	**Innovation and Design Thinking (Open Elective-III)**	1	The students gain the knowledge on the inputs required for innovation and also gain familiarity on Entrepreneurship.
			2	The students will get exposure on creative methods of ideation and the importance of protecting the ideas.
			3	The students gain knowledge on design thinking and types of thinking.
			4	The students gain familiarity on emerging technologies like Internet of things (IOT).
			5	The students understand the process of building the startup.
			6	The students gain knowledge on various startup funding and also to branding building for the startup.
70	**7ZC27**	**Indian History, Geography & Culture (Open Elective-III)**	1	To appreciate and understand our Indian History, Culture and Indian heritage.
			2	To understand earth evolution and world climatic change.
			3	To understand India Oceanography.
			4	Able to enhance and understand Indian monsoons, Indian agriculture.
			5	To understand secularism of our country.
			6	To appreciate and understand the social reformers who brought revolutionary changes in Indian society.
71	**7ZC15**	**FINANCIAL INSTITUTIONS , MARKETS**	1	This unit enables the students to understand the financial structure and the financial sector reforms after 1991.

		AND SERVICES (Open Elective-III)	2	The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
			3	The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
			4	The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market instruments
			5	The unit equips the students to understand about the asset fund based financial services
			6	The students will get exposure about the investment banking and merchant banking.
72	**7AC44**	**Fundamentals of Measurements and Instrumentation (Open Elective-III)**	1	Understand the principle of operation of different types of instruments viz., PMMC, moving iron type of instruments, the required characteristics of an instrument in general. The student demonstrates the ability to compensate for the errors in the instruments and to extend the range of the instruments.
			2	Demonstrates the knowledge of Potential and Current transformers; the errors in them and the effect of having an open/short in the secondary circuits; Understand the principle of operation of Dynamometer and Moving-iron type of Power factor meters.
			3	Comprehends the principle of operation of dynamometer type of Wattmeter and Induction type of Energy meter; use the wattmeter to measure the Active and Reactive power and demonstrates the ability to extend the range of them.
			4	Identify and use different techniques of measurement of Resistance, Inductance and Capacitance values.
			5	Understand the principle of operation of Different type of digital voltmeters, wave analyzers, spectrum analyzers and Cathode ray

				Oscilloscope.
			6	Demonstrates the ability in characterizing the different types of transducers and uses them to measure Strain, Gauge Sensitivity, Displacement, Velocity, Acceleration, Force, Torque and Temperature.
73	**7DC55**	**Internet of things(IOT) (Open Elective-III)**	1	Identify the implementation layers of an IoT application system
			2	Summarize the characteristics and challenges of designing SDN and NFV
			3	Describe the management of an IoT system using necessary protocols
			4	Design, Develop and Illustrate IoT applications using Raspberry PI platform and Python Scripting
			5	Implement web based services on IoT devices
			6	Design new projects using Raspberry PI
74	**7H619**	**LOGICAL REASONING**	1	The questions given on series completion and analogy.
			2	The questions given on odd one out in classification and coding and decoding.
			3	The questions given on blood relations.
			4	The questions given on directions and Arithmetical reasoning.
			5	The questions given on Venn diagrams, cubes and dice. .
			6	The questions given on clocks and calendar.
75	**7EC22**	**ARTIFICIAL INTELLIGENCE (Mandatory Course)**	1	Understand the concepts of state space representation and calculate time and space complexities of exhaustive search and heuristic search together.

			2	Apply AI techniques to solve problems of advanced searching techniques.
			3	Distinguish different knowledge representation techniques.
			4	Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
			5	Analyze different learning techniques and decision trees.
			6	Use techniques to represent domain knowledge of the expert systems.
76	**7HC74**	**Soft Skills and Technical Communication**	1	make a self-assessment
			2	enhance their soft skills and behavioral patterns
			3	equip themselveswith the required skillset for their career advancement
			4	develop interpersonal communication skills
			5	participate in group tasks and use effective language skills in interviews
			6	overcome stress and enhance employability quotient
77	**7B671**	**CAD/CAM LAB**	1	Draw computer Aided 2D drawings to solve design and manufacturing problems using CAD CAM principles.
			2	Acquire skills of developing geometric modeling of 3D components
			3	Developing assemblies different machine elements and import and export CAD models one software to anther software
			4	Learn skills of writing CNC part programming.
			5	Understand how to machine simple components on CNC lathe and CNC mill
			6	Understand how to simulate the articulated robot and Fabricate simple components on 3D printing machine

78	7B672	HEAT TRANSFER LAB	1	Compute the thermal conductivity of a given material rod and composite wall understand the physical significance of the thermal conductivity of the given material insulating powder. **(CO1)**
			2	To calculate thermal conductivity of lagged pipe and insulating powder under given conditions.
			3	To compute the forced ad free convection heat transfer coefficients under given conditions from fundamentals.
			4	Able to calculate LMTD for parallel flow and counter flow heat exchangers and overall heat transfer coefficient. and pinfin apparatus.
			5	should be able to calculate the emissivity of a given surface and to calculate Stefan-Boltzmann's constant experimentally.
			6	Understand the phenomena of pool boiling and to draw the boiling curve by showing different phases of boiling. and study the heat pipe
79	7B673	Metrology Lab	1	Student will become familiar with the different instruments that are available for linear, angular, roundness and roughness measurements
			2	they will be able to select and use the appropriate measuring instrument according to a specific requirement (in terms of accuracy, etc).
80	7B674	Group Project	1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects.
			2	Enables to apply modern tools and

				technologies for project works
			3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society.
			4	Enhances communicative skills and team work
			5	The students learn the ability to work as an individual with multidisciplinary approach
			6	
81	**7B675**	**Comprehensive Viva-voce-II**	1	Perform well in Technical interviews
			2	Apply knowledge in building their career in particular fields.
			3	Enhance their communication skills and interactive-ness.
82	**7B722**	**ROBOTICS**	1	Student demonstrate the basic knowledge in robotic systems their classification and application areas
			2	Student demonstrate the Robotic Kinematic Models and its importance
			3	Student demonstrate the Robotic dynamically models
			4	Student demonstrate the ability to plan trajectories in the presence/absence of obstacles
			5	Student learn the control system concepts and their application in robotics through linear and nonlinear control schemes
			6	Student understand commonly used sensory and vision systems used in robotics
83	**7B723**	**ADDITIVE MANUFACTU**	1	Understand the Additive manufacturing processes and their relationship with subtractive

		RING PROCESSES		manufacturing
			2	Demonstrate comprehensive knowledge of the broad range of liquid based rapid proto type processes, devices, capabilities and materials that are available
			3	Demonstrate comprehensive knowledge of the broad range of liquid based rapid proto type processes, devices, capabilities and materials that are available
			4	apply the principles of casting in Additive manufacturing systems
			5	Articulate the various tradeoffs of Additive manufacturing softwares / data format that must be made in selecting advanced/additive manufacturing processes, devices and materials to suit particular product requirements
			6	Learn various applications of additive manufacturing, such as in architecture, art, health care direct part production and mass customization
84	**7B724**	**MECHATRONICS(Professional Elective-I)**	1	able to understands the significance of integration of mechanical, electronics, control and computer engineering and also focuses the role of sensors
			2	able to learn the complete theory of various sensors
			3	be able to get skill to select appropriate actuators for different applications
			4	become proficient in building linear models of mechatronics
			5	become proficient in the programming of microcontrollers
			6	able to demonstrate PLCprogramming
85	**7B725**	**DESIGN AND ANALYSIS OF**	1	Demonstrate history, role, principle and steps of experimentation

		EXPERIMENTS (Professional Elective-I)	2	Apply concepts of Probability and statistics in design of experiments
			3	learn various DOE techniques
			4	Develops experiment design based on Taguchi method
			5	Analyses the experimental data of various experiments
			6	Solve multi response problems using DOE approaches
86	**7B726**	**OPERATIONS RESEARCH(Professional Elective-I)**	1	Formulate and solve mathematical model (linear programming problem) for a physical situations like production, distribution of goods and economics
			2	Recognize and Solve the problem of transportation involving a large number of shipping routes with least transportation cost and generate optimal assignment strategy for different situations
			3	Use Johnson's rule to create the optimal sequencing schedule for a sequencing problem and make decisions about replacing an item using replacement policy
			4	Analyze the performance measures of Queing system and Calculate the EOQ for minimizing the total inventory cost
			5	Apply simulation techniques for solving various types of problems and general idea development about Markov chains
87	**7B727**	**THERMAL TURBO MACHINERY(Professional Elective-I)**	1	Explain the compressible flow phenomena in turbomachine components
			2	Understand the steady and unsteady flow phenomena in tucts
			3	Perform simple aerodynamic designs using eulers equations etc..
			4	Explain the working steam turbines

			5	Understand gas turbine combustor principles and challenges
			6	Discuss jet propulsion technologies
88	7B728	NANOTECHNOLOGY(Professional Elective-I)	1	Know the different approaches of synthesis of nanomaterials, gain in depth of knowledge which will be helpful to them in their career to go forward successfully in the field of nano science and nanotechnology
			2	Learn about different physical and chemical methods for synthesis of nanomaterials
			3	Characterization of nanomaterials by using SEM, TEM, AFM, STM
			4	Characterization of nanomaterials by using XRD, FTIR, UV visible spectroscopy, Rama spectroscopy.
			5	Applications of carbon based nanomaterials
			6	Applications of nanomaterials in electronics, medicine, mechanical engineering.
89	7B729	Artificial Intelligences (AI) for Mechanical Engineering (Professional Elective-II)	1	to understand the history of AI and uninformed search Method
			2	to demonstrate informed search graphs, rule and pruning & Evaluation methods
			3	to demonstrate KR and KR&R through propositional logics and FOL
			4	To learn how to use BN, BNN , MDN in decision making
			5	Learn various techniques for planning and sequential decision problem
			6	brief out the basics of ML, SL,RL and CNN
90	7B730	POWER PLANT ENGINEERING (Professional Elective-IV)	1	Understand Concept of Steam power plant layout, Different sources of energy, Fuel handling equipments
			2	Understand Types of coals, coal handling, Coal

				storage, ash handling systems
			3	Understand Concept of Diesel Power Plant, Gas turbine plant, with auxiliaries
			4	Understand Concept of water power, hydrological cycle, Hydrographs, pumped storage plants and type dams and spill ways
			5	Understand Concept of Solar collectors, solar energy, Fuel cells, thermo electric and thermo ionic, MHD generation, Nuclear fuel and reactors
			6	Understand Concept of Capital cost, Different types of costs used in power plants, different types of factors
91	**7B731**	**Production Planning and Control (Professional Elective-II)**	1	Understand production systems and their characteristics to evaluate MRP and JIT systems against traditional inventory control systems
			2	Analyze aggregate planning strategies
			3	Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems
			4	Understand production systems and their characteristics to evaluate MRP and JIT systems against traditional inventory control systems
			5	Analyze aggregate planning strategies
			6	Apply forecasting and scheduling techniques to production systems. Understand theory of constraints for effective management of production systems
92	**7B732**	**ADVANCED MATERIALS AND PROCESSING(Professional Elective-II)**	1	Classify manufacturing processes
			2	Understand principles of casting and solidification
			3	Understand manufacturing of porous powder metallurgical products

			4	Utilize forming and processing technologies to shape metals and ceramics
			5	Understand the role of ceramics and composites in industrial applications
			6	Analyse the processing and defects of ceramics and polymers
93	**7B733**	**NON-DESTRUCTIVE TESTING OF MATERIALS (Professional Elective-III)**	1	Classify Non-Destructive Testing (NDT) methods
			2	Understand principles of various NDT methods
			3	Understand TECHNIQUES OF ULTROSONIC and thermography
			4	Gain knowledge in radiography
			5	Demonstrate the Acoustic methods
			6	Learn how to interpret the various techniques used in various case studies
94	**7B734**	**QUALITY AND RELIABILTY ENGINEERING (Professional Elective-III)**	1	Attain the basic techniques of quality assessment , fundamental knowledge of statistics and probability and Use control charts
			2	learn principles of DOQ design for quality
			3	Use reliability concepts to analyze for improving the process quality
			4	Describe various methods to asses reliability determination
			5	Acquire basic knowledge of reliability management
			6	Understand the concepts of risk management
95	**7B735**	**RENEWABLE ENERGY AND ENERGY MANAGEMEN T (Professional**	1	Recognize the ways of solar energy utilizations energy
			2	Describe the challenges and problems associated with the use of Bio mass as energy as an energy source

		Elective-III)	3	Discuss potential of technological implications in Biogas plants
			4	List and describe wind energy plants as the primary renewable energy resources and technologies
			5	Describe/illustrate basic concepts and system components of Geothermal, tidal, and wave energy
			6	Learn the methods of production of Hydrogen and utilization as an energy source
96	**7B736**	**PRODUCT DESIGN (Professional Elective-III)**	1	Apply structural approach to concept generation, selection and testing
			2	Understand various aspects of design such as industrial design, design for manufacture
			3	Economic analysis and product architecture
			4	Apply structural approach to concept generation, selection and testing
			5	Understand various aspects of design such as industrial design, design for manufacture
			6	Economic analysis and product architecture
97	**7B776**	**PRODUCTION DRAWING PRACTICES LAB**	1	able to understands the significance symbols used in drawing
			2	able to learn the complete requirements of various Assembly drawings
			3	Become proficient Drawing of different machine components
			4	become proficient Imagine and drawing the assembly by seeing the components given
			5	understand the existing geometric modeling
			6	understand the existing new component in design process
98	**7B777**	**INSTRUMENTATION LAB**	1	to select proper measuring instrument
			2	know requirement of calibration

			3	errors in measurement
			4	They can perform accurate measurements
99	**7B778**	**CAE LAB**	1	Select appropriate finite element for solving structural and thermal problems
			2	Correlate mathematical formulation using FE method
			3	Analyze Stresses and deflections of trusses and bars under static loading
			4	Analyze Stresses and deflections of thin plates subjected to in-plane loading and solids
			5	Interpret the results after model analysis and transient dynamic analysis
			6	Simulate real life structural and thermal problems
100	**7B779**	**PROJECT-I**	1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects
			2	Enables to apply modern tools and technologies for project works
			3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society
			4	Enhances communicative skills and team work
			5	The students learn the ability to work as an individual with multidisciplinary approach
101	**7B837**	**Mechanics Manufacturing Methods of Composite Materials (Professional Elective-IV)**	1	Understand the concepts and applications of composite materials
			2	Analyze micro mechanical behaviour of a lamina
			3	Learn matrix tranformation for stress and strain in composites
			4	Analyze Elastic behavior of composites

			5	Develop governing equations for bending strength evaluation in laminated plates
			6	Gains knowledge of manufacture of composites
102	**7B838**	**DESIGN AND ANALYSIS OF ENGINEERING MATERIALS (Professional Elective-IV)**	1	Understand the principles of materials selection and design
			2	Design components using appropriate attribute limits and material indices
			3	Establish the criteria for material qualification and acceptance.
			4	Apply design principles for manufacturing of different engineering components
104	**7B839**	**AUTOMOBILE ENGINEERING (Professional Elective-IV)**	1	study of two front wheel drive, rear wheel drive and four wheel drive
			2	understand the fuel systems like petrol injection system and diesel injection system
			3	know the thermo, water, forced circulation system , study of ignition system and we can know the various emission standards
			4	understand about clutches, single plate clutch, multi plate clutch, wheels , tyres and differential gear box
			5	know the steering geometry – Ackerman steering mechanism and Davis steering mechanism toe-in, and to know the objects of suspension system
104	**7B840**	**Advanced Manufacturing Processes (Professional Elective-IV)**	1	Understand abrasive and electrical discharge machining processes
			2	list the advances in casting
			3	learn principles and applications of electron beam, ion beam and laser hybrid welding processes
			4	apply advanced forming processes to manufacture mechanical products

			5	Understand the advantageous of micro fabrication
			6	realize the importance of nano fabrication
105	7B841	FLEXIBLE MANUFACTURING SYSTEMS & MACHINE VISION (Professional Elective-V)	1	Understand Evaluation and applications of FMS
			2	Understand Machining centers and FMS layouts
			3	Design and analyze FMS material handling systems
			4	Understand tool management and scheduling tools in FMS
			5	Identify the role of computers in FMS and machine vision and evaluate the performance of FMS
			6	Analyze case studies a typical FMS
106	7B842	DESIGN OPTIMIZATION (Professional Elective-V)	1	Basics of optimization, considerations relevant to mechanical / structural systems
			2	Concepts and methods for single-variable unconstrained and constrained optimisation
			3	Concepts and methods for multi-variable unconstrained and constrained optimization
			4	Techniques for nonlinear optimization
			5	Advanced optimization techniques
			6	Optimisation of complex mechanical elements
107	7B843	JET PROPULSION and ROCKET ENGINEERING (Professional Elective-V)	1	understand open, closed and semi closed cycle of gas turbines, thermal jet engines, classification of energy flow, trust power and propulsion efficiency
			2	understand essential components of turbo pro and turbo jet performance evaluation, thrust augmentation
			3	understand plant layout of Ramjet , principle of operation

			4	understand liquid propellant Rocket engines, compassion of propulsion systems
			5	understand flight mechanics, applications of trust profiles, rocket heat transfer and ablative to cooling
			6	understand cryogenics, advanced propulsion systems, elementary treatment of Electrical Nuclear and Plasma Arc propulsion
108	**7B844**	**COMPUTATIONAL FLUID DYANAMICS (Professional Elective-V)**	1	gain knowledge on using numerical techniques
			2	Understand various applied numerical methods to solve fluid flow problems
			3	understand and apply finite volume method to solve heat transfer problems
			4	know application of finite volume method and fundamentals of fluid flow modeling
			5	right fluid flow governing equations, momentum and energy equations apply to fluid flow problems
			6	gain knowledge about different algorithms
109	**7B845**	**CARBON BASED NANOSTRUCTURES AND THEIR APPLICATIONS (Professional Elective-V)**	1	To investigate and formulate method to use carbon nanotubes as active components in organic electronic devices
			2	To explore methods of synthesis to obtain SWNT with desired characteristics
			3	To understand the dependence of the performance of the nanotubes based transistors on the nanotube bundle geometry
			4	Apply the knowledge acquired for synthesis of CNTs by various methods.
			5	Carry out research in the areas of lithium, hydrogen adsorption and energy storage
			6	Pursue research on nano-chip, applications leading to communications and aerospace

110	**7B881**	**PROJECT -II**	1	Students use the concepts learned in the courses, so far, in conceptualizing, designing and executing the projects
			2	Enables to apply modern tools and technologies for project works
			3	Inculcates an enthusiasm to use the creative ideas to execute projects to meet the current needs of the society
			4	Enhances communicative skills and team work
			5	The students learn the ability to work as an individual with multidisciplinary approach