Hindustan College of Science and Technology

Department of Mechanical Engineering

COURSE OUTCOMES
(SESSION 2021-22)

B.Tech. (Mechanical Engineering)

SEMESTER- III

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KOE031-38/ KAS302	Engg. Science Course/Maths IV	3	1	0	30	20	50		100		150	4
2	KAS301/ KVE301	Technical Communication/Universal Human Values	2	1	0	30	20	50		100		150	3
			3	0	0								
3	KME301	Thermodynamics	3	1	0	30	20	50		100		150	4
4	KME302	Fluid Mechanics & Fluid Machines	3	1	0	30	20	50		100		150	4
5	KME303	Materials Engineering	3	0	0	30	20	50		100		150	3
6	KME351	Fluid Mechanics Lab	0	0	2				25		25	50	1
7	KME352	Material Testing Lab	0	0	2				25		25	50	1
8	KME353	Computer Aided Machine Drawing-I Lab	0	0	2				25		25	50	1
9	KME354	Mini Project or Internship Assessment*	0	0	2			50				50	1
10	KNC301/ KNC302	Computer System Security/Python Programming	2	0	0	15	10	25		50			0
11		MOOCs (Essential for Hons. Degree)											
		Total										950	22

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

SEMESTER- IV

Sl. No.	Subject Codes	Subject	Periods			Evaluation Scheme				End Semester		Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KAS402/ KOE041-48	Maths IV/Engg. Science Course	3	1	0	30	20	50		100		150	4
2	KVE401/ KAS401	Universal Human Values/Technical Communication	3	0	0	30	20	50		100		150	3
			2	1	0								
3	KME401	Applied Thermodynamics	3	0	0	30	20	50		100		150	3
4	KME402	Engineering Mechanics	3	1	0	30	20	50		100		150	4
5	KME403	Manufacturing Processes	3	1	0	30	20	50		100		150	4
6	KME451	Applied Thermodynamics Lab	0	0	2				25		25	50	1
7	KME452	Manufacturing Processes Lab	0	0	2				25		25	50	1
8	KME453	Computer Aided Machine Drawing-II Lab	0	0	2				25		25	50	1
9	KNC402/ KNC401	Python Programming / Computer System Security	2	0	0	15	10	25		50			0
10		MOOCs (Essential for Hons. Degree)											
		Total										900	21

B. Tech Mechanical Engineering
Evaluation Scheme

SEMESTER- V												
Sl. No.	Code	Subject	Periods			Evaluation Scheme			End Semester			Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KME 501	Heat and Mass Transfer	3	1	0	30	20	50		100		150	4
2	KME 502	Strength of Material	3	1	0	30	20	50		100		150	4
3	KME 503	Industrial Engineering	3	1	0	30	20	50		100		150	4
4		Departmental Elective-I	3	0	0	30	20	50		100		150	3
5		Departmental Elective-II	3	0	0	30	20	50		100		150	3
6	KME 551	Heat Transfer LAB	0	0	2				25		25	50	1
7	KME 552	Python Lab	0	0	2				25		25	50	1
8	KME 553	Internet of Things Lab	0	0	2				25		25	50	1
9	KME 554	Mini Project or Internship Assessment*	0	0	2				50			50	1
10	KNC501/ KNC502	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			NC
11		MOOCs (Essential for Hons. Degree)											
		Total	17	3	6							950	22

*The Mini Project or internship (4 - 5 weeks) conducted during summer break after IV semester and will be assessed during V semester.

SEMESTER- VI												
Sl. No.	Code	Subject	Periods			Evaluation Scheme			End Semester			Total	Credits
			L	T	P	CT	TA	Total	PS	TE	PE		
1	KME 601	Refrigeration and Air Conditioning	3	1	0	30	20	50		100		150	4
2	KME 602	Machine Design	3	1	0	30	20	50		100		150	4
3	KME 603	Theory of Machine	3	1	0	30	20	50		100		150	4
4		Departmental Elective-III	3	0	0	30	20	50		100		150	3
5		Open Elective-I	3	0	0	30	20	50		100		150	3
6	KME 651	Refrigeration and Air Conditioning Lab	0	0	2				25		25	50	1
7	KME 652	Machine Design Lab	0	0	2				25		25	50	1
8	KME 653	Theory of Machine Lab	0	0	2				25		25	50	1
9	KNC601/ KNC602	Constitution of India, Law and Engineering / Indian Tradition, Culture and Society	2	0	0	15	10	25		50			NC
10		Total	17	3	6							900	21

B. Tech Mechanical Engineering
Evaluation Scheme
Effective in Session 2021-22

Sl. No.	Code	Subject	Periods			Evaluation Scheme			End Semester			Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
SEMESTER- VII													
1		HSMC-1/HSMC-2	3	0	0	30	20	50		100		150	3
2		Departmental Elective-IV	3	0	0	30	20	50		100		150	3
3		Departmental Elective-V	3	0	0	30	20	50		100		150	3
4		Open Elective-II	3	0	0	30	20	50		100		150	3
5	KME 751	Measurement & Metrology Lab	0	0	2				25		25	50	1
6	KME 752	Mini Project or Internship Assessment*	0	0	2				50			50	1
7	KME 753	Project	0	0	8				150			150	4
8		MOOCs (Essential for Hons. Degree)											
		Total	9	0	12	21						850	18

*The Mini Project or internship (5 - 6 weeks) conducted during summer break after VI semester and will be assessed during VII semester.

Sl. No	Code	Subject	Periods			Evaluation Scheme			End Semester			Total	Credit
			L	T	P	CT	TA	Total	PS	TE	PE		
SEMESTER- VIII													
1		HSMC-2/HSMC-1	3	0	0	30	20	50		100		150	3
2		Open Elective-III	3	0	0	30	20	50		100		150	3
3		Open Elective-IV	3	0	0	30	20	50		100		150	3
4	KME 851	Project	0	0	18				100		300	400	9
5		MOOCs (Essential for Hons. Degree)											
		Total	9	0	18	27						850	18

Program Outcomes (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSOs)

1. Exhibit their knowledge for problem identification and their respective solutions in the field of Design, Manufacturing, and Thermal Engineering.

2. Innovate, develop and apply scientific concepts, practical skills and advance tools in various fields of Mechanical Engineering.

Department: Mechanical Engineering
Course Outcomes(COs):B.Tech.2nd , 3rd and 4th year
Session:2021-22

B.Tech:3rd Semester		
Code	Course Name	Course Outcomes
KAS301	**Technical Communication**	CO1:Understand the nature and objective of Technical Communication relevant for the work place as Engineers.
		CO2:Utilize the technical writing for the purposes of Technical Communication and its exposure in various dimensions.
		CO3:Have effective Presentations skill to face diverse audience with confidence.
		CO4:Create a vast knowhow of the application of the learning to promote their technical competence.
		CO5:Evaluate their efficacy as fluent & efficient communicators by learning the Voice dynamics.
KOE033	**Energy Sciences & Engineering**	CO1: In this unit students will be able to understand the various form of energy and its inter-conversion. Also, able to understand working and applications of various engines and turbines based on thermodynamic cycle.
		CO2:Students will be able to recognize and recall the basics of nuclear reactor terminology, definitions, and concepts associated with reactor physics and theory and technology of nuclear power plant.
		CO3:Able to explain the principles that underlie the ability of various natural phenomena to deliver solar energy. Outline the technologies that are used to harness the power of solar energy.
		CO4:Students able to understand processing and limitations of fossil fuels (coal, petroleum and natural gas) and necessasity of harnessing alternate energy resources.
		CO5:Students may realize the environmental problems directly related to energy production and consumption includes air pollution, climate change, water pollution, thermal pollution, and solid waste disposal.

KME301	**Thermodynamics**	CO1: Explain fundamental concepts of thermodynamics.
		CO2: Apply first law of thermodynamics to open and closed systems
		CO3: Understand second law of thermodynamics, concept of entropy and their applications.
		CO4: Understand availability and irreversibility and thermodynamic relations.
		CO5: Use properties of pure substance and air-water vapour mixture to analyze the open and closed systems.
		CO6: Analyze air and vapour compression refrigeration systems.
KME302	**Fluid Mechanics and Fluid Machines**	CO1: Students will gain the knowledge on fluid mechanics fundamentals like fluid statics.
		CO2: Student will have basic idea on fluid dynamics and kinematics which are used in real working environment.
		CO3: Student will study the fundamental of boundary layer concepts and its applications.
		CO4: Student will understand the principles of turbo machinery and measure the performance of different types of turbines.
		CO5: Student will calculate the performance of different types of pumps.
KME303	**Materials Engineering**	CO1: Explain crystal structure and mechanical properties of materials.
		CO2: Understand the theories of failures of materials.
		CO3: Provide a detailed interpretation of equilibrium phase diagrams.
		CO4: Explain the microstructure and heat treatment of metals and alloys.
		CO5: Describe various case hardening methods.
KME351	**Fluid Mechanics Lab**	CO1: Calculate friction losses in pipes and determine the flow pattern in pipes.
		CO2: Calibrate the flow measurement devices using Bernoulli's equation.
		CO3:Verify momentum equation experimentally and find metacentric height of a floating bodies.
KME352	**Material Testing Lab**	CO1:Determine various Mechanical Properties experimentally
		CO2: Calculate Spring Index and Young's Modulus.
		CO3: Understand Non Destructive Testing Methods.
KME353	**Computer Aided Machine Drawing Lab**	CO1: Use various conventional representation of machine components and materials.
		CO2:Apply the fundamental concepts of engineering drawing to represent variousmachine components
		CO3:Understand the concepts of computer aided 2D drafting using AutoCAD and draw machine elements using AutoCAD.

KME354	**Mini Project or Internship**	CO1:Perform the engineering activities with effective presentation and report.
		CO2:Perform as an individual and/or team member to manage the tasks in time.
		CO3Justify the ethical principles in engineering practices.
KNC301	**COMPUTER SYSTEM SECURITY**	CO1:To discover software bugs that pose cyber security threats and to explain how to fix the bugs to mitigate such threats
		CO2:To discover cyber attack scenarios to web browsers and web servers and to explain how to mitigate such threats
		CO3:To discover and explain mobile software bugs posing cyber security threats, explain and recreate exploits, and to explain mitigation techniques.
		CO4:To articulate the urgent need for cyber security in critical computer systems, networks, and world wide web, and to explain various threat scenarios
		CO5:To articulate the well known cyber attack incidents, explain the attack scenarios, and explain mitigation techniques.

B.Tech:4th Semester

KME401	**Applied Thermodynamics**	CO1: Understanding of different types of fuels and their combustion characteristics.
		CO2: Comparison of different air standard cycles.
		CO3 Analyze the Rankine cycle with various configurations to optimize the design of a power plant and combustion analysis. .
		CO4: Classification and working performance of boilers, condensers and their components.
		CO5: Understand the flow of steam and gases in nozzles, working of steam turbines and calculation of its efficiency and losses.
		CO6: Analyze the working of gas turbine and calculation of its power and efficiency. Analyze jet propulsion and rocket engines .
KME402	**Engineering Mechanics**	CO1:Calculate the resultant force and moment for planar force system under equilibrium condition.
		CO2: Use the concept of equilibrium to solve engineering problems involving friction.
		CO3: Analyze mechanical structure using equations of equilibrium (Truss and Beam).
		CO4: Determine mass and area properties of various geometrical shapes.
		CO5:Calculate the motion parameters like displacement, velocity and acceleration Using principles of rigid body dynamics.
KME403	**Manufacturing Processes**	CO1:Explain the various types of casting processes, defects in casting processes and design of riser and gating.
		CO2:Analyze metal forming operations like forging, tube drawing, extrusion, rolling, and sheet metal working operations.
		CO3:Analyze various aspects of metal cutting processes and comprehend the fundamentals of additive manufacturing.

		CO4:Understand the grinding process, the specification of grinding wheel and various super finishing processes.
		CO5:Describe the welding processes like; Gas welding, Arc welding, TIG & MIG, Resistance welding etc.
KAS402	**MATHEMATICS IV**	CO1:The idea of partial differentiation and types of partial differential equations
		CO2:Apply the concept of separation of variables to solve wave, heat, Laplace and transmission equations.
		CO3:Evaluate Moments, M, G.F Correlations, linear regression.
		CO4:Apply the concept of probability to solve discrete and continuous probability distributions.
		CO5:Apply the concept of sampling to study t-test, F-test and Chi-square test, One-way Analysis of Variance (ANOVA)
KVE401	**Universal Human Values and Professional Ethics**	CO1:Understand the significance of value inputs in a classroom, distinguish between values and skills, understand the need, basic guidelines, content and process of value education, explore the meaning of happiness and prosperity and do a correct appraisal of the current scenario in the society
		CO2: Distinguish between the Self and the Body, understand the meaning of Harmony in the Self the Coexistence of Self and Body.
		CO3:Understand the value of harmonious relationship based on trust, respect and other naturally acceptable feelings in human relationships and explore their role in ensuring a harmonious society
		CO4: Understand the harmony in nature and existence, and work out their mutually fulfilling participation in the nature.
		CO5:Distinguish between ethical and unethical practices, and start working out the strategy to actualize a harmonious environment wherever they work
KNC 402	**PYTHON PROGRAMMING**	CO1: To read and write simple Python programs.
		CO2:To develop Python programs with conditionals and loops
		CO3:To define Python functions and to use Python data structures – lists, tuples, dictionaries
		CO4:To do input/output with files in Python
		CO5:To do searching ,sorting and merging in Python
KME451	**Applied Thermodynamics Lab**	CO1: Explain the working of IC Engines. Describe the working of boilers.
		CO2: Comprehend the working of gas & steam turbines.
		CO3: Explain the working of IC Engines.
KME452	**Manufacturing Processes Lab**	CO1: Make pattern and execute metal casting.
		CO2:Perform machining processes like turning, milling, drilling, grinding, etc.
		CO3: Execute various forming and welding operations.
KME453	**COMPUTER AIDED MACHINE DRAWINGII LAB**	CO1:To provide an overview of how computers can be utilized in mechanical component design
		CO2:Understand the practical knowledge of Assembly Drawling
		CO3:Understand the knowledge of Drawing of automobile parts like connecting rod, crank shaft, piston etc.

B.Tech:5th Semester

KME501	**Heat & Mass Transfer**	CO1: Understand the fundamentals of heat and mass transfer.
		CO2:Apply the concept of steady and transient heat conduction
		CO3: Apply the concept of thermal behavior of fins.
		CO4: Apply the concept of forced and free convection.
		CO5:Apply the concept of radiation for black and non black bodies
		CO6:Conduct thermal analysis of heat exchangers
KME502	**Strength of Material**	CO1:Understand the concept of stress and strain under different conditions of loading
		CO2:Determine the principal stresses and strains in structural members
		CO3:Determine the stresses and strains in the members subjected to axial, bending and torsional loads
		CO4:Apply the concepts of stresses and strain in solving problems related to springs, column and pressure vessels
		CO5:Calculate the slope, deflection and buckling of loaded members
		CO6:Analyze the stresses developed in straight and curved beams of different cross sections
KME503	**Industrial Engineering**	CO1: Understand the concept of production system, productivity, facility andprocess planning in various industries.
		CO2: Apply the various forecasting and project management techniques.
		CO3: Apply the concept of break even analysis, inventory control and resourceutilization using queuing theory.
		CO4: Apply principles of work study and ergonomics for design of work systems.
		CO5: Formulate mathematical models for optimal solution of industrial problemsusing linear programming approach.
KME051	**Computer Integrated Manufacturing**	CO1:Understand the basic concepts of automation, computer numeric control machining
		CO2:Understand the algorithms of line generation, circle generation, transformation, curve, surface modeling and solid modeling
		CO3: Understand group technology, computer aided process planning, flexible manufacturing, Industry 4.0, robotics.
		CO4:Understand information system and material handling in CIM environment, rapid prototyping
		CO5:Apply the algorithms of line & circle generation and geometric transformations

Code	Subject	Course Outcomes
KME055	**Advance Welding**	CO1:Explain metal transfer mechanism and classify different types of welding process on the basis of heat sources.
		CO2:Explain the mechanism of modern welding process and their Parameters and control.
		CO3:Explain different Non Destructive Testing methods for welds.
		CO4:Explain different Inspection codes for weldments.
		CO5:Design and failure analysis of Weldment for pressure vassels, Offshore structures and Submarine Pipe lines, Heavy structures.
KNC 501	**CONSTITUTION OF INDIA, LAW AND ENGINEERING**	CO1: Identify and explore the basic features and modalities about Indian constitution.
		CO2: Differentiate and relate the functioning of Indian parliamentary system at the center and state level.
		CO3: Differentiate different aspects of Indian Legal System and its related bodies.
		CO4:Discover and apply different laws and regulations related to engineering practices
		CO5:Correlate role of engineers with different organizations and governance models
KME551	**Heat Transfer Lab**	CO1:Apply the concept of conductive heat transfer.
		CO2:Apply empirical correlations for both forced and free convection to determine the value of convection heat transfer coefficient
		CO3:Apply the concept of radiation heat transfer for black and grey body.
		CO4:Analyze the thermal behaviour of parallel or counter flow heat exchangers
		CO5:Conduct thermal analysis of a heat pipe
KME552	**Python Lab**	CO1:Apply conditional statement, loops condition and functions in python program
		CO2:Solve mathematical and mechanical problems using python program
		CO3:Plot various type of chart using python program
		CO4:Analyze the mechanical problem using python program
KME553	**Internet of Things Lab**	CO1:Understand Internet of Things and its hardware and software components
		CO2:Interface I/O devices, sensors & communication modules
		CO3:Remotely monitor data and control devices
		CO4:Design prototype of IoT based smart system
		CO5:Develop IOT based projects for real life problem
KME554	**Mini Project or Internship Assessment**	CO1: Perform the engineering activities with effective presentation and report.
		CO2: Perform as an individual and/or team member to manage the tasks in time.
		CO3: Justify the ethical principles in engineering practices.

B.Tech:6th Semester

KNC 602	**Indian Tradition, Culture and Society**	CO1: The course aims at imparting basic principles of thought process, reasoning and inference to identify the roots and details of some of the contemporary issues faced by our nation And try to locate possible solutions to these challenges by digging deep into our past.
		CO2: To enable the students to understand the importance of our surroundings and encourage the students to contribute towards sustainable development.
		CO3: To sensitize students towards issues related to 'Indian' culture, tradition and its composite character.
		CO4: To make students aware of holistic life styles of Yogic-science and wisdom capsules in Sanskrit literature that are important in modern society with rapid technological advancements and societal disruptions.
		CO5: To acquaint students with Indian Knowledge System, Indian perspective of modern scientific world-view and basic principles of Yoga and holistic health care system.
KME601	**Refrigeration & Airconditioning**	CO1:Understand the basic concepts of Refrigeration & Air Conditioning and its future prospects.
		CO2:Explain the construction and working of various components in Refrigeration & Air Conditioning systems.
		CO3:Understand the different types of RAC systems with their respective applications
		CO4:Apply the basic laws to the thermodynamic analysis of different processes involved in Refrigeration and Air Conditioning.
		CO5:Apply the basic concepts to calculate the COP and other performance parameters for different RAC systems
KME602	**Machine Design**	CO1: Recall the basic concepts of Solid Mechanics to understand the subject.
		CO2: Classify various machine elements based on their functions and applications.
		CO3: Apply the principles of solid mechanics to machine elements subjected to static and fluctuating loads.
		CO4: Analyze forces, bending moments, twisting moments and failure causes in various machine elements to be designed.
		CO5: Design the machine elements to meet the required specification.
KME603	**Theory of Machine**	CO1: Understand the principles of kinematics and dynamics of machines.
		CO2: Calculate the velocity and acceleration for 4 bar and slider crank mechanism
		CO3: Develop cam profile for followers executing various types of motions
		CO4: Apply the concept of gear, gear train and flywheel for power transmission
		CO5: Apply dynamic force analysis for slider crank mechanism and balance rotating reciprocating masses in machines.

KME 061	**Nondestructive Testing**	CO1: Understand the concept of destructive and Non destructive testing methods.
		CO2: Explain the working principle and application of die penetrant test and magnetic particle inspection.
		CO3: Understand the working principle of eddy current inspection.
		CO4:Apply radiographic techniques for testing
		CO5:Apply the principle of Ultrasonic testing and applications in medical and Engineering areas.
KOE060	**IDEA TO BUSINESS MODEL**	CO1: Enhance creative knowledge of students regarding selection of a business idea and it's implementation process.
		CO2: Acquire knowledge on entrepreneurship development, its Pro's and con's.
		CO3: Acquire basic knowledge on how to become an Entrepreneur.
		CO4:Develop knowledge on Production systems and it's sustainability through production, planning and control (PPC)
		CO5: Develop appropriate business model and apply in a better way.
KME 651	**Refrigeration & Airconditioning Lab**	CO1:Determine the performance of different refrigeration and air & conditioning systems
		CO2:Apply the concept of psychometric on different air cooling systems
		CO3:Interpret the use of different components, control systems and tools used in RAC systems
		CO4:Demonstrate the working of practical applications of RAC systems
KME 652	**Machine Design Lab**	CO1: Apply the principles of solid mechanics to design various machine Elements subjected to static and fluctuating loads.
		CO2:Write computer programs and validate it for the design of different machine elements
		CO3: Evaluate designed machine elements to check their safety.
KME 653	**Theory of Machine Lab**	CO1:Demonstrate various mechanisms, their inversions and brake and clutches in automobiles
		CO2:Apply cam & follower mechanism to get desired motion of follower
		CO3:Apply the concepts of gears and gear train to get desired velocity ratio for power transmission
		CO4:Apply the concept of governors to control the fuel supply engine
		CO5:Determine the balancing load in static and dynamic balancing problem

B.Tech:7th Semester

KHU702	**PROJECT MANAGEMENT & ENTREPRENEURSHIP**	CO1:Introduce various qualities required for entrepreneurship.
		CO2:Think creative and innovative, business Opportunities, value creation.
		CO3:Write and understand Project management, "Project Life Cycle, Project managerial skill
		CO4:Write project proposal, Project financing, Project Balance sheet
		CO5:Social Entrepreneurship, Social Innovators, Social venture
		CO6:Introduce various qualities required for entrepreneurship.
KME 071	**Additive manufacturing**	CO1: Identify the need of development of novel manufacturing techniques such as additive manufacturing/rapid prototyping etc. and its
		CO2: Analyze the different methods of additive manufacturing and its parameters
		CO3:Discuss various types of software/hardware/processes used and their advantages. Study the additive manufacturing processes in real time
KME 072	**HVAC systems :**	CO1:Understand the basics concepts of HVAC and various HVAC systems
		CO2:Understand the use of refrigerants with their respective applications and its future trends
		CO3:Understand the use of different auxiliary systems used in HVAC systems.
		CO4:Apply the basic laws for thermodynamic analysis of different processes involved in HVAC systems.
		CO5:Apply the basic concepts to calculate the HVAC loads for different applications
		CO6: Apply the concepts of psychrometry to design HVAC systems for different applications
KME 073	**Mathematical modeling of manufacturing processes**	CO1:Understand the fundamentals of manufacturing processes, mathematical models and their solutions
		CO2:Understand unconventional and conventional machining, their discretetime linear, nonlinear models and solutions
		CO3:Analyze the mechanism of forming and heat transfer in welding
		CO4:Apply the principles of casting, powder metallurgy, coating and additive Manufacturing
		CO5: Understand the fundamental of heat treatment, micro / nano manufacturing and processing of nonmetallic materials.
KME 076	**Power Plant Engineering**	CO1:Understand the different sources of power generation and their impact on environment
		CO2: Understand the elements of power generation using conventional and nonconventional energy sources.
		CO3: Understand the concepts of electrical systems used in power plants.
		CO4: Apply the basic concepts of thermodynamics to measure the performance of different power plants.

		CO5: Determine the performance of power plants based on load variations.
KOE074	**RENEWABLE ENERGY RESOURCES**	CO1:Understand of renewable and nonrenewable sources of energy
		CO2:Gain knowledge about working principle of various solar energy systems
		CO3:Understand the application of wind energy and wind energy conversion system.
		CO4:Develop capability to do basic design of bio gas plant
		CO5:Understand the applications of different renewable energy sources like ocean thermal, hydro, geothermal energy etc.
KME751	**Measurement & Metrology Lab**	CO1:Understand the basic principles of instrumentation for measurement of surface finish, strain, temperature, pressure and flow.
		CO2:Understand the principle and operation of Coordinate Measuring Machine(CMM).
		CO3:Apply Sine Bar, Slip Gauges, Bevel Protractor, Stroboscope, Dial Indicator etc. for measurement of different attributes
		CO4:Apply the basic concepts of limits, fits & tolerances for selective assembly
KME752	**MINI PROJECT OR INTERSHIP ASSESSMENT (Industrial Training)**	CO1:Understand the operational aspects of an organization.
		CO2:Prepare and present summery of knowledge gained during summer training.
		CO3:Relate and express impact of industry on human race and environment (living / non living) in a better way.
KME753	**PROJECT**	CO1: Identify, formulate and investigate complex engineering problems with the help of acquired engineering knowledge & exposure.
		CO2: Select and apply suitable modelling and simulation tools to make decisions at different stages of the solution process.
		CO3: Demonstrate the communication and interpersonal skills while working on projects as an individual or as a member of a team.
		CO4: Understand the relevance and importance of social, ethical, environmental and cultural concerns in project conception, planning & execution.
		CO5: Understand the general principles of engineering & management and apply them to multidisciplinary project environments.

B.Tech:8th Semester

KOE 090	**ELECTRIC VEHICLE**	CO1: Explain the basics of electric and hybrid electric vehicles, their architecture, technologies and fundamentals.
		CO2: Analyze the use of different power electronics converters and electrical machines in hybrid electric vehicles.
		CO3:Able to interpret the working of different configurations of electric vehicles and its components, hybrid vehicle configurations
		CO4:Explain the use of different energy storage systems used for hybrid electric vehicles, their control techniques, and select appropriate energy balancing technology
		CO5:Ability to understand the control and configurations of HEV charging stations
KOE 085	**Quality Management)**	CO1:Realize the importance of significance of quality
		CO2: Manage quality improvement teams.
		CO3: Identify requirements of quality improvement programs.
		CO4: Identify improvement areas based on cost of poor quality.
		CO5: Organize for quality and development of quality culture through small group activities.
KHU801	**RURAL DEVELOPMENT: ADMINISTRATION AND PLANNING**	CO1:Students can understand the definitions, concepts and components of Rural Development
		CO2:Students will know the importance, structure, significance, resources of Indian rural economy
		CO3:Students will have a clear idea about the area development programmes and its impact
		CO4: Students will be able to acquire knowledge about rural entrepreneurship.
		CO5:Students will be able to understand about the using of different methods for human resource planning
KME851	**PROJECT**	CO1: Identify, formulate and investigate complex engineering problems with the help of acquired engineering knowledge & exposure.
		CO2: Select and apply suitable modelling and simulation tools to make decisions at different stages of the solution process.
		CO3: Demonstrate the communication and interpersonal skills while working on projects as an individual or as a member of a team.
		CO4: Understand the relevance and importance of social, ethical, environmental and cultural concerns in project conception, planning & execution.
		CO5: Understand the general principles of engineering & management and apply them to multidisciplinary project environments.
		CO6:Realize the need for, and engage in, lifelong learning to face the challenges posed by technological changes