JIS GROUP
Educational Initiatives

CURRICULUM ESSENTIALS

Department of Mechanical Engineering

Departmental Vision

To be recognised as a department with world-wide reputation. Our vision is to graduate creative problem solvers who can tackle issue from a variety of perspectives.

Departmental Mission

Imparting quality education and promoting research and development opportunities to the students to make them successful engineers and researchers in the field of Mechanical Engineering.

Departmental Curriculum Structure

1st Year, 1st Semester

A. THEORY							
Sl No	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	M 101	MATHEMATICS-I	3	1	0	4	4
2	CH 101/ PH 101	CHEMISTRY(GR.A)(EVEN) /PHYSICS-I(GR.B)(ODD)	3	1	0	4	4
3	EE 101/ EC 101	BASIC ELECTRICAL ENGG(GR.A)(EVEN)/BASIC ELECTRONICS ENGG(GR.B)(ODD)	3	1	0	4	4
4	HU 101	PROFESSIONAL COMMUNICATION	2	0	0	2	2
5	ME 101	ENGINEERING MECHANICS	3	1	0	4	4
Total of Theory						18	18
B. PRACTICAL							
6	HU191	LANG. LAB. & SEMINAR PRESENTATION	0	0	2	2	1
7	CH 191/ PH191	CHEMISTRY LAB(GR.A)(EVEN)/PHYSICS-I LAB(GR.B)(ODD)	0	0	3	3	2
8	EE 191/ EC 191	BASIC ELECTRICAL ENGG LAB(GR.A)(EVEN)/BASIC ELECTRONICS ENGG LAB(GR.B)	0	0	3	3	2
9	ME 191	ENGG DRAWING & GRAPHICS(GR.A)(EVEN)/ WORKSHOP PRACTICE(GR.B)	0	0	3	3	2
Total of Practical						11	07

1st Year, 2nd Semester

A. THEORY							
Sl No	**Paper Code**	**Theory**	**Contact Hours /Week**				**Credit Points**
			L	**T**	**P**	**Total**	
1	M 201	MATHEMATICS-II	3	1	0	4	4
2	CH 201/ PH 201	CHEMISTRY(GR.B)(EVEN)/PHYSICS-I(GR.A)(ODD)	3	1	0	4	4
3	EE 201/ EC 201	BASIC ELECTRICAL ENGG(GR.B)(EVEN)/BASIC ELECTRONICS ENGG(GR.A)(ODD)	3	1	0	4	4
4	CS 201	COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING	3	1	0	4	4
5	ME 201	ENGINEERING THERMODYNAMICS & FLUID MECHANICS	3	1	0	4	4
Total of Theory						20	20
B. PRACTICAL							
6	CS291	COMPUTER FUNDAMENTALS & PRINCIPLE OF COMPUTER PROGRAMMING LAB	0	0	3	3	2
7	CH 291/ PH291	CHEMISTRY LAB(GR.B)(EVEN)/PHYSICS-I LAB(GR.A)(ODD)	0	0	3	3	2
8	EE 291/ EC 291	BASIC ELECTRICAL ENGG LAB(GR.B)(EVEN)/BASIC ELECTRONICS ENGG LAB(GR.A)(ODD)	0	0	3	3	2
9	ME 291	ENGG DRAWING & GRAPHICS(GR.B)(EVEN)/WORKSHOP PRACTICE(GR.A)	0	0	3	3	2
Total of Practical						13	08
C. SESSIONAL							
10	MC 281	SOFT SKILL DEVELOPMENT	0	0	2	2	0
Total of Semester			**28**				

2nd Year, 3rd Semester

Subject Type	Subject Code	Subject Name	Contact hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
PC	ME 301	APPLIED THERMODYNAMICS	3	0	0	3	3
PC	ME 302	STRENGTH OF MATERIALS	3	0	0	3	3
PC	ME 303	FLUID MECHANICS	3	0	0	3	3
ES	EE(ME) 301	ELECTRICAL MACHINES	3	0	0	3	3
BS	M(ME)301	MATHEMATICS- III	3	0	0	3	3
BS	PH(ME)301	PHYSICS- II	3	0	0	3	3
B. PRACTICAL:							
PC	ME 391	STRENGTH OF MATERIALS LAB	0	0	3	3	2
PC	ME 392	MACHINE DRAWING- I	0	0	3	3	2
ES	EE(ME)391	ELECTRICAL MACHINES LAB	0	0	2	2	1
BS	PH(ME)391	PHYSICS-II LAB	0	0	3	3	2
C. SESSIONAL							
MC	MC381	TECHNICAL SKILL DEVELOPMENT	0	0	2	2 UNITS	0
		Total: Eleven	17	0	13	30	24

2nd Year, 4th Semester

Subject Type	Subject Code	Subject Name	Contact Hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
PC	ME 401	FLUID MACHINERY	3	0	0	3	3
PC	ME 402	PRIMARY MANUFACTURING PROCESS	3	0	0	3	3
PC	ME 403	ENGINEERING MATERIALS	3	0	0	3	3
PC	ME 404	MECHANISMS	3	0	0	3	3
BS	M(CS)401	NUMERICAL METHODS	3	0	0	3	3
HU	HU 401	ENVIRONMENTAL SCIENCE	2	0	0	2	2
B. PRACTICAL:							
PC	ME 491	FLUID MECHANICS & HYDRAULIC MACHINES LAB	0	0	3	3	2
PC	ME 492	MANUFACTURING TECHNOLOGY LAB	0	0	3	3	2
PC	ME 493	MATERIAL TESTING LAB	0	0	3	3	2
PC	ME 494	MACHINE DRAWING-II	0	0	3	3	2
BS	M(ME)491	NUMERICAL METHODS LAB	0	0	3	3	2
C. SESSIONAL							
HS	HU 481	TECHNICAL REPORT WRITING & LANGUAGE PRACTICE	0	0	2	2	1
		Total: Twelve	17	0	17	34	28

3rd Year, 5th Semester

Subject Type	Subject Code	Subject Name	Contact Hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
PC	ME 501	HEAT TRANSFER	3	0	0	3	3
PC	ME 502	DESIGN OF MACHINE ELEMENTS-I	3	0	0	3	3
PC	ME 503	DYNAMICS OF MACHINES	3	0	0	3	3
PC	ME 504	METROLOGY & MEASUREMENT	3	0	0	3	3
HU	HU(ME) 501	VALUES & ETHICS	2	0	0	2	2
PE-I	ME 505A ME 505B ME 505C	REFRIGERATION & AIR CONDITIONING MECHATRONICS APPLIED FLUID MECHANICS	3	0	0	3	3
B. PRACTICAL:							
PC	ME591	HEAT TRANSFER LAB	0	0	3	3	2
PC	ME 592	DYNAMICS OF MACHINES LAB	0	0	3	3	2
PC	ME 593	METROLOGY & MEASUREMENT LAB	0	0	2	2	1
PE LAB-I	ME 594 A	REFRIGERATION & AIR CONDITIONING LAB	0	0	3	3	2
	ME 594 B	MECHATRONICS LAB					
	ME 594 C	APPLIED FLUID MECHANICS LAB					
C. SESSIONAL							
PROJECT	ME 581	MINI PROJECT-I	0	0	3	3	2
MC	MC 582	SEMINAR	0	0	2	2	0
		TOTAL: Twelve	17	0	16	33	26

3rd Year, 6th Semester

Subject Type	Subject Code	Subject Name	Contact Hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
PC	ME 601	MACHINING PRINCIPLES & MACHINE TOOLS	3	0	0	3	3
PC	ME 602	DESIGN OF MACHINE ELEMENTS-II	3	0	0	3	3
PC	ME 603	IC ENGINE & GAS TURBINE	3	0	0	3	3
PE-II	ME 604A	ROBOTICS: MECHANICS AND CONTROL	3	0	0	3	3
	ME 604B	COMPOSITE MATERIALS					
	ME 604C	FLUID POWER CONTROL					
OE-I	ME605A	RENEWABLE ENERGY SYSTEMS	3	0	0	3	3
	ME 605C	GAS DYNAMICS AND JET PROPULSION					
B. PRACTICAL:							
PC	ME 691	MACHINING & MACHINE TOOLS LAB	0	0	3	3	2
PC	ME 692	DESIGN PRACTICE LAB	0	0	2	2	1
PC	ME 693	I C ENGINE LAB	0	0	3	3	2
PE LAB-II	ME 694 A	ROBOTICS LAB	0	0	3	3	2
	ME 694 B	COMPOSITE MATERIALS LAB					
	ME 694 C	FLUID POWER CONTROL LAB					
C. SESSIONAL:							
PROJECT	ME 681	MINI PROJECT-II	0	0	3	3	2
MANDATORY	MC 682	GROUP DISCUSSION	0	0	2	2	0
		TOTAL: Eleven	15	0	16	31	24

4th Year: 7th Semester

Subject Type	Subject Code	Subject Name	Contact Hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
PC	ME 701	POWER PLANT ENGINEERING	3	0	0	3	3
PC	ME 702	ADVANCED MANUFACTURING TECHNOLOGY	3	0	0	3	3
PE-III	ME 703 A	ADVANCED WELDING TECHNOLOGY	3	0	0	3	3
	ME 703 B	BIOMECHANICS & BIOMATERIALS					
	ME 703 C	FINITE ELEMENT METHOD					
PE-IV	ME 704 A	TRIBOLOGY	3	0	0	3	3
	ME 704 B	OPERATIONS RESEARCH					
	ME 704 C	MATERIALS HANDLING					
OE-II	ME 705 A	ENERGY CONSERVATION & MANAGEMENT	3	0	0	3	3
	ME 705 B	QUALITY & RELIABILITY ENGINEERING					
	ME 705 C	HYDRO, WIND AND WAVE POWER					

B. PRACTICAL:							
PC	ME 791	ADVANCED MANUFACTURING LAB	0	0	2	2	1
PE-III lab	ME 793 A	ADVANCED WELDING LAB	0	0	2	2	1
	ME 793 B	BIOMECHANICS & BIOMATERIALS LAB					
	ME 793 C	FINITE ELEMENT METHOD LAB					
C. SESSIONAL:							
PW	ME 781	PROJECT- I	0	0	6	6	3
PW	ME 782	DESIGN OF MECHANICAL SYSTEM	0	0	3	3	2
PW	ME 783	VIVA-VOCE ON VACATIONAL TRAINING	0	0	0	0	2
		TOTAL: Ten	15	0	13	28	24

4th Year, 8th Semester

Subject Type	Subject Code	Subject Name	Contact Hours/Week				Total Credits
			L	T	P	Total	
A. THEORY:							
HU	HU(ME)801	PRODUCTION & OPERATIONS MANAGEMANT	2	0	0	2	2
PE-V	ME 802A	AUTOMOBILE ENGINEERING	3	0	0	3	3
	ME 802B	CAD/CAM					
	ME 802C	AUTOMATION & CONTROL					
OE-III	ME 803A	TURBO MACHINERY	2	0	0	2	2
	ME 803B	MAINTENANCE ENGINEERING					
	ME 803C	NUMERICAL HEAT TRANSFER					
OE-IV	ME 804A	SAFETY & OCCUPATIONAL HEALTH	2	0	0	2	2
	ME 804B	NUCLEAR POWER GENERATION AND SUPPLY					
	ME 804C	FRACTURE MECHANICS					
B. SESSIONAL:							
PW	ME 881	PROJECT II	0	0	12	12	6
PW	ME 882	GRAND VIVA	0	0	0	0	2
		TOTAL: SIX	9	0	12	21	17

DETAILS OF ABBREVIATION USED:

HS	Humanities and Social Sciences	PC	Professional -Core
BS	Basic Sciences	PE	Professional -Electives
ES	Engineering Sciences	OE	Open Electives

Program Educational Objectives (PEO)

PEO 1: To create an ambient academic environment for students to learn engineering, Mathematics, Science And English essential for solving Mechanical Engineering problems.

PEO 2: To prepare the students with technical knowledge and computing skills necessary to design, analyze and create novel products and solutions for Mechanical Engineering problems.

PEO 3: Conduct ethically as a professional engineer and exhibit good competency in their work culture.

PEO 4: To encourage students for lifelong learning, research and development with strong professional moral and ethical values.

Program Outcome (PO)

The Graduates have

1. An ability to design and conduct experiments, as well as to analyze and interpret data.
2. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
3. An ability to function on multidisciplinary teams
4. An ability to identify, formulate and solve engineering problems.
5. An understanding of professional and ethical responsibility.
6. An ability to communicate effectively.
7. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
8. A recognition of the need for, and an ability to engage in life-long learning.
9. A knowledge of contemporary issues.
10. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcome (CO)

ENGINEERING MECHANICS –ME 101

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Determine the resultant force and moment for a given force system.
CO2	Analyze planar and spatial systems to determine the forces in members of trusses, frames and problems related to friction.
CO3	Calculate the motion parameters for a body subjected to a given force system.
CO4	Determine the deformation of a shaft and understand the relationship between material constants.
CO5	Determine the centroid and second moment of area

PROFESSIONAL COMMUNICATION- HU101

CO	Statement
CO1	To acquire proficiency in speaking grammatically correct English.
CO2	To enhance their perception in comprehending English passages.
CO3	To develop their writing skills in business communication.
CO4	To get that accuracy in solving English Aptitude Questions.
CO5	To make them Industry Ready to accept challenges in their professional life.

LANGUAGE LAB AND SEMINAR PRESENTATION- HU181

CO	Statement
CO1	To be efficient in using basic grammar of English Language.
CO2	To be able to read and comprehend any given passage in English
CO3	Build confidence in speaking, reading and writing English professionally
CO4	Build confidence in speaking, reading and writing English professionally
CO5	To be able to employ writing skills proficiently.
CO6	To be prompt in speaking/presenting spontaneously on given subjects.

CHEMISTRY- CH101/CH201

CO	Statement
CO1	Able to apply fundamental concepts of thermodynamics in different engineering applications
CO2	Able to analyze & design simple and technologically advance electrical and energy storage devices
CO3	Able to prepare composites, Synthetic polymers, etc.
CO4	Able to apply the knowledge of chemical reactions to industries and scientific and technical fields
CO5	Capable to evaluate theoretical and practical aspects relating to the transfer of the production of chemical products from laboratories to the industrial scale, in accordance with environmental considerations

CHEMISTRY- CH191/CH291

CO	Statement
C01	Able to analyse different parameters of water considering environmental issues.
C02	Able to operate different types of instruments for estimation of small quantities chemicals used in industries and scientific and technical fields.
C03	Able to work as an individual also as an team member
CO4	Able to synthesize nano and polymer materials.
C05	Capable to design innovative experiments applying the fundamentals of chemistry

MATHEMATICS-I
Code: M-101

CO	Statement
C01	Able to explain the applicability of determinant and matrix in the different types of engineering problem.
C02	Able to apply Mean value theorems & expansion of function in engineering field.
C03	Able to apply the area & volume integrals in different engineering problems.
CO4	Able to apply vector concepts in numerous engineering experiments and problems.
CO5	Application of improper integral in engineering field.

ENGINEERING DRAWING & GRAPHICS – ME191 & ME 291

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Draw orthographic projections of lines, planes and solids
CO2	Construct isometric scale, isometric projections and views.
CO3	Draw sections of solids including cylinders, cones, prisms and pyramids.
CO4	Draw projections of lines, planes, solids, isometric projections and sections of solids including cylinders, cones, prisms and pyramids using AutoCAD

ENGINEERING THERMODYNAMICS & FLUID MECHANICS – ME201

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Apply conservation laws to fluid flow problems in engineering applications.
CO2	Design experimental procedure for physical model studies.
CO3	Design the working proportions of hydraulic machines.

WORKSHOP PRACTICE LAB – ME191 & ME291

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Study and practice on machine tools and their operations
CO2	Practice on manufacturing of components using workshop trades including fitting, carpentry, foundry and welding
CO3	Identify and apply suitable tools for machining processes including turning, facing, thread cutting and tapping
CO4	Apply basic electrical engineering knowledge for house wiring practice

MATHEMATICS-II
Code: M 201
Course Outcome:

CO	Statement
CO1	Able to apply the knowledge of first order differentiation in engineering field.
CO2	Able to analyse type of higher order equations and apply in numerous engineering application.
CO3	Able to analyze graph theory concepts in explaining the behavior of electrical, communication and electromagnetic field.
CO4	Able for application of Laplace Transform for solving various engineering problems.

APPLIED THERMODYNAMICS – ME301

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Understand the concepts of continuum, system, control volume, thermodynamic properties, thermodynamic equilibrium, work and heat.
CO2	Apply the laws of thermodynamics to analyze boilers, heat pumps, refrigerators, heat engines, compressors and nozzles.
CO3	Evaluate the performance of steam power cycles.
CO4	Evaluate the available energy and irreversibility.
CO5	Evaluate properties of pure substances and gas mixtures.
CO6	Analyze air standard cycles applied in prime movers.

STRENGTH OF MATERIALS – ME302

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Analyze and design structural members subjected to tension, compression, torsion, bending and combined stresses using the fundamental concepts of stress, strain and elastic behavior of materials.
CO2	Utilize appropriate materials in design considering engineering properties, sustainability, cost and weight.
CO3	Perform engineering work in accordance with ethical and economic constraints related to the design of structures and machine parts.

FLUID MECHANICS - ME 303

Course outcome: By the completion of the course, the students should be able to:

CO	Statement
CO1	Knowledge of mathematics, science and engineering applications and demonstrate ability to identify, formulate and solve engineering problems.
CO2	Ability to analyze fluid flow problems with the application of the momentum and energy equations
CO3	Capability to analyze pipe flows and open channel flows
CO4	Ability to analyze dimension analysis, model study and prototype study

STRENGTH OF MATERIALS LAB – ME 391

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Calculate tensile stresses & strain for different loading conditions
CO2	Calculate compressive stresses for brittle materials.
CO3	Observe bending stresses in beams.
CO4	Understand the principle of hardness measuring instruments.
CO5	Evaluate impact strength of sample specimen.

MACHINE DRAWING I – ME 392

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Able to understand product symbols, weld symbols, pipe joints
CO2	Understand orthographic projections of machine elements
CO3	Understand isometric projections of machine elements
CO4	Understand detailed assembly drawings of Plummer block, Tailstock, Welded joints, tool head of shaper

TECHNICAL REPORT WRITING AND POWER POINT PRESENTATION LAB- HU381/HU481

CO	Statement
CO1	Build confidence in speaking, reading and writing English professionally
CO2	Understanding communication techniques and learning the method of technical writing.
CO3	To be prompt in public speaking spontaneously on given subjects.
CO4	To preserve proper body language.
CO5	To have confidence to participate in any kind of given conversation and deliver presentations.

MATHEMATICS III
Code: M301
Course Outcome:

CO	Statement
CO1	Able to apply the knowledge of Fourier series and transform in engineering problems like finding the frequency of wave propagation.
CO2	Able to apply the knowledge of Complex Analysis viz. the Cauchy Residue Theorem to evaluate integrals and sum series.
CO3	Able to solve the stochastic model of engineering problems using the idea of different kind of engineering problems.
CO4	Able to know that differential equation is a very important mathematical model of many problems in the application of engineering and also be able to utilize theories and methods learned in the course to analyze and solve a differential equation. .

FLUID MACHINERY – ME 401
Course outcome: By the completion of the course, the students should be able to:

CO	Statement
CO1	Impart the knowledge on pumps and turbines and impart the knowledge of impact of jets.
CO2	Able to calculate various parameters like efficiency, specific speed etc.
CO3	Impart the knowledge on miscellaneous hydraulic machines like hydraulic press, hydraulic ram, hydraulic lift, hydraulic coupling, gear pump etc.
CO4	To some extent the students will get expertise about the design methodologies of Fluid Machinery.

PRIMARY MANUFACTURING PROCESS – ME 402

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Understand the basic ideas of casting processes
CO2	Understand the basic ideas of forming processes
CO3	Understand the basic ideas of welding processes
CO4	Understand the basic ideas of press tool works
CO5	Understand the basic ideas of powder metallurgy

ENGINEERING MATERIALS – ME 403

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Get the basic ideas of crystal structure, imperfection, diffusion
CO2	Understand the basic ideas of phase diagrams
CO3	Understand the basic ideas of heat treatment
CO4	Understand the basic ideas of classification of ferrous and non ferrous alloys
CO5	Understand the basic ideas of polymers and elastomers, ceramic and composite materials
CO6	Understand the basic ideas of corrosion and degradation of engineering materials

MECHANISMS– ME 404

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Get the basic ideas of link, pairs, chains and different types of mechanisms
CO2	Obtain the basic ideas of application of vector diagrams to solve the problems of kinematic problems
CO3	Determine the degree of freedom of different mechanisms
CO4	Gain the basic ideas of Belt drive
CO5	Understand the basic ideas of gears
CO6	Gain the basic ideas of Kinematics of cams
CO6	Basic ideas of kinematic synthesis

FLUID MECHANICS & HYDRAULIC MACHINES LAB – ME-491

Course outcome: By the completion of the course, the students should be able to:

CO	Statement
CO1	Ability to Identify, name, and characterize flow patterns and regimes
CO2	Capability to understand basic units of measurement, converts units, and appreciate their magnitudes.
CO3	Measure fluid pressure and relate it to flow velocity
CO4	Demonstrate practical understanding of the various equations of Bernoulli
CO5	Demonstrate practical understanding of friction losses in internal flows.
CO6	To calculate the hydraulic efficiency of impulse turbine, Francis turbine, centrifugal pump and reciprocating pump etc.
CO7	Demonstrate the ability to produce a working model through hands-on experience in fluid mechanics design and explain its operation in terms of what was learned in the course.

MANUFACTURING TECHNOLOGY LAB - ME 492

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Analyze the thermal, metallurgical aspects during solidification in casting.
CO2	Analyze the thermal, metallurgical aspects during welding and their role on quality of cast or weld objects.
CO3	Design the gating and riser system needed for casting and requirements to achieve defect free casting
CO4	To understand the basic geometry of pattern making and their application.
CO5	Analyze the welding process behavior for common and newer welding techniques
CO6	To gain the knowledge of Forging technique and application in industrial domain.

MATERIAL TESTING LAB - ME 493

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Studies of strain-strain behaviour of materials
CO2	Studies of mechanical properties of materials
CO3	Rockwell hardness tester for measurement of hardness
CO4	Measurement of surface hardness

MACHINE DRAWING-II - ME 494

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Gain the basic concepts of Auto- CAD
CO2	Draw the assembly drawing of a simple gear box
CO3	Draw the assembly drawing of a Flange coupling
CO4	Draw the assembly drawing of a welded bracket join by stud bolt
CO5	Draw the assembly drawings in Auto- CAD

NUMERICAL METHODS
Code: M (CS) 401
Course Outcome:

CO	Statement
C01	Able to numerically approximate functions with polynomials.
CO2	Able to understand basics of finite precision arithmetic, conditioning of problems and stability of numerical algorithms.
CO3	Able to solve numerically a scalar nonlinear equation.
CO4	Able to solve dense systems of linear equations and have a working knowledge of LU factorizations for these problems.
CO5	Able to use the method of lines to solve basic partial differential equations.

HEAT & MASS TRANSFER - ME 501
Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Basic heat transfer mechanisms (conduction, convection and radiation).
CO2	Heat transfer by conduction in solids for steady-state and transient conditions.
CO3	Heat transfer by convection in closed conduits and on external surfaces, heat transfer by thermal radiation.
CO4	Convective mass transfer.
CO5	Friction and pressure loss in boundary layer flows in closed conduits and external surfaces.

DESIGN OF MACHINE ELEMENTS-I - ME 502

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Understand the customers' need, formulate the problem and draw the design specifications.
CO2	Understand component behavior subjected to loads and identify the failure criteria.
CO3	Analyze the stresses and strains induced in a machine element.
CO4	Understand the concepts of principal stresses, theories of failure, stress concentration and fatigue loading.
CO5	Design keys, cotters and knuckle joints including riveted, bolted and welded joints.
CO6	Understand the basic concept of shaft, open and crossed belt pulley drives.

DYNAMICS OF MACHINES - ME 503

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Be proficient in the use of mathematical methods to analyze the forces and motion of complex systems of linkages, gears and cams.
CO2	Be able to design linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship.
CO3	Be able to analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams.

METROLOGY & MEASUREMENT - ME 504

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Inspection of engineering parts with various precision
CO2	Design of part, tolerances and fits.
CO3	Principles of measuring instruments and gauges and their uses
CO4	Evaluation and inspection of surface roughness instruments
CO5	Inspection of spur gear and thread elements.

I.C. ENGINES – ME 505A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Describe and explain different types of reciprocating internal combustion engines (ICE), their typical design features and performance characteristics.
CO2	Describe and analyse the power cycle of internal combustion engines using ideal gas cycles, air cycles, and fuel-air cycles. Compute indicated power and thermal efficiency.
CO3	Describe and explain the gas exchange process and power boosting by means of turbo charging.
CO4	Describe and explain engine heat transfer and its relation to thermal loading of engine components and cooling.
CO5	Explain the characteristic of homogeneous combustion in SI-engines and spray combustion in CI-engines. Fuel quality requirements of SI- and CI-engines.
CO6	Describe methods for reduction of exhaust emissions, and their relations to fuel quality and engine performance.

HEAT & MASS TRANSFER LAB - ME 591

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	To conduct various experiments to determine thermal conductivity and heat transfer coefficient in various materials
CO2	To select appropriate materials & designs for improving effectiveness of heat transfer.
CO3	To conduct performance tests and thereby improve effectiveness of heat exchangers.

MACHINE DESIGN-I - ME 592

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Be able to analyze the stress and strain on mechanical components; and understand, identify and quantify failure modes for mechanical parts
CO2	Demonstrate knowledge on basic machine elements used in machine design; design machine elements to withstand the loads and deformations for a given application, while considering additional specifications
CO3	Be proficient in the use of software for analysis and design.

DYNAMICS OF MACHINES LAB - ME 593

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	To analyze the forces and motion of complex systems of linkages, gears and cams.
CO2	Be able to design linkage, cam and gear mechanisms for a given motion or a given input/output motion or force relationship.
CO3	To analyze the motion and the dynamical forces acting on mechanical systems composed of linkages, gears and cams.

METROLOGY & MEASUREMENT LAB - ME 594

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Linear and angular measurements exposure.
CO2	To create awareness on various mechanical measuring instruments
CO3	Surface roughness measurement by Tolysurf.

IC ENGINES & REFRIGERATION LAB - ME 595A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Understand the complete operation of 2 stroke and 4 stroke I.C engines
CO2	Use of catalytic converters and its effect on flue gas
CO3	Calorific value of Bomb Calorimeter
CO4	Learn the functions of an multi point fuel ignition engine
CO5	To understand the principles of refrigeration and air conditioning.
CO6	Basic ideas of vapour compression refrigeration system

MACHINING PRINCIPLES & MACHINE TOOLS - ME 601

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Application of cutting mechanics to machining of metals based on cutting force and power consumptions.
CO2	Selection of suitable cutting tool materials and tool geometries for machining of different types of metals and selection of optimum parameters for the respective machining process.
CO3	Understanding of chip formation mechanism (both for ductile and brittle materials) and ability to measure the cutting forces during chip formation process and understanding of economics of machining, heat distribution in machining and its effects and ability for carrying out temperature measurement during machining.
CO4	Understanding of tool life, role and types of cutting fluids in machining, machinability index and ability to measure tool life, tool wear and flank wear during machining and description of different grinding processes, grinding wheel selection, temperature and force measurement during grinding.
CO5	Discussion of milling machines, various operations and Nomenclature of Cutters and explanation of the mechanisms of shaper, planner and slotter and various machining operations performed.

DESIGN OF MACHINE ELEMENTS-II - ME 602

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Understand the concepts of principal stresses, theories of failure, stress concentration and fatigue loading.
CO2	Design couplings and gears.
CO3	Analyze the pressure distribution and design journal bearings.
CO4	Design belts, springs, brakes, clutches and engine parts.

FLUID POWER CONTROL - ME 603 A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Design and draw multi-actuator fluid power systems.
CO2	Construct a multi-actuator fluid power system.
CO3	Design a Fluids Power distribution system.

MATERIALS HANDLING - ME 604A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	The students will be able to design any conveyor required for transport of any type of materials such as liquids, solids, powders etc.
CO2	Introduce the students about materials handling methods used in industries such as belt conveyors, chain conveyors, pulleys, screw conveyors etc.
CO3	The students will be able to do managerial works assigned to them in industries.

COMPUTATIONAL FLUID DYNAMICS - ME 605A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	The student will demonstrate the ability to use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.
CO2	The student will demonstrate the ability to analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc., using flow visualization and analysis tools.
CO3	The student will demonstrate an ability to describe various flow features in terms of appropriate fluid mechanical principles and force balances.

RENEWABLE ENERGY SYSTEMS - ME 605B

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Principles, overview and importance of renewable energy
CO2	Solar-based heating and power generation
CO3	Energy systems, storage and transmission
CO4	Opportunities for, and challenges to, societal implementation

FLUID POWER CONTROL LAB - ME 691 A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Familiarity with common hydraulic components, their use, symbols, and mathematical models
CO2	Ability to design, analyze and implement simple control systems
CO3	Ability to relate control systems analysis with actual performance

MACHINING & MACHINE TOOLS LAB - ME 692

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Use in applications by learning construction of machine tools
CO2	Analyse forces, can control appropriateness for machine power according to working standards.
CO3	Determining measurement and surface quality of machine tools in machining.

MACHINE DESIGN-II - ME 693

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	Outcome of this subject is very straight forward. Until and unless the students learn this subject, they won't be able to design any machine element starting from simplest to toughest one.
CO2	In the first part of Machine Design the students will learn the selection and analysis of mechanisms needed for a specified job.
CO3	In the second part of the same thing they will learn the selection of material required for a machine member and also the design technique of the same.

TRIBOLOGY - ME-703C

Course outcome: By the completion of the course, the students should be able to:

CO	Statement
CO1	Impart the knowledge on friction, lubrication and wear in all contacting pairs
CO2	Have a knowledge of surface topography and know how to model a rough engineering surface; Understand Hertz contact and rough surface contact
CO3	Be familiar with adhesion theories and the effect of adhesion on friction and wear
CO4	Able to know the methods to reduce the friction for engineering surface
CO5	Tribological knowledge helps to improve service life, safety and reliability of interacting machine components; and yields substantial economic benefits

AUTOMOBILE ENGINEERING – ME 802A

Course outcomes: At the end of the course, the student will be able to:

CO	Statement
CO1	The anatomy of the automobile in general
CO2	The location and importance of each automobile parts
CO3	The functioning of the engine and its accessories, gear box, clutch, brakes, steering, axles and wheels
CO4	Suspension, frame, springs and other connections
CO5	Emissions, ignition, controls, electrical systems and ventilation

INDUSTRIAL ROBOTICS - ME-802B

Course outcome: By the completion of the course, the students should be able to:

CO	Statement
CO1	Equipped with the knowledge automation and brief history of robot and applications.
CO2	Familiarize with the kinematic motions of robot.
CO3	gain knowledge about robot end effectors and their design concepts.
CO4	Equipped with the Programming methods & various Languages of robots.
CO5	Equipped with the principles of various Sensors and their applications in robots.

JIS GROUP

Educational Initiatives

Narula Institute of Technology
81, Nilgunj Road
Agarpara, Kolkata-109
Ph: +91 33 2563 8888/7777
Website: www.nit.ac.in
Follow us on