MECHNICAL NGINEERING   YEAR : II   SEMISTER : III

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
		Theory	L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	CS1301	NUMERICAL ANALYSIS & COMPUTER PROGRAMMING(C,C++)	2	1	-	15	10	25	50	75	
2	ME1302	MATERIAL SCIENCE	2	1	-	15	10	25	50	75	
3	ME1303	STRENGTH OF MATERIALS	3	1	-	30	20	50	100	150	
4	ME1304	FLUID MECHANICS	3	1	-	30	20	50	100	150	
5	ME1305	APPLIED THRMODYNAMICS	3	1	-	30	20	50	100	150	
6	MH1306	MATHEMATICS III	3	1	-	30	20	50	100	150	
	PRACTICAL/DRAWING/DESIGN										
7	CS1302-P	NUMERICAL ANALYSIS & COMPUTER	-	-	3	25	-	25	25	50	
8	ME1307-P ME1308-P	MATERIAL SCIENCE/ STRENGTH OF MATERIALS LAB	-	-	3	25	-	25	25	50	
9	ME1309-P	FLUID MECHANICS LAB	-	-	3	25	-	25	25	50	
10	ME1310P	APPLIED THRMODYNAMICS LAB	-	-	3	25	-	25	25	50	
11	HS1303-P	GENERAL PROFICIENCY III	-	-	-	-	-	50	-	50	
		TOTAL	**16**	**6**	**12**	**-**	**-**	**-**	**-**	**1000**	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS : 34   TOTAL CREDITS : 32

26

MECHNICAL NGINEERING   YEAR : II
SEMISTER : IV

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
		Theory	L	T	P	SESSIONAL	EXAM			SUB TOTAL	
						TA	CT	TOT	ESE		
1	ME1401	MECHNICAL MEASUREMENT & METROLOGY	2	1	-	15	10	25	50	75	
2	ME1402	INDUSTRIAL ENGINEERING	2	1	-	15	10	25	50	75	
3	ME1403	ADVANCE STRENGTH OF MATERIALS	3	1	-	30	20	50	100	150	
4	ME1404	KINEMATICS OF MECHANIC	3	1	-	30	20	50	100	150	
5	ME1405	MANUFACTURE SCIENCE I	3	1	-	30	20	50	100	150	
6	EE1402	ELECTRICAL MACHINES	3	1	-	30	20	50	100	150	
	PRACTICAL/DRAWING/DESIGN										
7	ME1406-P	MECHNICAL MEASUREMENT & METROLOGY LAB	-	-	3	25	-	25	25	50	
8	ME1407-P	KINEMATICS OF MECHANIC LAB	-	-	3	25	-	25	25	50	
9	ME1408-P	MANUFACTURE SCIENCE I LAB	-	-	3	25	-	25	25	50	
10	EE143-P	ELECTRICAL MACHINES LAB	-	-	3	25	-	25	25	50	
11	HS1404-P	GENERAL PROFICIENCY IV	-	-	-	-	-	50	-	50	
		TOTAL	16	6	12	-	-	-	-	**1000**	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER
EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS: 34   TOTAL CREDITS: 32

MECHNICAL   ENGINEERING   YEAR : III   SEMISTER : V

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
		Theory	L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	HS1501	MANAGEMENT SCIENCE	2	1	-	15	10	25	50	75	
2	ME1502	PRODUCT DEVELOPMENT	2	1	-	15	10	25	50	75	
3	ME1503	MACHINE DESIGN I	3	1	-	30	20	50	100	150	
4	ME1504	DYNAMICS OF MACHINES	3	1	-	30	20	50	100	150	
5	ME1505	MANUFACTURE SCIENCE II	3	1	-	30	20	50	100	150	
6	ME1506	HEAT & MASS TRANSFER	3	1	-	30	20	50	100	150	
		PRACTICAL/DRAWING/DESIGN									
7	ME1507-P	MACHINE DESIGN I LAB	-	-	3	25	-	25	25	50	
8	ME1511-P ME1508-P	HEAT & MASS TRANSFER/ DYNAMICS OF MACHINES LAB	-	-	3	25	-	25	25	50	
9	ME1509-P	MANUFACTURE SCIENCE II LAB	-	-	3	25	-	25	25	50	
10	ME1510-P	COMPUTER AIDED DRAFTING LAB	-	-	3	25	-	25	25	50	
11	HS1505-P	GENERAL PROFICIENCY V	-	-	-	-	-	50	-	50	
		TOTAL	**16**	**6**	**12**	**-**	**-**	**-**	**-**	**1000**	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS: 34   TOTAL CREDITS : 32

28

MECHNICAL   ENGINEERING   YEAR : III   SEMISTER : V

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
		Theory	L	T	P	SESSIONAL	EXAM			SUB TOTAL	
						TA	CT	TOT	ESE		
1	HS1601	PROJECT MANAGEMENT & BUSINESS MANAGEMENT	2	1	-	15	10	25	50	75	
2	ME1602	IC ENGINE	2	1	-	15	10	25	50	75	
3	ME1603	MACHINE DESIGN II	3	1	-	30	20	50	100	150	
4	ME1604	FLUID MACHINERY	3	1	-	30	20	50	100	150	
5	ME1605	AUTOMETIC CONTROLI	3	1	-	30	20	50	100	150	
6	ME1606	REFRIGERATION & AIR CONDITIONING	3	1	-	30	20	50	100	150	
		PRACTICAL/DRAWING/DESIGN									
7	ME1607-P	IC ENGINE LAB	-	-	3	25	-	25	25	50	
8	ME1608-P	MACHINE DESIGN LAB	-	-	3	25	-	25	25	50	
9	ME1609-P	FLUID MACHINERY LAB	-	-	3	25	-	25	25	50	
10	ME1610-P	REFRIGERATION & AIR CONDITIONING LAB	-	-	3	25	-	25	25	50	
11	HS1606-P	GENERAL PROFICIENCY VI	-	-	-	-	-	50	-	50	
		TOTAL	**16**	**6**	**12**	**-**	**-**	**-**	**-**	**1000**	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS: 34   TOTAL CREDITS: 32

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
						SESSIONAL		EXAM		SUB TOTAL	
		Theory	L	T	P	TA	CT	TOT	ESE		
1	HS1701	COMPUTER AIDED DESIGN	3	1	-	15	10	25	50	75	
2	ME1702	NUMERIC CONTROL OF MACHINE TOOLS & ROBOTICS	3	1	-	15	10	25	50	75	
3	ME1703	AUTOMOBILE ENGINEERING	3	1	-	30	20	50	100	150	
4		OPEN ELECTIVE I	3	1	-	30	20	50	100	150	
5		PROFESSIONAL ELECTIVE I	3	1	-	30	20	50	100	150	
		PRACTICAL/DRAWING/DESIGN									
7	ME1704-P	COMPUTER AIDED DESIGN	-	-	3	30	20	50	100	150	
8	ME1705-P	NUMERIC CONTROL OF MACHINE TOOLS & ROBOTICS	-	-	3	25	-	25	25	50	
9	ME1706-P	AUTOMOBILE ENGINEERING	-	-	3	25	-	25	25	50	
10	ME1707-P	PROJECT I	-	-	3	25	-	25	25	50	
11	HS1707-P	GENERAL PROFICIENCY VII	-	-	-	-	-	50	-	50	
		TOTAL	15	5	12	-	-	-	-	1000	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS: 34   TOTAL CREDITS: 32

	Sl.No.	Code	PAPER
OPEN ELECTIVE I	01	HS2731	Enterprise Resource Management
	02	CS2731	E-Commerce Strategic IT
	03	HS2732	Technology Management.
	04	HS2733	Decision Support and Executive Information system.
	05	CS2732	Software Technology
PROFESSIONAL ELECTIVE II	01	MH2731	Finite Element Analysis
	02	ME2731	Vibration Engineering
	03	ME2732	Energy Engineering
	04	ME2733	Manufacture and Inspection of Gears
	05	ME2734	Total Quality Management.
	06	HS2734	Total Quality Management
	07	HS2735	Value Engineering

Sl. No.	Course No.	Subject	Periods			Evaluation Scheme					Credit
		Theory	L	T	P	SESSIONAL EXAM				SUB TOTAL	
						TA	CT	TOT	ESE		
1	ME1801	POWER PLANT ENGINEERING	3	1	-	30	20	50	100	150	
2	ME1802	MECHANICAL SYSTEM DESIGN	3	1	-	30	20	50	100	150	
3		PROFESSIONAL ELECTIVE III	3	1	-	30	20	50	100	150	
4		OPEN ELECTIVE II	3	1	-	30	20	50	100	150	
5		PROFESSIONAL ELECTIVE I	3	1	-	30	20	50	100	150	
	PRACTICAL/DRAWING/DESIGN										
6	ME1803-P	PROJECT II	-	-	12	100	-	100	100	200	
7	ME1808-P	GENERAL PROFICIENCY VII	-	-	-	-	-	50	-	50	
		TOTAL	**15**	**5**	**12**	**-**	**-**	**-**	**-**	**1000**	

TA-TEACHERS ASSESSMENT   CT-CLASS TEST   ESE- END SEMESTER EXAMINATION

TOTAL MARKS: 1000   TOTAL PERIODS: 34   TOTAL CREDITS: 32

	Sl.No.	Code	Paper
OPEN ELECTIVE I	1	HS2831	Knowledge Management
	2	CS2831	IT in Marketing Management
	3	CS2832	IT in HR Management
	4	CS2833	IT in Finance Management
	5	CS2834	project Management & Software Tools
	6	HS2832	Human Values
	7	HS2833	Science Technology and Society
PROFESSIONAL ELECTIVE Ii	1	ME2831	Machine Tool Design
	2	ME2832	Hydraulic control
	3	ME2833	Experimental Mechanics
	4	ME2834	Automotive Chassis and Transmission
	5	ME2835	Pumps, Fans, Blowers, and Compressors
	6	ME2836	Cost Estimation and Optimization
	7	ME2837	Tero technology Mechatronics Engineering
	8	HS2834	Entrepreneurship Development
	9	HS2835	Advanced Operation Research
	10	ME2838	Project Engineering
PROFESSIONAL ELECTIVE III	1	ME2839	Pneumatic Control and Low Cost Automation
	2	ME2840	Computer Aided Engineering
	3	ME2841	Cryogenic Engineering
	4	ME2842	Special Casting Techniques
	5	EC2831	Robotics
	6	HS2836	Enterprise Resource Planning
	7	HS2837	Industrial Design
	8	HS2838	Personal Management
	9	HS2839	Financial Management and Accounting

Syllabus of B. Tech. in Mechanical Engineering

Semester III

CS1301   **Numerical Analysis & computer program (C & C++)**

(2-N-0)

I Numerical Analysis

Approximations & round of errors, Truncation errors and Taylor series, Determination of roots of polynomials & transcendental equations by Newton- Raphson, Secant & Barstow's method. Solutions of linear simultaneous linear Algebraic Equations by Gauss Elimination & Gauss Siedel iteration methods.

Curve fitting- linear & non linear regression analysis.

Backward, Forward & Central difference relations & there uses in Numerical differentiation & integration Application of Difference relations in the solution of partial differential equations. Numerical solution of ordinary differential equations by Euler, Modified Euler, Runge-Kutta & predictor- Corrector method.

II Computer Programming

Introduction to Computer programming in C & C++ languages. Arithmetic expressions, Simple programs. The emphasis should be more on programming techniques rather then the language itself. The C programming language is being chosen mainly because of the availability of the compilers, books and other reference materials.

Example of some simple C program. Dissection of the program line by line. Concepts of variables, program statements & function calls from the library (Printf for example)

C data types, int, char, float etc.

C expressions, Arithmetic operations, relational & logic operations.

C assignment statements, extension of assignment to the operations. C primitive input output using getchar & putchar, exposure to the scanf & printf functions.

C statements, conditional execution using if, else. Optionally switch & break statements may be mentioned

Concepts of loops, example of loops in C using for, while & do while. Optionally co   may be mentioned.

One dimensional arrays & example of it erative programs using arrays, 2 D arrays. Use in matrix computations.

Concept of sub-programming, functions. Example of functions, Argument passing mainly to the simple variables.

Pointers, relationship between arrays & pointers Argument passing using pointers

Array of pointers, passing Arrays as argument strings & C string library

Structure and unions Defining C structures, passing structures as arguments.

 Examples

File I/O use of fopen Fscanf & Fprintf routines.

ME 1302   **MATERIALS SCIENCE**   **(2-0-0)**

Introduction : Types Of Materials From Structure to property   1hours

Crystal Structures : Seven Systems & fourteen lattices; lattice direction & planes   2hours

Crystal Imperfections : Point Line & Planar defects   1hours

Deformation Mechanism & Mechanical Properties of Materials : Plastic deformation of single crystals & polycrystals; strengthening mechanisms; recovery- re-crystallization- grain growth; tensile impact, fatigue & creep of metals & alloys; deformation behavior of ceramics & polymers; mechanical testing methods   6hours

Diffusion in solid mechanics: Fick's Laws; Factors affecting diffusion in metals ceramic & semiconductors

     1hours

Nucleation & Growth : Homogenous & heterogeneous nucleation kinetics; growth & overall transformation kinetics.   2hours

Principal Of Solidification : Development of microstructures like dendrites, cellular structure, columnar grains etc.   3hours

Phase Diagrams : Phase rules; Isomorphous, eutectic, peretectic, eutectoid & Fe-Cermeutic diagram, Phase diagrams of ceramics & electronic materials.   5hours

Heat treatment of materials : TTT, CCT diagrams; hardenability, role of alloying elements; different heat treatment procedures; pearlitic, bainitic & martensitic transformations.   7hours

Degradation & failure of Materials : Wear, corrosion, Oxidation etc.   3hours

Selection of Engineering Materials: Common Engineering materials including metals & alloys, Polymers, ceramics, composites electronic materials & there selection procedures   12hours

ME 1303   **STRENGTH OF MATERIALS**   **(3-N-0)**

Stress: Axial load safety concept, general concepts; stress analysis of axially loaded bars, member strength of design criteria   (4 lectures)

Strain: Axial strain & deformation; Strains & deformationin axially loaded bars Stress Strain relation ship, poisons ratio, Thermal strain & deformation, Strain Concentration.   (4 lectures)

Generalised Hooke's Law, pressure vessels, constitutive relationship-generalized concepts,relationship between elastic constants; thin wall pressure vessel.   (6 lectures)

Torsion: Torsional stress & deformation in circular members, design of circular member in torsion closed coil hetical spring   (5 lectures)

SFD & BMD: Axial force,shear & bendingmoment diagram, introduction-direct approach for axial force. Shear & bending, Bendingof beams withsymetrical cross- section   (4 lectures)

Stress in Beam: Shear stress in beams; Introduction shear flow -shear stress in beams.   (4 lectures)

Combine Stress: Transformation of stress & strain; Analysis for combined loading; Transformation of stress & strain – Mohr's rule for stress transformation.   (6 lectures)

Deflection of Beams: Introduction; Deflection by integration deflection by moment area method.
                                                            (6 lectures)

Stability of column: Introduction – Euler's buckling load formula, Rankin's formula. Introduction to beam column.   (2 lectures)

ME 1304 **FLUID MECHANICS** (3-1-0)

Introduction: Fluid & flow-definition & types, Properties of ideal & real fluids, continuum concept, Lagrangian & Eulerian approach. (4 lectures)

Fluid Static's: General differential equation, Hydrostatics manometery, Force on plane & curved surfaces, Stability of floating & submerged bodies, Relative equilibrium. (4 lectures)

Kinematics of Fluid: Steady flow, Uniform flow, Stream, Streak & path lines, Continuity equation, Stream function, Irrational flow, Velocity potential, Flow nets, Circulation, Simple flow, Flow around half body Circular cylinder with & without rotation, Lift & drag. (6 lectures)

Dynamics of Fluid: Concept of System & control volume, Reynolds transportation theorem, Euler's equation, Bernoulli equation, Navier Stocks equation to nozzle, Venturimeter orifices and mouthpieces, Time taken in emptying a vessel; pitot and prandtl tube (6 lectures)

Flow in Pipes: Laminar flow through pipe, Total & hydraulic gradient lines, Series & parallel connection of pipes, Transmission of power through pipes. (4 lectures)

Laminar Flow of Viscous Fluids: Boundary layer concept, Boundary layer thickness, Displacement, Momentum & energy thickness, Integral method, drag on flat plate, flow around airfoil, Boundary layer separation, Flow, Plane flow. (6 lectures)

Turbulent Flow: Fluid friction & Reynolds's number, Prandtl mixing length hypothesis velocity distribution in pipes, the universal pipe friction flows, Cole Brook White formula (5 lectures)

Dimensional Analysis: Buckingham's P theorem, non dimensional numbers & there application, Similitude. (3 lectures)

Compressible fluid flow: Velocity of sound, Mach number, Steady isentropic flow through ducts, Chocked flow, Flow through Convergent & convergent- divergent nozzle, Adiabatic flow, Fanno lines, Diabetic flow, Rayleigh lines. (6 lectures)

ME 1305 **APPLIED THERMODYNAMICS** **(3-0-0)**

Introduction to thermodynamic systems: Definition, Familiarity eighth common examples of thermodynamic system such as steam power plant, Vapour compression refrigeration, Automobile engine, Air compressor, a rocket engine. (6 lectures)

Review of basic concepts: Working fluid properties (air, steam) for various thermodynamic process & cycles, First law & second law energy equations for closed & open system under SSSF & USUF condition. (4 lectures)

Third law of thermodynamics: Measurement of entropy, Zero value of entropy, Absolute zero temperature. (3 lectures)

Thermodynamic (PVT) relations of working fluid: Equations of state for ideal & real gases, Behavior of real gases & compressibility factor, Law of corresponding state & use of generalized compressibility chart, Helmoltz & Gibb functions. (6 lectures)

Gas power cycle: Carnot, Sterling, Ericssion, Otto Diesel, Dual combustion, Brayton & Atkinsion cycle, Air standard thermal efficiency, Maximum work output & efficiency, Indicated power, Break power & mean effective pressure for reciprocating engine. (9 lectures)

Vapour power cycle: Carnot & Rankine cycle, Reheating & regenerative feed heating Rankine cycle, Binary Vapour cycle, Thermal efficiency & work ratio, Factor affecting efficiency & work output. (9 lectures)

Refrigeration cycle/ process: Brayton air refrigeration cycle, Vapor compression Cycle, Vortex & pulse tube, Refrigeration, Thermoelectric refrigeration. (7 lectures)

MH 1306   **Mathematics – III**   **(3-0-0)**

Fourier series: Fourier series; Half- range series, Harmonic analysis.

Solution in series: Differentiation & integration of infinite series, series solution of differentials equations, Bessel & Legendre equations, there series solution, elementary properties of Bessel functions & Legendre polynomials.

Complex Variables: Functions of a complex variable, Exponential, Trigonometric, Hyperbolic & Logarithmic functions, Differentiation, Analytic functions, Cauchy- Riemann equations, conjugate functions, Application to two dimensional potential problems, Conformal transformations, Schwartz- Christoffel transformation, Cauchy's integral theorem, Taylor's & Laurent's expansions, Branch points, zeros, Poles & residues, Simple problems on contour integration.

Boundary value problems: Equation for vibration of strings, heat flow & electrical transmission lines, Laplace's equation in Cartesian, Cylindrical polar and spherical polar coordinates;, Solution by separation of variables.

Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier & Laplace transforms, Simple applications of these transforms to one dimensional problems.

CS1302 – P   NUMERICAL ANALYSIS & COMPUTER PROGRAM (C & C++) LAB
(0-0-3)

Development of computer program for

- Numerical integration by Trapezoidal & Simpson's rule.

- Gauss- Siedeliteration method.

- Various matrix operatio: I''I- & their use as Sub - routines.

ME 1307- P MATERIAL SCIENCE LAB   (0-0-3)

List of experiments

1.   To study the lattice structure of various types of unit cells, observe the mille indices for various planes & directions in unit cells.

2.   To study the microstructure of cast iron, mild steel, brass solder underancaed, cold work forged, rolled condition.

3.   To verify Hall effect.

4.   To verify the fracture, characteristics of ductile & brittle materials.

5.   To determine the chemical composition of a few common alloys.

6.   To determine the percentage of carbon & sulphur contents in a alloy with Fe as main constituent.

ME 1308-P   STRENGTH OF MATERIALS LAB   (0-0-3)

List of experiments

1.   Tensile test: To prepare the tensile test upon the given specimen (Mild Steel)

2.   Compression test: To determine the compressive strength of the given specimen.

3.   Torsion test: To perform the Torsion test on the given specimen.

4.   Impact test: To determine the Impact toughness of the given material.

5.   Brinell Hardness test: To determine the hardness of the given specimen.

6.   Vicker's Hardness test: To determine the hardness of the given specimen.

7.   Rockwell Hardness test: To determine the hardness of the given specimen.

List of experiments

1.   Verification of Bernoulli's theorem.

2.   Determination of Co-efficient of discharge for a venture-meter.

3.   Determination of loss of head of water flowing in pipe, through different climaters

4.   Determination of loss of head due to friction.

5.   Determination of Co-efficient of discharge for Orifice meter.

6.   Determination of met accenteric height of a boat model.

7.   Verification of Reynolds Law.

8.   Viscosity determination of a liquid by capillary tube method.

Syllabus of B. Tech. in Mechanical Engineering

Semester IV

ME1401   MECHANICAL MEASUREMENTS & METROLOGY   (2-0-0)

1.   Mechanical Measurements

Introduction: Introduction to measurement & measuring instruments, Generalized measuring system & functional elements, accuracy & precision, units of measurement, static & dynamic performance characteristics of measurement devices, calibration concept of error, sources of error, Statistical analysis of errors.   (5 lectures)

Sensor & Transducers: Types of sensors, types of transducers & there characteristics. (3 lectures)

Measurement Of Displacement & Angular Velocity   (2 lectures)

Measurement of pressure: Gravitational, directing acting, elastic & indirect type pressure transducers, Measurement of very low pressure.   (3 lectures)

Strain measurement: Types of strain gauges & there working, strain gauge circuits, temperature compensation. Strain rosettes.   (3 lectures)

2.   Metrology

Standards of linear measurement, line end standards.   (1 Lecture)

System of limits & fits   (1 Lecture)

Linear & angular measurements devices & systems.   (1 Lecture)

Limit gauges & their design.   (1 Lecture)

Measurement of geometric forms like straight, flatness, roundness & Circularity.(2 Lecture)

Optical projectors, toolmakers microscope, autocollimators.   (3 Lecture)

Interferometry: principle & use of interferometry, optical flat & interfermometers, laser interfermometers   (3 Lecture)

Comparators. types, working   principles and signification range.   (2 Lecture)

Measurement of screw threads gears   (1 Lecture)

Surface texture quantitative evaluation of surfaces roughness & its measurement (2 Lecture)

Introduction to CMM. In-process gauging systems.

Inspection in-process & final inspection Sampling & 100% inspection Sampling Plans (3 Lecture)

MEl402   INDUSTRJAL ENGINEERING   (2-1-0)

Evaluation of Work Study: Work of F.W. Taylor, Frank & LiIlen Gilberth & others, Productivity definition, Means of increasing productivity, Work Study definition, Productivity & work study, Human factor in the application of work study,.   (8 lectures)

Motion Study: Definition, aims, procedure for method study, selection of jobs, recording techniques, micro motion study, Therbligs, Cyclograph & Chronocyclo-graph, Principles of .motion economy, design of work place layout, Analysis in the form of a chart, operation Chart**,** flow chart, flow diagram, String diagram, Man machine chart, Two hand chart, Simo chart.   (10 lectures)

Work Measurement (Time Study): Definition, uses, procedure, time study equipment, Performance rating, allowances, Number of cycles to be studied, Determination of standard time, Predetermined Motion Time Systems   (6 lectures)

Job Evaluation: Job evaluation, objectives of job evaluation, Methods of job evaluation, Non-quantitative & quantitative.   (5 lectures)

Wages & Incentives: Characteristics of a good wage or incentive system, Methods of wage payment, Concept of wage incentive schemes, financial & non-financial, Halsely premium plan, Merri's Multiple piece rate system.   (6 lectures)

Concept of New Techniques: Scheduling through Network C P M & PERT, use of linear programming methods to solve product — mix problems.   (5 lectures)

Value Engineering: Concept of value, product life cycle, value engineering approaches, job plan, value tests.   (3 lectures)

ME1403   ADVANCED STRENGTH OF MATERIALS   (3- 3 -0)

Stress and strain in three dimension, theories of yielding,. different theories of failure, comparison of theories of failure, yield loci.   (6 lecture.)

Bending of curved beams in the plain of loading crane hooks, rings and chain links
                                                          (7 lectures)

Strain energy due to direct bending, Castig Liano's theorem, applicable to deflection of simply supported beams and cantilever beams due to shear.   (5 lectures)

Thick cylinders, radial and hoop stresses, applications of compound stress theories, compound cylinders, thick spherical shell, radial and circumferential stresses.   (8 lectures)

Shear center of thin walled open cross flow section shear flow   (4 lectures)

Fatigue: fatigue of metal, Bauschinger's Experiment, strain method of obtaining fatigue ranges; formula connected to Stress range, maximum stress and ultimate strength, .S-N curve, Gerber's formula, Goodman's law.   (6 lectures)

Creep: creep of metals, Mechanism of creep, equilibrium temperature, creep curve, creep rate, prediction of long term properties from short duration list.   (3 lectures)

MEI 404   KINEMATICS OF MACHIN E   (-3- 1-0)

Kinematics: Elements, pairs, mechanisms, four bar Chain and its inversions, velocity and acceleration in mechanism, velocity and acceleration diagrams, Klein's construction, Coriolis component, instantaneous centre method, synthesis of mechanism; pantograph, Scott Russel, Indicator diagram mechanisms, Davis and Ackermenn steering mechanism, Hook's joint.   **(10** lecture s**)**

Brakes and Dynamometers: Band & Block brakes, braking action, absorption and transmission type dynamometers, Prony, rope and hydraulic dynamometers, Braking systems of automobiles   (5 lectures)

Inertia Force Analysis: Velocity and acceleration of slider crank and four bar mechanism s, inertia force, piston thrust and forces in connecting rod, turning moment diagram, flywheel.   (6 lectures).

Governors: Simple, Porter, Proell, Hartnell and spring controlled governors, governor effort, power stability, inertia effects.   (5 lectures)

Cams: types of cams, displacement, velocity and accelerations curves for different cam followers, consideration of pressure angle and wear, analysis of motion of follower for cams with specified contours
                                                                                       (6 lectures)

Gyroscope: Principles of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels   (5 lecture)

Balancing: Balancing of rotating masses in the same and different planes, balancing of reciprocating masses, swaying couple, hammer blow and tractive effort, primary and secondary balancing of a locomotive and internal combustion engines, balancing machines   (7 lectures)

ME1405   MANUFACTURE SCIENCE I   *(3 - 1 - 0)*

Importance of manufacturing, economic & technological definition of Manufacturing_ Survey' of manufacturing process   (2 lectures)

Casting: Basis principal & survey of casting processes, sand casting: patterns, pattern material, allowance, Green and dry sand moulding, moulding methods, moulding sand properties and testing, elements of mould and design consideration Cores: use, materials and making practice, Die, investment and centrifugal casting processes, Melting practice and concepts in solidification, Inspection and defects analysis.   (10 lectures)

Forming: Elastic and plastic deformation, concept of strain-hardening, rolling, forging, extrusion, wire & tube drawing: processes, machines and equipments, parameters arid force calculations
                                                                                    (8 lectures)

Sheet-metal working: Role of sheet metal components Cutting mechanism Description of cutting processes, like blanking, piercing, lancing etc; Description of forming processes: bending cup drawing, coming, embossing etc. basic elements of processes for sheet metal working. Part feeding system: Punch and die clearance and die elements.   (10 lectures)

Welding: Principle of welding, soldering, brazing and adhesive bonding Survey of welding and allied processes. Arc Welding: power sources and consumables. MMAW, TIG processes and their parameter selection. Resistance Welding: principle and equipments Spot, projection and seam welding processes, Gas welding and cutting: processes and equipments.   (10 lectures)

Powder Metallurgy: Powder manufacturing, compaction and sintering processes
Advantages and application of P/M.   (4 lectures)
Manufacturing of plastic components.

EE1412   ELECTIRICAL MACHINESS   (3-1-0)

Electromagnetic and transformers:
Review of laws of Electromagnetic and Electro-mechanics
Autotransformer: Equivalent circuits and equations shown step-up and step-down operations; Comparison with two winding transformer on the basis of copper losses and volume of copper. Three-phase transformers, special constructional features - cruciform mitering, alternative winding arrangements, cooling methodology, conservators, breathers, Buchholz , relay, Transformer connections, vector phase groups. Phase conversions —3 to 1, 3 to 2, **3 to** 6 and   3 to 12.
Parallel operation of **single and three-phase transformers** and load sharing; Testing of 3-phase transformers; Special Purpose **Transformers: Pulse,** Isolation, Welding, Rectifier, High frequency.

DC Machines:
Review of constructional features. Methods of excitation, Armature windings, Power balance, Voltage and torque equations. Operation .as generator-self exaltation principles, Armature reaction, Characteristics of generators and motors, Commutation; Starting and speed control including solid state controllers; Braking, Losses, Efficiency; Testing, efficiency and application of DC motors; Parallel operation of generators; Amplidyne and Metadyne.

Poly-phase Synchronous Machines:
Constructional features, Poly-phase Distributed AC Windings: Types, Coil span and winding factors; Excitation systems, e m f equation and harmonic elimination; Interaction between excitation flux and armature in m.m.f, equivalent circuit model and phasor diagram for circle diagram; Power angle equations and characteristics Voltage regulation and affect of AVR
Synchronizing methods, Parallel operation and load sharing, active and reactive power control, operation on infinite bus-bar.
Analysis under sudden short circuit; Transient parameters;
Motoring mode, Transition from motoring to generating mode, Phasor diagram, steady state operating characteristics, V-curves, starting, synchronous condenser, hunting - damper winding effects, speed control including solid state control.
Testing of Synchronous Machines -- Stability considerations; Brushless generators, Single- phase generators.

Induction Machines:
Review of basic theory and construction, phasor diagram and equivalent circuits, Torque speed characteristics, testing and circle diagram: Starting and speed control including solid state controllers

ME1406-P MECHANICAL MEASUREM ENTS METROLOGY LAB (O-0-3)

List of Experiments (Any Eight)

1. Study of various types of measuring instruments gauges
2. To measure strain.
3. To measure the "Surface Roughness" of a work piece with the help of Profilometer.
4. Study of various types of Dynamometers & to measure force, torque & power.
5. To study the Pressure measuring devices.
6: Study of various types of temperature measuring devices.
7. Calibration of Thermocouples,
8. Study of various types of Flow-meters.
9. To measure the vibration noise of equipments.
10. To study the application of Sensors & Transducers.
11. To measure the Screw Threads &. to determine the flatness of the surface.

M E 1 4 0 7 - P   KINEMATICS OF MACHINE LAB   (0-0-3)

List of Experiments

1. To draw velocity diagram of four bar mechanism.
2. To draw velocity diagram of slider crank mechanism.
3. To draw acceleration diagram of four bar mechanism.
4. To draw displacement diagram, velocity diagram *&* acceleration diagram of cam follower.
5. To draw a cam profile.
6. Determination of Balancing of masses by graphical method for several unbalanced mass in a same place.

ME1408-P   MANUFACTURING SCIENCE 1 LAB   (0-0-3)

List of Experiments

1. To make solid pattern casting of Aluminum.
2. To make a hollow pattern casting of alloy,
3. Fan Box with hook.
4. Hexagonal nut with threading
3. Tungsten Inert Gas Welding (TIG).
6. Metal Inert Gas Welding (MIG)
7. Powder Metallurgy - Compaction of metal powder sintering testing.

EE/413-1-P   ELECTRICAL MACHINES LAB   (0-0-3)

List of Experiments:

Characteristics of DC Machines - motors and generators with different excitation

Hopkinsin's test and Fields test — loss calculations and prediction of performance characteristics.

Speed control of DC motors - conventional and electronics

Determination efficiency of single-phase transformer by using back-to-back test;   Determination efficiency of single-phase transformers by R-L & R-C loads.

Determination of equivalent circuit parameters of a three-phase slip-ring induction motor.

Determination of equivalent circuit parameters of a three-phase squirrel cage induction motor by block rotor test and to draw circle diagram;   -

Phase conversion using Scott connection and perform load test

No-load short-circuit and Zero Power Factor (ZIT') tests 0n a synchronous machine,   Determination of voltage regulation at specified load by (i) EMF, (ii) MMF (iii) Potier method, (iv) ASA methods and comparison of results; Load angle characteristic'-and comparison with theoretical predicted results.

V-curves and inverted V-curves of synchronous machines; Comparison with predicted characteristics; Synchronization of -three Phase alternator With infinite bus bar; study of variation of excitation and mechanical power input on performance

Slip-test, short circuit and lagging current tests on a salient pole machine and determination of armature parameters; Estimation of voltage regulation at specified loads using Blondel's method; Comparison with results from load test.

Sudden short circuit test and determination of   Xc, X^d, X^d- and machine time constants -Determination of X_1, X_2, X_0 by fault simulation methods,

Study of Automatic Voltage Regulators (AVR) and from grid to stand alone mode

HS1404-P GENERAL PROFICIENCY IV   (0-0-3)

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation - Paper & oral Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report, / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme NSS).

Semester V

HS 1501   MANAGEMENT SCIENCE   (2-1-0)

Basic Concepts and Functions of Management
Planning
Nature, Purpose and Objectives of Planning, Organizing: nature and Purpose, Authority and Responsibility, Staining, Supply of Human Resources, Performance Appraisal, Controlling: System and Process of Controlling, Control Techniques,

Human Resource Management
Nature and Scope of Human Resource Planning, Training and Development, Recruitment and Selection, Career Growth,. Grievances, Motivation and its types. Need for Motivation, Reward and Punishment. Models for Motivation Leaders
Kind of Leaders, leadership styles, Roles and Function of Leaders, Conflict Management, Kinds and Cause of Conflict, Settlement of Conflict, Group and Team working, Organizational Design and Development

Marketing Management
Marketing Environment Consumer Markets and Buyer Behavior, Marketing Mix, Advertising and Sales Promotion, Channels of Distribution.

Financial Management and Accounting Concepts
Book Keeping, Financial Statement Analysis, Financial Ratios, Capital Budgeting, Break-Even Analysis

Production/Operation Management:
 Planning and Design of Production and Operation Systems, Facilities Planning, Location, Layout and Movement of Materials, Materials Management and Inventory Control, Maintenance management, PERT & CPM.

Management Information System:
Role of information in decision making, Information system planning, Design and Implementation, Evaluation and Effectiveness of Information System
Statistical Quality Control, TQM and ISO Certification

Social and Ethical Issues in Management
Ethics in management, Social Factors, Unfair and Restrictive Trade Practices

Strategic and Technology Management:
Need, Nature, Scope and Strategy, SWOT analysis, value and concepts

ME1502   PRODUCT DEVELOPMENT   (2- 1 -0)

Background for design, design theory, design materials, human factors it design, applied ergonomics, product development processes and organisations, identifying customer needs, establishing product specifications, concept generation and sc: lection, product architecture.

Product design methods
Creative and rational, clarifying objectives - the objective trees method, establishing functions the function analysis Method, setting requirements the performance specification method, determining characteristics -the QFD method, generating alternatives - the morphological chart method, evaluating alternatives - the weighted objectives method, improving details - the value engineering method and design strategies.

Design for manufacture
Estimating manufacturing costs reducing component, assembly and support costs design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective proto typing - principles and planning.

Industrial design
Its need, impact and quality, industrial design process and its management
Legal issues in product design, design resources, economics and management of product development projects.

ME 1503   MACHINE DESIGN   (3-1-0)

Materials
Properties and IS coding of various materials, Selection of material from properties and economic aspects.

Design for Strength
Allowable stresses, detailed discussion on factor of safety (factor of ignorance), Stress concentration-causes, Introduction of various design considerations like strength stiffness, weight, cost, space etc, Concept of fatigue failures.

Design of pin, cotter and keyed joints, screw fastenings, subjected to direct stress. Levers, laminated springs under bending: Shafts and shaft couplings in torsion. **design** of shafts and brackets subjected to combined stresses. Design of thin and thick cylinders, power screws, lead screws
Design of weldments subjected to eccentric loading and combined stresses.

ME1504   DYNAMICS OF MACHINES   (3-1-0)

Gears

Laws of gearing, gears terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact- with a gear, interference and under cutting, bevel, helical and spiral gears.   (7 lectures)

Gear Trains

Simple Compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes-sliding and constant mesh gear box for automobiles   :
                                                    (7 lectures)

Vibrations

One dimensional longitudinal transverse and f**orsional** vibration, natural frequency, effect of damping on vibration, **different types of** damping. Forced vibrations, force and displacement transmissibility, **vibration Isolation,** vibration measuring instruments.
                                                    (8 lectures)

Many Degree or Freedom System

Exact-analysis of undamped and damped continuous systems subjected to periodic force, influence numbers, analysis of two and three degree of freedom lumped mass system, principle of tuned absorbers   (7 lectures)

Numerical Methods

Raleigh, Dunkerley Stodola, Rayleigh-Ritz and Holtzer methods for finding natural frequency of continuous / lumped mass systems for different types of end conditions
                                                    (6 lectures)

Critical Speeds of Shafts

Critical speeds of shaft having multiple discs with and without Jumping, secondary critical speed.   (5 lectures)

ME1505   MANUFACTURE SCEENCE II   (3-1-0)

Classification of metal removal processes and machines

Mechanics of metal cutting
Geometry of single point cutting tool and tool angles. Tool nomenclature in ASA ORS & NRS and interrelationship. Mechanism of chip formation and types of chips, chip breakers. Orthogonal and oblique cutting, cutting forces and power required, theories of metal. cutting. Thermal aspects of machining and measurement of chip tool interface temperature. Friction in metal cutting   (9 lectures)

Machinability Concept and evaluation of machinability, tool life, mechanisms of tool . failure, tool life and cutting parameters, rriachinabilitv index. factors affecting rnachinability
                                                                                          (6lectiires)
Cutting fluids Types, selection and application methods   (1lectures)
General purpose machine tools Constructional details of lathe, drilling, milling shaping and planning machines. Tooling, attachments and operations performed, selection or cutting, parameters, calculation of forces and time for machining. Broaching operation.

Capston and turret lathes, single and multiple spindle automates, operations planning and tool layout.   (9 lectures)

Abrasive processes Abrasives: natural and synthetic, manufacturing, nomenclature, selection of grinding wheels, wheel mounting and dressing Machines for surface and cylindrical grinding, their constructional details and processes   (6 lectures)

Surface finishing Honing, lapping, super-finishing, polishing and buffing processes (2 lectures)

Screw threads and gear manufacturing methods**.**   (2 lectures)

Introduction to Jigs and fixture and their use for productivity improvement (3 lectures)

Non-conventional machining Benefits, general applications and survey of non conventional machining processes. Mechanisms of metal removal cooling of equipments process parameters, surface finishing obtained, and specific applications of   EDM, LBM, EBM, ECM, USM, AJM processes.   (6 lectures)

MEI.506   HEAT AND MASS TRANSFER   (3-1-0)

Introduction.
Various modes of heat transfer, Fourier's,. Newton's and Stefan Boltzman's Law. combined modes of heat transfer, thermal diffusivity, overall heat transfer coefficient   (3 lectures)

Conduction
The thermal conductivity of solids, liquids and gases, factors influencing conductivity, measurement. The general differential equation of conduction. One dimensional steady state conduction, linear heat flow through a plane and composite wall, tube and sphere, critical thickness of insulation, Effect of variable thermal conductivity, Conduction with heat sources, heat transfer from, rods heated at one both ends. Heat transfer from fins of uniform cross section, Errors of measurement of temperature thermometer   (12 lectures)

Convection (Forced)
Introduction, laminar boundary layer equations on a flat plate and in a tube, laminar forced convection on a flat plate and in a tube, simple Reynolds analogy, Dimensional analysis of forced convection, empirical relationship for forced convection.   (6 lectures)

Convection (Natural)
Dimensional analysis of natural convection; empirical relationship for natural convection, Convection with phase change Description of condensing flow. A theoretical model of condensing flow, boiling heat transfer, Empirical relationships for convection with phase change.

                                                                                (6 lectures)
Heat Exchangers
Different types of heat exchangers: Determination of heat exchanger performance. Heat exchanger transfer units, Analysts restricted to parallel and counter flow heat exchanger.   (4 lectures)

Thermal Radiation
Introduction, absorption and reflection of -radiant energy .Emission, Radiosity and irradiation Black *and* non black bodies. Krichoff's law intensity of radiation, radiation exchange between black surface, geometric, configuration factor grey body relation exchange between, surfaces of unit configuration factors. Electrical analogy to simple problems. Non-luminous gas radiation. Errors in temperature measurement due *to* radiation   (7 lectures)

Introduction to Mass Transfer
Mass and mole concentrations, molecular diffusion, eddy, diffusion, Molecular diffusion
from an evaporating fluid surface, introduction *to* mass transfer in Laminar and turbulent convection Combined heat and mass transfer, The wet and dry bulb thermometer.   (6 lectures)

MEI507-P   MACHINE DESIGN I LAB   **(0-0-3)**

List of Experiments
1.   Design of Cotter & Pin Joint
2.   Design of a Knuckle Joint
3.   Design of a Shaft.
4.   Design of Spring.
5   Design of Coupling
6.   Design of Screw Jack.
7.   Design of Weld Joints

ME 1508-P   DYNAMICS OF MA MINES LAB   **(0-0-3)**

List of Experiments

1.   To draw the involute profile of a gear.
2.   To determine gear ration of epicyclic gear train by graphical method.
3.   Study & use of vibration measuring instruments.
4.   To determine natural frequency of longitudinal vibration
5.   To determine critical speed of shaft.
6.   To study the Fatigue Testing Machine & to find **the no.** of cycles at which a material fails

MLE1511-P   **HEAT & MASS TRANSFER LAB**   **(0-0-3)**

List of Experiments

1.   Determination of Thermal conductivity of Metal Bar
2.   Determination of Stefan Boltzman Constant
3.   Determination of Heat Transfer co-efficient in natural convection
4.   To determine effectiveness of Tubular Heat Exchanger (Parallel flow & counter flow).
5.   To determine the emissivity of a plate at various temperature.
6   To determine the Steady State Heat flow through composite bar.

ME1509- P   MANUFACTURING SCIENCE LAB   **(0-0-3)**

List of Experiments

1.   Boring & threading.
2.   Making T slot by milling
3.   Shaping V - groove
4.   Polishing of Mild Steel & Aluminum work-piece
5.   Tool - grinding.
6.   Thread cutting

ME1510 – P **COMPUTER AIDED DRAFTING** (0-0-3)

List of Experiments

1. To learn various commands used **in** AUTOCAD
2. To practice for dimensioning.
3. To draw machining & welding symbols in drawing.
4. To draw a component of Machine part.
5. To draw assembly drawing.
6. Autolist program for Tetrahedron/rectangular box.
7. Autolist program of a single slider crank mechanism.
8. Autolist program for drawing "Mohr's circle".
9. Autolist program to calculate VEL, ACC & DISPL

HS1505-P GENERAL PROFICIENCY V (0-0-0)

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation - Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report /Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)

Semester VI

HS1601   PROJECT MANAGEMENT & BUSINESS MANAGEMENT   (2-1-0)

I. PROJECT MANAGEMENT
Concept of Project, Types of project, Project life cycle

Project identification and formulation, Need analysis, Resource surveys marketing research

Project feasibility analysis, Technical feasibility, Choice of technology, financial feasibility, Project budgeting Geographic feasibility. Location and site selection.

Investment analysis, Project appraisal, NPV, IRR, ROI, Payback period, Consideration of risk and uncertainty in the Project

Project finance, Sources of finance, Internal and external finance, World bank, etc,, role of financial institutions.

Project organization: Role and importance of project manager, Project team structure Task force, selection and training of project manager.

Project planning, Implementation and control, Routing and scheduling of project, CPM, PERT and GERT, Project Programming Budgeting System (PPBS).

Project maintaining tool and techniques, Project management information system (PMIS), Project documentation and audit, Computer application in project management

II.   BUSINESS MANAGEMENT

Concept, System approach for business management, Social arid political aspects on business, Forms of business single proprietorship, Partnership; Joint ventures, Components of business management . Business Organization Kinds of organization. Organization structure Line, Functional. Staff Line and staff etc

Financial management

Need of finance, Kinds and sources of capital, Shares & debentures, Fixed and working capital, Assets, Financial statements and their importance in business, Financial ratio current ratio, liquidity ratio, equity ratio, inventory ratio, etc Relation with other departments,

Cost and cost control

Elements of cost, type of cost - direct and indirect variable and fixed labor cost, over head cost. Cost control techniques, Budgets- Meaning. kinds, Budgetary control.

break even analysis

Interest and depreciation

Meaning, Compound interest, Annuity — types capital recovery annuity, present worth annuity, etc , Nominal and effective rate of interest, Depreciation -. meaning, kinds and causes, methods of calculating depreciation- straight line, sinking funds method, declining balance method, etc.

Human Resource Management

Need importance for business, acquisition of human resource; personnel management, difference / relation; between HRM & personnel management strategic human resource management, Relationship with other departments, relation, Trade union Employee union, Disputes and methods of settling disputes - collective bargaining, conciliation, arbitration, etc-

Sales & Marketing

Importance for growth for business; idea or overview, of sales & marketing; effect of consumer behavior on business; relationship of marketing with other departments.

Purchase Management

Importance and objectives, 'Functions and duties, Purchasing procedure, Kinds of purchasing, Relationship with other departments

Managerial Economics

Economic background to management. Economic system and its functions, Managerial economics - nature and scope, its relationship with other disciplines, Determinants, elasticity and kinds of demand; Pricing decisions, Monopoly and Oligopoly, Perfect and monopolistic 'competition. Capital budgeting

Economic Environment

Need importance of regulation of business Capitalism socialism Democratic and mixed Directive principles of state policy (DPSP), government policies Economical commercial, banking fiscal monetary, industrial and technological policies theory of national income, determination, economic fluctuation, stabilization.

ME1 602   IC ENGINE   (2-1-0)

Fuel air cycles real cycles, volumetric efficiency and thermal efficiency effect of' variable specific heats and dissociation on indicator diagram.   (3 lectures)

S.I. Engines
Principles of carburetion, effect of nozzle tip and compressibility, jet size and depression at ventuni-choke and compensation.   (3 **lectures)**

Combustion in S.I. Engines
Flame development and its propagation, ignition lag, effects of engine parameters, Pre-ignition, Combustion chambers.   (3 Lectures)

Ignition system
Battery and coil ignition system. Magneto system, spark advancing   (3 Lectures)

Combustion in LC. Engines
P.O. indicator diagram and their study for various stages of combustion, delay period, combustion chambers.   (4 lectures)

Detonation in LC. Engines
Various parameters effecting detonation, knock rating of fuel, Octane and centane numbers, H.U.C.R. action of dopes; Valve timing and firing order.   (3 lectures)

Fuel injection system
Air and solid injection; fuel pump and injectors, petrol injection.   (3 lectures)

Supercharging in LC. Engines
Effect of altitude on power output; types of supercharger.   (3 lectures)

Two Stroke Engine
Constructional detail, scavenging system, valve diagrams, Supercharging.   (3   lectures)

Cooling system
Piston and cylinder temperature distribution; air and water cooling
Lubrication system. Principles, various methods   (3 lectures)

Testing of Engines
Engine indicator, measure of air and fuel supply Friction losses Mechanical and thermal efficiencies, engine losses and heat balance.   (4 lectures)

Compressor.
Centrifugal and axial type Performance   (3 lectures)

Gas Turbine
Introduction ideal cycles, regeneration, reheating and inter cooling, closed and open cycle operating variables.
Jet propulsion Principles turbojet and turboprop Engines   (3 lectures)

IME1603   MACHINE DESIGN II   (3-1-0)

Fatigue consideration in design

Variable load, Loading pattern. Endurance stresses; influence of size, surface finish notch sensitivity & stress concentration. Goo-dmann line, Soderberg line; Design of machine members, subjected to combined steady alternating stresses. Design of finite life,

Design of gear tooth
Lewis and Buckingham equations, wear and dynamic load consideration Design & force analysis *of* spur, helical, bevel & worm gears. Bearing reactions due to gear tooth forces Detailed design of the fixed ratio gear boxes.

Design of sliding & **journal bearing,** method of lubrication, hydrodynamic, hydrostatic, boundary etc. Mini.mun films thickness & thermal equilibrium

Design of fly wheels, plate clutches, brakes, crank shafts, cam shaft & connecting rod Design of helical springs. Design of crane hook, C-lamp, machine frame etc.

ME1604　　　　　　FLUID MACHINERY　　　　　　　　　　　　(3-1-0)

Introduction

Classification- energy transfer between fluid arid rotor - Flow through machines ideal
and actual slip　　　　　　　　　　　　　　　　　　　　　　　　(6 lectures)

Hydraulic Turbines

Impulse type - Pelton wheel - Reaction type - Francis, Kalpan and Propeller Principle of operation-
regulation and performance — Draf tube　　　　　　　　　　　(12 lecture)

Hydraulic Pumps

Radial Flow, axial flow and mixed flow type - reciprocating and centrifugal pumps
performance studies - fluid coupling and torque converter　　　　　(12 lectures)

Compressors and Blowers

Radial flow an axial flow type - reciprocating and centrifugal compressors applications
Characteristics　　　　　　　　　　　　　　　　　　　　　　　(12 lectures)

ME1605   AUTOMATIC CONTROL   (3-1 -0)

Introduction:

Meaning and need of automation, Types of automation: fixed, programmable, flexible, and integrated automation.   ,

Components of automation
Actuators, controllers, sensors. Actuators; Solenoids and torque motors, Hydraulic and pneumatic actuators, valves and circuits Sensors, characteristics, contact a nd non contact type, Pressure switches, proximity and position sensors. Encoders,
resolvers, synchros. Vision systems; Components of vision systems, image, camera, image capturing systems, processing systems Bar coding and other identification systems. Controllers; Digital and analog control, open and closed loop control, servo system, servo system analysis and response control configuration

Logic control and PLC's
Logic control, logic control elements, Programmable logic controllers- Application architecture, operation, and programming of PLCs. Typical applications.

Automated material handling systems
Automated flow line's, transfer mechanisms, conveyors, robots, Automated guided vehicles, categories, guidance technologies and control: Automated Storage and Retrieval Systems, categories and components.

Automated inspection systems
In process gauging systems, Co-ordinate measuring machines: Construction, operational modes and different probes.
Automated assembly systems:

Factory communication –
Interface standards, Communication networks, LAN, WAN, Protocols: OSI and MAP.

Flexible Manufacturing systems
Types, components, architecture and control
Computer integrated manufacturing.

Refrigeration and heating systems Air Refrigeration. systems; Bell Cole man air refrigeration cycle. Aircraft air conditioning systems and its performance; steam and air heating systems; piping and accessories.

Vapor compression refrigeration Simple cycle, T -S and p-h charts, analysis of vapor compression cycle; factors effecting performance of vapor compression cycle, actual vapor compression cycle; use of multistage compression, heat exchangers, flash chambers; properties of refrigerants and their suitability.

Vapor absorption and other refrigeration systems: Description of system components, generator, rectifier, condenser, absorber, heat exchanger and water pump, Aqua ammonia and water Lithium bromide systems.

Refrigeration equipment: Constructional, details, capacity control and performance of compressors, condensers, evaporators. Expansion devices; Purpose

Psychometrics: Psychometric and Psychometric properties, Psychometric relations, Psychometric chart and its use, Psychometric processes. Humidification and dehumidification; evaporative cooling; Jet water-cooling; air washers and air cleaners; Human comfort: Factors affecting comfort; comfort charts..

Estimating' Requirements: - Heating, cooling, humidifying and de humidifying requirements Loads: Building transmission, infiltration and air charges Heat gain from people, light, power and duct Winter and summer design conditions, air quantity and temperature requirements.

Automotive Air- Conditioning: System location and layout, components, Automotive heaters, air routing and temperature control-Objectives, evaporator care air blow, through the dash circulating unit duct system, system maintenance.

ME16O7   IC ENGINE LAB   (0-0-3)

ME1-608-P   MACHINE DESIGN LAB   (0-0-3)

List of Experiments

ME I609-P FLUID MACHINERY LAB   (0-4-3)

List of Experiments

MEI610-P   REFERIGERATION & AIR CONDITIONING LAB   (0-0-3)

List of Experiments

1.   Refrigeration testing Determination of COP & cooling capacity of refrigeration testing machine.
2   Preparation of vapour compression cycles of refrigeration testing machine
3.   Determination of efficiencies of refrigeration testing machine
4.   Preparation of :
       # Vapour compression cycle &
       # Heal factor of air conditioner
5   Determination of :
       # HP
       # COP &
       # refrigeration capacity of the air conditioner.

HS1606-P GENERAL PROFICIENCY VI   (0-0-0)

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation -Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)

Semester VII

ME 1701-P   **COMPUTER AIDED DESIGN**   (**3-1-**0)

Computer graphics hardware - interactive input and output devices, graphics software, output primitives and their attributes, line drawing and ellipse generating algorithms, interactive picture construction techniques, 2D geometric transformations, window, view port and clipping, 3D display methods, 3D object representation - Bezier curves and splines, 3D geometric and modeling transformations, 3D viewing, wire frame, surface and solid modeling, kinematic analysis of open and closed loop mechanisms.

Purpose and applications of optimum design, formulation and classification of optimization problems, linear programming - simplex method, one dimensional based minimization based on elimination and interpolation, unconstrained optimization direct search and descent methods, constrained optimization - penalty function method.

Introduction to geometric, dynamic, integer and quadratic programming, computer aided optimum design of machine elements like gears, bearings, shafts and springs.

ME1702   NUMERIC CONTROL OF MACHINE TOOLS AND ROBOTICS
(3-1-0)

I. NUMERIC CONTROL:

Introduction to numerical control, components, axes of NC machine tools, open and close loop control, actuation and feedback systems, Point to point, linear and contouring systems. Tooling for NC systems. Steps in NC manufacturing Machining and turning centers and their features. ATC and APC.

NC programming: Input media and coding formats. Manual part programming for lathe, drilling and milling machines, cutter diameter and length compensation. Computer assisted part programming languages APT, EXPAT, ADAPT, COMPACT. CAD / CAM approach of programming.

Computer numerical control, direct and distributed numerical control, adaptive control.
.

II ROBOTICS:

Industrial robots and their applications for transformational and handling activities Configuration and motions Actuators, sensors and end effectors Features like work envelop, precision of movements, weight carrying capacity. Robot programming languages.

Vision systems. Introduction to intelligent robots.

ME1703 AUTOMOBILE ENGINEERING   (3-1-0)

The Automobile
History of development, Automobiles industry in India and abroad testing of automobiles. Resistances to motion and power requirement for propulsion.

Automobile Engines
Requirements and classification, materials, constructional details and manufacturing process of engine components. Exhaust manifolds-types-necessity, maintenance problems: Materials used
(4 lectures)

Frame
Layout of a chassis types of chassis frames and bodies, their constructional features, loading points, testing of frames and materials.   (3 lectures)

Transmission System
Necessity of Clutch in automobile, Types of clutches, clutch material, clutch. lining. Fluid coupling over running clutch, necessity and field of application. Gear boxes, Necessity of gear box, Construction details of sliding mesh, constant mesh, synchromesh and epicyclic *gear* boxes, Automatic transmission system, Hydraulic torque converter.   (7 lecture)

Drive Line and Rear Axle
Propeller shaft, universal joints, Rear axle drives, Torque reaction, driving thrust, overdrive, Hotchkiss and torque tube drives, rear axle types and construction Principle of different types of differential   (5 lectures)

Wheels and Tires —
Types of Wheels and tires Tire construction; functions of tires, solid and pneumatic tires, tire inflation pressure, tire wear and their causes; repair of the tire and tube   (4 lectures)

Steering System
Steering wheel and steering column, Steering boxes, steering linkages, steering mechanisms, under and over steering. Front axle, Steering Geometry wheel alignment. wheel balancing, centre point steering, power steering.   (6 lectures)

Suspension system
Objects and requirements, Types of suspension systems, suspension spring, front and rear suspension systems, Independent suspension system, shock absorber.   (3 lectures)

Brakes
Necessity of brake, theory of brake shoe, Classification and function, self energizing brakes, lining materials, factors influencing operation of brakes such as operating Temperature, using area etc
(6 lectures)

Storage Battery
Charging, discharging and testing of battery, capacity and efficiency. method of charging from D C and A C mains, defects and remedies of battery of idle and new batteries, maintenance and storage of batteries.   (2 lecture)

Starter Motor
Battery motor starting system series motor and its characteristics consideration in selecting size of motor. Types of drives, starting and generating circuit, solenoid switches. (3 lecture)

Wiring for Auto Electrical Systems
Wiring diagram of typical wiring systems and wire loops.   (2 lectures)

ME1704-P   COMPUTER AIDED DESIGN   (0-0-3)

List of Experiments
1. Power transmission by interference feet
2. Design of gears by `C Program'.
3. Selection of bearing
4. Design of shaft.
5. Design of thick cylinder.
6. Design of spring.
7. `**3** D modelling & analysis of stresses'
8. 'C' Program for design of Flange coupling.

ME 1705   NUMERIC CONTROL OF MACHINE TOOLS & ROBOTICS   (0-0-3)

List of Experiments
1. Development of camp profile.
2. Development of drilling jig.
3. Development & machining of irregular shapes machine parts.
4. Determination of joint velocities of a robot.

ME1706-P   AUTOMOBILE ENGINEERING LAB   **(0-0-3)**

List of Experiments

1   To study& practice of "Stearing system".

2   To study & practice of "Ignition system".

3   To study & practice of "Transmission system.

4   To study & practice of "Suspension system".

5   To study & practice of "Braking System "

6   To study & analysis, of "Chassis" (frame)

7   To study & analysis of 1ubrication & cooling system.

H.S1707-P   **GENERAL PROFICIENCY VII**   **(0-0-0)**

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation -Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)

ME1801 POWER PLANT ENGINEERING   (3-1-0)

Introduction: Power and energy, sources of energy, review of thermodynamic cycle related to power plants, fuels and combustion, steam generators and steam prime movers, steam condensers, water turbines.

Variable Load Problem: industrial production and power generation compared ideal and realised load curves, terms and factors. Effect of variable load on power plant operation, methods of meeting the variable load problem. Power plant economics and other considerations in plant selection.

Steam power plant: Power plant boilers including critical and super critical boilers fluidized bed boilers, boilers mountings and accessories general layout of a steam power plant different systems such as fluid handling systems, combustion system, draft, ash handling system, feed water treatment, regenerative systems, condenser and cooling system, turbine auxiliary systems such as governing, feed heating, turbine mountings, lubrication, flange bearing and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency trouble shooting and remedies.

Diesel power plant: General layout, performance of diesel engine, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, cooling system, diesel plant operation and efficiency, heat balance, trouble shooting and remedies.

Gas turbine power plant: Elements of gas turbine power plants, regeneration and reheating, cogeneration, Auxiliary systems such as fuel, controls and lubrication, operation and maintenance performance and trouble shooting and remedies.

Nuclear power plant: Principles of nuclear energy, basic components of nuclear reactions , nuclear power station, troubleshooting and remedies.

Hydro electric station: principles of working, applications; site selection classification and arrangement of -hydro-electric plants run off size of plant and choice of units, operation and maintenance hydro systems, interconnected systems trouble shooting and remedies.

ME1802   MECHANICAL SYSTEMATIC DESIGN   (3-1-0)

Design of Engineering system with it sub-systems including consideration of alternatives.

Specifications of the components of engineering system

Designing various components of the system from manufacturing point of view -

 Systems will be selected out of the following:

- Material handling and transportation systems
- A system power plant
          (i) Boiler (ii) Condenser   (iii) Turbine (steam)
- Refrigeration and Air-conditioning
          (i) Compressor (ii) Condenser   (iii) Evaporator
- Pneumatic and Hydraulic *System*s
          (i) Single *and* double acting cylinders
          (ii)   Control valves
           (ii) Hydraulic cylinder
- A pressure vessel   •
          (i) Vessel   (ii) Ends
          (iii) Supports   (iv) Nozzles and manholes

H.S1707-P   **GENERAL PROFICIENCY VII**   **(0-0-0)**

Debate, Elocution, Extempore, Group Discussion, Panel Discussion, Presentation -Paper & oral, Allegation & clarification, Quiz / Brain Teaser, Survey Report / Project Report / Case Study, Dissertation, Mock Interview, Expository / Argumentative Report & National Service Scheme (NSS)