PANDIT DEENDAYAL PETROLEUM UNIVERSITY
SCHOOL OF TECHNOLOGY
COURSE STRUCTURE FOR B.TECH. MECHANICAL ENGINEERING

SEMESTER IV			B.TECH. MECHANICAL ENGINEERING											
Sr. No	Course Code	Course Name	Teaching Scheme					Exam Scheme						
			L	T	P	C	Hrs/wk	Theory			Practical		Total Marks
								MS	ES	IA	LW	LE/Viva	
1	MA 202T	Numerical Methods	3	1	0	7	4	30	60	10	--	--	100
2	ME/IE 202T	Manufacturing Processes -I	3	0	-	6	3	30	60	10	--	--	100
	ME/IE202P		--	--	2	1	2	--	--	--	25	25	50
3	ME/IE 206T	Design of Machine Elements	3	0	--	6	3	30	60	10	--	--	100
	ME/IE 206P		--	--	4	2	4	--	--	--	50	50	100
4	ME/IE 207T	Kinematics of Machines	2	0	--	4	2	30	60	10	--	--	100
	ME/IE 207P		--	--	2	1	2	--	--	--	25	25	50
5	ME/IE208T	Engineering Metallurgy	3	0	--	6	3	30	60	10	--	--	100
	ME/IE 208P		--	--	2	1	2	--	--	--	25	25	50
6	ME/IE 209T	Fluid Machinery	3	0	--	6	3	30	60	10	--	--	100
	ME/IE 209P		--	--	2	1	2	--	--	--	25	25	50
		Total	**17**	**1**	**12**	**41**	**30**						900

MS = Mid Semester, ES = End Semester; IA = Internal assessment (like quiz, assignments etc)

LW = Laboratory work; LE = Laboratory Exam

MA202T NUMERICAL METHODS										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Term Work	Practical /Viva	Total Marks
					ES	MS	IA			
3	1	--	7	4	60	30	10	--	--	100

UNIT I **12**

Numerical Solution of System of linear equations & non-linear equations: Solution of transcendental and non-linear equations by Bisection, Regulafalsi, Newton's Raphson and secant method. Solution of a system of linear simultaneous equations by LU Decomposition, Cholesky Decomposition, Jacobi and Gauss Seidel methods. Ill conditioned system, Norms. Solution of a tridiagonal system, Evaluation of largest & smallest Eigen values and corresponding Eigen vectors by Power method.

UNIT II **16**

Interpolation and Numerical Integration: Finite differences, Interpolation and extrapolation, Errors in interpolating polynomial, Newton-Gregory forward and backward, Gauss forward and backward, Lagrange and Newton's divided difference formulae, Inverse interpolation by Lagrange methods, Numerical differentiation and integration, Trapezoidal, Simpson's 1/3rd, Simpson's $3/8^{th}$ Rule. Numerical solution of first order ordinary differential equation by Taylor's series, Picard's Euler's, Modified Euler's, Runge-Kutta methods. Multi step methods: Adams- Moulton method, Milne's method. Numerical solution of boundary value problems by finite difference.

UNIT III **12**

Probability: Various approaches of probability-classical, frequency (statistical), subjective and axiomatic. Theorems on probability, conditional probability, independence, Bayes Theorem.
Random variable-discrete and continuous. Distribution function and their properties, probability mass and density functions.

UNIT IV **12**

Statistics: Mathematical expectation, Moment generating function and its properties. Probability distributions: Bernoulli, binomial, negative binomial, Poisson and normal distributions. Theory of least squares and curve fitting. Correlation-Simple, multiple and partial, Regression lines and regression coefficients.

Approximate Total : 52 Hrs

References Books:

1. B.S. Grewal, Numerical Methods in Engineering and Science with Programs in C & C++, Khanna Publisher
2. S.S. Sastry, Introductory Methods for Numerical Analysis, Prentice Hall of India.
3. M.K. Jain, S.R.K. Iyenger and R.K. Jain, Numerical Methods for Scientific and Engineering Computation, New Age International
4. S.C. Gupta and V.K. Kapoor, Fundamentals of Mathematical Statistics, S. Chand Publisher
5. R.K. Jain & S.R.K. Iyenger,Advanced Engineering Mathematics, Narosa.

ME/IE 202T MANUFACTURING PROCESSES –I										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100

UNIT I : **04**

Kinematic schemes of machine tools – Constructional features of speed gear box and feed gear box.

UNIT – II: **10**

Engine lathe: Principle of working, specification of lathe – types of lathe – work holders tool holders – Boxtools Taper turning thread turning – for Lathes and attachments.Turret and capstan lathes – collet chucks – other work holders – tool holding devices – box and tool layout.Principal features of automatic lathes – classification – Single spindle and multi-spindle automatic lathes– tool layout and cam design.

Shaping slotting and planning machines: Principles of working – Principal parts – specification classification,operations performed. Kinematic scheme of the shaping slotting and planning machines, machining time calculations.

UNIT – III: **15**

Drilling and Boring Machines: Principles of working, specifications, types, operations performed – tool holding devices – twist drill – Boring machines – Fine boring machines – Jig Boring machine. Deep holedrilling machine. Kinematics scheme of the drilling and boring machines

Milling machine: Principles of working – specifications – classifications of milling machines – Principal features of horizontal, vertical and universal milling machines – machining operations Types geometry of milling cutters – milling cutters – methods of indexing – Accessories to milling machines, kinematic scheme of milling cutters – milling cutters – methods of indexing.

Grinding machine: Fundamentals – Theory of grinding – classification of grinding machine – cylindrical and surface grinding machine – Tool and cutter grinding machine – special types of grinding machines – Different types of abrasives – bonds specification of a grinding wheel and selection of a grinding wheel Kinematic scheme of grinding machines.

UNIT –IV: **10**

Lapping, honing and broaching machines: comparison to grinding – lapping and honing. Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations.

Principles of design of Jigs and fixtures and uses: Classification of Jigs & Fixtures – Principles of location and clamping – Types of clamping & work holding devices. Typical examples of jigs and fixtures.

Approximate Total : 39Hrs

REFERENCES / TEXT BOOKS :

1. R.K. Jain and S.C. Gupta, Production Technology.
2. Production Technology, H.M.T. (Hindustan Machine Tools).
3. C.Elanchezhian and M. Vijayan, Machine Tools, Anuradha Agencies Publishers.
4. B.S.RaghuVamshi, Workshop Technology – Vol II,

ME/IE 202P MANUFACTURING PROCESSES –I										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

List of Experiments:

1. Prepare a Job on Lathe Machine.
2. Prepare a Job on Milling Machine.
3. Prepare a Job on Drilling Machine.
4. Prepare a Job on Grinding Machine.
5. Prepare a Job on Shaping Machine.
6. Total productive maintenance of different machines like drilling, milling, grinding, shaping
7. Effect of operating variables
8. Study of specification of machines through different catalogs.

ME/IE 206T DESIGN OF MECHINE ELEMENTS										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100

UNIT I: **09**

Concepts of Mechanics of Solids: Axial, Bending, and Torsional loading, Static vs. dynamics loads, Impact load, Stress, Strain, Generalized Hooke's law, Plane stress and plane strain conditions, Mohr's circle, Combined loading, Torsional and bending stress, Curved Beams, Stiffness in tension, bending, torsion and combined situations, Column buckling, Theories of failure

Engineering Materials: Materials testing and their properties, Tension, Compression, Hardness and Torsion test, Fatigue test and estimation of endurance strength, Goodman's line,Soderberg's line, Modified Goodman's line, Creep, Heat Treatment of steels, BIS codes of steels, Materials selection**Design Concepts:** Stress concentration, Theoretical stress concentration factor, Factor of safety, Design for strength, rigidity, Manufacturability, Assembly, Reliability, Ergonomics etc., Preferred numbers, Fits and Tolerances, Design for static and dynamics loads

UNIT II **14**

Design of Permanent Joints: Permanent vs. temporary joints, Advantages and disadvantages of permanent joints

Riveted Joint: Terminology of a riveted joint, types of rivets and riveted joints, Materials for rivets, Stresses in rivets and design of a riveted joint, Joint Efficiency, Longitudinal and circumferential riveted joint for boilers and pressure vessels, Eccentrically loaded riveted joint

Welded Joint: Types of welded joints, Weld Materials, Stresses in welded joints and design of welded joints, Welded joint subjected to eccentric loading

Design of Keys, Cotters and Knuckle Joints: Types of keys, Stresses in keys and their design, Design of Cotter joint, Spigot and socket joint, Sleeve and Cotter, Jib and cotter joint, Knuckle joint.

UNIT III **08**

Design of Shafts: Shaft Material, Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads, Use of internal and external circlips, Gaskets and seals

Design of Shaft Couplings: Types of couplings, Rigid vs. flexible couplings, Flange coupling.

UNIT IV **08**

Design of Mechanical Springs: Types of springs, Materials for Springs, Stresses, deflection and buckling of helical springs, Spring for fatigue loading, Natural frequency of helical springs, Helical Springs of non-circular cross-sections, Helical Tension spring, Energy storage capacity, Helical torsion springs, Co-axial springs,leaf springs

Approximate Total: 39Hrs

Texts and References

1. C. Sharma and K. Purohit, Design of Machine Elements, PHI Publishers.
2. U. Jindal, Machine Design, Pearson Publishers.
3. N. Pandya and C. Shah, Machine Design, Charotar Publishers.
4. J. Shigley, C. Mischke, R. Budynas, Mechanical Engineering Design, Tata-McGraw Hill

Publishers.
5. R. Juvinall, K. Marshek, Fundamental of Machine Component Design, John Wiley and Sons Publishers.
6. R. Norton, Machine Design: An Integrated Approach, Pearson Education Publishers.
7. V. Bhandari, Machine Design, Tata-McGraw Hill Publishers.
8. S. Kazimi, Solid Mechanics, Tata-McGraw Hill Publishers.

ME/IE 206P DESIGN OF MECHINE ELEMENTS										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	4	2	4	--	--	--	50	50	100

List of Design Problem:

1. Machine Drawing Sheet 1: Free-hand drawing, title block, reproduction of given orthographic and isometric views
2. Machine Drawing Sheet 2: Preparation of Orthographic, Isometric and Sectional views
3. Machine Drawing Sheet 3: Preparation of sketches for various threads, threaded fasteners, keys, shafts, and joints
4. Machine Drawing Sheet 4: Preparation of an assembly drawing for a simple machine
5. Machine Drawing Sheet 5: Preparation of an assembly drawing for a complex engineering machine (**Title block consists of surface roughness and tolerances.)**
6. Design exercise for threaded fasteners, riveted and welded joints, boiler joints
7. Design exercise for temporary joints
8. Design exercise for shaft and shaft couplings
9. Design exercise for springs

Computer Aided Drafting:

1. Introduction to CADD and CAD software
2. Practice of CADD and CAD software

ME/IE 207T Kinematics of Machines										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	--	4	2	50	50	--	--	--	100

UNIT I **7**

Fundamentals of Kinematics and Mechanisms Kinematic link, Types of links, Kinematic pair, Types of constrained motions, Types of Kinematic pairs,Kinematic chain, Types of joints, Mechanism, Machine, Degree of freedom (Mobility), Kutzbachcrieterion, Grubler's criterion. Four bar chain and its inversions, Grashoff's law, Slider crank chain and its inversions, Double slider crank chain and its inversions. Pantograph, Swinging/Rocking mechanisms, Geneva mechanism. Equivalent linkage of mechanisms.

Steering gear mechanisms: Condition for correct steering, Davis steering gear mechanism, Ackermannsteering gear mechanism.

UNIT II **6**

Velocity and Acceleration Analysis of Simple Mechanisms : **Graphical Methods-I:**Relative velocity method: Relative velocity of a point on a link, Angular velocity of a link, Slidingvelocity, Velocity polygons for simple mechanisms. Relative acceleration method: Relative accelerationof a point on a link, Angular acceleration of a link, Acceleration polygons for simple mechanisms.

Instantaneous center of rotation (ICR) method: Defination of ICR, Types of ICRs, Methods of locating ICRs, Kennedy's Theorem, Body and space centrode.

UNIT III **7**

Velocity and Acceleration Analysis of Mechanisms:Graphical Methods-II: Velocity and acceleration diagrams for the mechanisms involving Coriolis component of acceleration.Klein's construction.

Kinematic Analysis of Mechanisms:Analytical Methods: Analytical methods for displacement, velocity and acceleration analysis of slider crank mechanism.Position analysis of links with vector and complex algebra methods, Loop closure equation, Chacesolution, Velocity and acceleration analysis of four bar and slider crank mechanisms using vector andcomplex algebra methods.Hooke's joint, Double Hooke's joint.

UNIT IV **9**

Introduction to Synthesis of Linkages: Steps in synthesis process: Type, number and dimensional synthesis. Tasks of Kinematic synthesis: Path,function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanicaland structural errors, Branch defect and order defect, Crank Rocker mechanisms.

Graphical synthesis: Two and three position synthesis using relative pole method and inversion method for single slidercrank and four bar mechanism, Three position motion synthesis of four bar Mechanism.

Analyticalsynthesis: Derivation of Freudenstein's equation, Three position function generation using Freudenstein's equation.

Cams:

Introduction, Types of cams, Types of followers, Definitions, Follower displacement diagrams, High speed cams, Motions of follower, Layouts of cam profiles, Cams with specified contours, Analysis of cams.

APPROXIMATE TOTAL 26 Hours

Texts and References

1. S. S. Ratan, “Theory of Machines”, Tata McGraw-Hill publications, New Delhi
2.GhoshAmitabha,“Theory of Mechanisms and Machines”, East West Press
3. Rao J.S. and Dukkipati R.V, “Mechanisms and theory Machines theory”, Wiley Eastern Ltd.
4. Shigley J.E and Uicker J.J, “Theory of Machines and Mechanisms,”, Oxford University Press

ME/IE 207P Kinematics of Machines										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

List of Experiments:

1. To study various types of kinematic links, pairs, chains and mechanisms.
2. To study inversions of 4 bar mechanisms, single and double slider crank mechanisms.
3. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.
4. To study various types of steering mechanisms.
5. To study various type of cam and follower arrangements.
6. To plot follower displacement vs cam rotation for various Cam Follower systems.
7. To perform velocity and acceleration analysis of various mechanisms by graphical method and analytical method
8. Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.

ME/IE 208T ENGINEERING METALLURGY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100

UNIT I **09**

Structure Property Relation: Engineering metals and alloys , Elastic and plastic deformation, deformation in a single crystal and polycrystalline metal, Critical resolved shear stress, plastic deformation mechanisms-slip and twin, effect of defects on deformation mechanism, work hardening, fracture in metals , changes in properties due to deformation, Re-crystallisation, cold working and hard working.

UNIT II **10**

Testing of metals Concept of stress and strain, strength, elasticity, plasticity, stiffness, resilience, Toughness, Malleability, Ductility, and Brittleness. Destructive Tests like: Tension Test- Engineering and True stress-strain curves, their conversion relationships, evaluation of properties. Numerical based on tension test, engineering stress-strain diagram for ductile and brittle metal, compression test. Hardness test- Brinell. Poldi, Vickers, Rockwell, Rockwell superficial. Micro hardness test. Impact tests- Charpy and izod, , Fatigue and creep test, Erichsen cupping test , concept of fracture toughness testing ;

Introduction to Non Destructive Testing: Visual Inspection, dye penetration test, ultra sonic test,.

UNIT III **10**

Ferrous metals and Designation Wrought and cast components, Allotropy of Iron, Iron-carbon diagram, plain carbon steels, limitations of plain carbon steel, and advantages of alloy steels. Effect of alloying elements on mechanical properties of steel, Alloy steels, Tool steels, stainless steels, cast irons. Designation of steels and cast iron.

Heat Treatment Effect of non equilibrium cooling on microstructure and properties of steel, TTT diagram for 0.8% carbon steel only, Isothermal treatments, Continous cooling Transformation curves, Critical Cooling Rate & Heat treatments like Annealing, Normalizing, Hardening and tempering. Hardenability of steels, Jominey end quench test, surface hardening treatment scarburizing. Nitriding, Carbonitriding, tufftride, sursulf, Induction hardening and flame hardening.

UNIT IV **10**

Introduction to Powder Metallurgy- applications

Non ferrous metals and alloys- Copper and its alloys, Aluminium and its alloys, babbits.

Introduction to Advanced Material Types and Properties of Composite materials, High temperature materials& cryogenic materials. Glass and Rubber.

Approximate Total: 39Hrs

References / Books :

1. R.A. Higgins, Engineering Metallurgy, Viva Books Pvt Ltd.
2. R.A.Higgins, Properties of Engineering Materials Viva Books Pvt Ltd.
3. DrV.D.Kodgire, Material science and metallurgy for Engineers.
4. Donald RAskeland, The Science and Engineering of materials, Thomson Brooks.
5. R.E. Reed-Hill, Physical Metallurgy Principles, Cengage Learning.
6. F.C. Compbell, Elements of Metallurgy and Engineering Alloys, ASM International, Ohio.
7. R .E. Smallman, A.H.W. Nagan Physical Metallurgy and Advanced Materials, Elsevier.
8. William D Callister, Jr., Materials Science and Engineering, Wiley India (P) Ltd.
9. D.A. Porter and K.E. Easterling, Phase Transformations in Metals and Alloys, Second edition,

Chapman and Hall, London

ME/IE 208P ENGINEERING METALLURGY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

List of Experiments:

1. Plot the following data on stress v/s strain curve and understand and derived the following mechanical properties; modulus of elasticity (E), Yield strength (0.2 %), Tensile strength and % elongation & modulus of resilience.
   Plot the following data on true stress v/s strain curve and understand difference between the engineering and true stress v/s strain
2. Importance of Modulus of Resilience.
   Plot the following date of TS and hardness and understand the VARIABILITY OF MATERIAL PROPERTIE through the Standard Deviation.
3. Hardness measurement
   Plot the following data on Impact energy v/s temperate and understand the importance of DBTT curve
4. Plot the following data of fatigue test [stress amplitude v/s number of cycle (longN)] and calculate fatigue life & fatigue strength.
5. Apply the lever rule for the following phase diagrams and calculate number of phases, composition of phase, and amount of phases for the given condition.
6. Introduction to Metallographic
7. Introduction of MICROSCOPIC TECHNIQUES
   Determination of ASTM Grain Size Number
8. Guided bend test for the determination of soundness and ductility of welds in ferrous and non ferrous materials.
9. To determine the macro hardness of the steel and aluminum samples using Macro Vickers hardness test.
10. To determine the micro hardness of the steel and aluminum samples using Knoop and Vickers hardness tests.
11. Study the variation in micro and macro hardness of the welded steel samples using Vickers hardness test.
12. To develop and observe the microstructure of the steel/welded samples under optical microscope.
13. To develop and observe the macrostructure of steel/welded samples under optical microscope & Measurement of weld bead dimensions using tool maker microscope
14. Study the application and use of image analysis software in Engineering Metallurgy.
15. To develop and observe the microstructure of different nonferrous materials- Aluminum and Copper.
16. Study of ASTM STANDARS; the Standard Test Methods and Definitions for Mechanical Testing of Steel Products (ASTM Designation: A 370 – 07).Standard Terminology Relating to Methods of Mechanical Testing (ASTM Designation: E 6 – 07)
17. Industrial visit to Heat Treatment Plant.
18. Experiment based on NDT; DP, UT.

ME/IE 209T FLUID MACHINERY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
3	0	--	6	3	30	60	10	--	--	100

UNIT I **06**

Introduction: Definition and classification of turbo machines; Principles of operation; Energy transfer in turbo machines.

Impact of Free Jet: Impulse – momentum principle; Impact of jet on different types of flat and Curved plates fixed and moving single and series of plates held normal or inclined; derivation of efficiency condition for maximum efficiency and value of maximum efficiency.

UNIT II **10**

Hydraulic Turbine: General Lay out and essential components of hydro power plant, Classification of turbines.

Pelton Wheel Turbines: Major component parts; construction; operation and governing mechanism of a Pelton wheel; effective head; available head; work done and efficiency of a Pelton wheel; design aspects; speed ratio; flow ratio; jet ratio; number of jets; number of buckets and working proportions; Performance Characteristics; governing of impulse turbines.

Francis Turbines: Major Component parts; construction and operation of a Francis turbine; governing mechanism; work done by the turbine runner; working proportions and design parameters; slow; medium and fast runners; inward/outward flow reaction turbines; Performance Characteristics.

Propeller and Kaplan turbines: Major Component parts; construction and operation of a Propeller; Kaplan turbine; differences between the Francis and Kaplan turbines; draft tube - its function and different forms; Performance Characteristics; Governing of reaction turbine.

UNIT III **13**

Reciprocating air compressor : compression process, work of compression, single and multi stage compression, volumetric efficiency, air motors

Rotary compressor: centrifugal and axial flow compressor, positive displacement compressor, velocity diagram, Analysis, Design and construction features. Compressor characteristics, surging and choking.

UNIT IV **10**

Pumps: Working principles; classification of pumps.

Centrifugal Pumps: Roto-dynamics pumps; construction and working; velocity vector diagrams and work done; mano-metric efficiency; vane shape;pump losses; minimum starting speed; design considerations; multi-stage pumps. Similarity relations and specific speed; net positive suction head; cavitation and maximum suction lift; performance characteristics.

Reciprocating Pumps: Construction and operational details; work and power input; volumetric efficiency and slip; separation; air vessels and their utility; maximum speed of the rotating crank; characteristic curves; centrifugal V/S reciprocating pumps.

Centrifugal Fans & Blowers: Working principles; types; velocity diagrams; stage parameters, design parameters, losses

Approximate Total: 39Hrs

Texts and References

1. Shepherd, D. G., Principles of Turbo machinery, Macmillan,
2. S. L. Dixon, Fluid Mechanics, Thermodynamics of Turbomachinery, Pergamon Press Ltd.
3. G. Ingram, Basic Concepts in Turbomachinery, Grant Ingram &Ventus Publishing
4. R. K. Turton, Principles of Turbomachinery, Chapman & Hill
5. Cherkassky, V. M., Fans and Compressors, Pumps , Mir Publishers
6. Sayers, A.T., Hydraulic and Compressible Flow Turbo machines, McGraw Hill
7. V. and Manohar Prasad, An Introduction to Energy Conversion Vol.III: Turbo machinery, Wiley Eastern
8. Vasandani, V.P., Hydraulic Machines: Theory and Design, Khanna Publishers
9. Wright,T., Fluid Machinery: Performance, Analysis and Design, CRC Press

ME/IE 209T FLUID MACHINERY										
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
--	--	2	1	2	--	--	--	25	25	50

List of Experiments:

1. Experiment on Performance Characteristics of Pelton Wheel Turbine
2. Experiment on Performance Characteristics of Francis Turbine
3. Experiment on Performance Characteristics of Kaplan Turbine
4. Experiment on performance characteristics of centrifugal pump
5. Experiment on performance characteristics of reciprocating pump
6. Experiment on performance characteristics of axial flow fan
7. Experiment on performance characteristics of jet pump