SANDIP UNIVERSITY

School of Engineering and Technology

Department of Mechanical Engineering

Year: TE B.Tech. **Semester: V**

Course : Hydraulic Machines (MB) **Course Code: 17YME501**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
3	-	-	3	10	20	10	10	--	50	--	100
Max. Time: 3 Hrs. End Semester Exam (Theory)									End Semester Exam (Lab) - 3Hrs.		

Prerequisite: **Fluid Mechanics, Engineering Mechanics**

Course Objectives	
1	To provide the knowledge of basic principles, governing equations and applications of turbo-machines.
2	To understand construction and working principle with detail of velocity diagram of impulse turbine.
3	To explain construction and working principle with detail of velocity diagram of reaction turbine.
4	To provide adequate knowledge about the performance and governing of turbines.
5	To explain construction and working principle with detail of velocity diagram of hydraulic pumps.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Basics of Turbo Machinery:** Turbo machines (Hydraulic & Thermal), Classification of Turbo machines, Comparison with positive displacement machines, Fundamental equation governing turbo machines, Different losses associated with turbo-machinery, Applications of Turbo machines, Introduction to hydro-electric power plant.	10
	II	**Impact of Jet** Impulse – momentum principle, jet impingement - on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes, Jet striking tangentially at the tip of a stationary vane and moving vane(s), jet propulsion of ships.	
2	I	**Impulse Turbine:** Classification – impulse and reaction turbines, water wheels, components, construction and operation of a Pelton wheel, work done, effective head, available head and efficiency of a Pelton wheel, design aspects, speed ratio,flow ratio, jet ratio, number	08

		of jets, number of buckets and working proportions, Numericals.	
3	I	**Reaction Turbine:** Component parts, construction and operation of a Francis turbine, Propeller, Kaplan turbine, differences between the Francis and Kaplan turbines, work done by the turbine runner, working proportions and design parameters, slow, medium and fast runners, degree of reaction, inward/outward flow reaction turbines, construction and operation of a draft tube - its function and different forms, Numericals.	09
4	I	**Model Similitude:** Performance Characteristics and governing of impulse turbines , Performance Characteristics and Governing of reaction turbine, Unit quantities, specific speed and model relationships for turbines, scale effect, cavitation – its causes, harmful effects and prevention, Thomas cavitation factor, permissible installation height, Numericals.	08
5	I	**Hydraulic Pumps:** Pumps: definition and classifications - Centrifugal pump: classifications, working principles, velocity triangles, specific speed, efficiency and performance curves- Reciprocating pump: classification, working principle, indicator diagram, work saved by air vessels and performance curves – cavitation in pumps - rotary pumps: working principles of gear and vane pumps	10
		Total No. of Hrs	**45 Hrs**

Beyond the Syllabus
1. Introduction to new types of turbine, Deriaz (Diagonal), Bulb, Tubular turbines

Course Outcome	
Students should able to	
CO1	Comprehend the concepts of Turbo machinery
CO2	Analyze the performance and understand the working principles of impulse turbine
CO3	Understand the working principles and ability to select turbo machine for given application.
CO4	Predict the performance and understand the governing of turbine and the characteristics of turbine.
CO5	Understand the working principles and various types of hydraulic pumps.

RecommendedResources	
Text Books	1. Modi & Seth, Fluid Mechanics, Hydraulic and Hydraulic Machines, Standard book house. 2. S S Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishers 3. Narayana pillai, Fluid Mechanics & Fluid machines, Universities press. 4. Hydraulic Machines, Dr. J. Lal, Metropolitan Book Co. Pvt. Ltd., Delhi
Reference Books	1. S K Som and G Biswas, Introduction to Fluid Mechanics and Fluid Machines, Tata McGraw Hill. 2. D. S. Kumar, Fluid Mechanics and Fluid Power Engineering, S.K.Kartha

	and sons. 3. R. K. Bansal, Fluid Mechanics and Hydraulic machine, Laxmi Publications (p) ltd., New Delhi 4. Rajput, Fluid mechanics and fluid machines, S. Chand &Co. 5. Vasandani, V.P., Hydraulic Machines-Theory and Design, Khanna Publishers, 1992.
E-Resources	1. https://onlinecourses-archive.nptel.ac.in/noc19_me15

Year: TE B.Tech. **Semester: V**
Course : Design of Machine Elements **Course Code: 17YME502**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
3	-	2	4	10	20	10	10	--	50	50	150
Max. Time: 3 Hrs. End Semester Exam (Theory)									End Semester Exam (Lab) - 2Hrs.		

Prerequisite: **Engineering Drawing, Engineering Mechanics, Solid Mechanics**

Course Objectives	
1	To effectively choose proper materials for different machine elements depending ontheir physical and mechanical properties.
2	To develop a thorough understanding of basic principles of Machine Design to design basic elements viz.shafts, couplings etc.
3	Student shall gain design knowledge of the different types of fasteners and welded joints used in the machine design process.
4	Student shall gain a thorough understanding of the different types of failure modes and criteria for various machine component.
5	To understand the procedure to design different types of springs.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to Design and Design against Static Loads** Basic principle of Machine Design, Design considerations, Fits and tolerances, Factor of safety, Standards & Codes, Preferred Series and Numbers, Principle stresses & strains, Theories of failures.	6
	II	Design of Cotter joint, Knuckle joint, Levers - hand / foot lever, lever for safety valve, bell crank lever, components subjected to eccentric loading.	4
2	I	**Shafts and Couplings** Design of Shaft on the basis of strength, torsional rigidity and lateral rigidity, A.S.M.E. code for shaft design. Types of Keys, their design and selection based on shafting condition. Classification of coupling, Design of Flanged couplings, Bush pin type flexible couplings.	9
3	I	**Design of Fasteners**	5

		Nomenclature for bolts and screws, Choice of appropriate bolts, bolts subjected to tensile, compressive and torsional loading, Determining shear loads.	
	II	**Design of Welded Joints** Welding symbols, Stresses in butt and fillet welds, Strength of butt, parallel and transverse fillet welds, Axially loaded unsymmetrical welded joints	4
4	I	**Design against Fluctuating Loads** Stress concentration, variables stresses, reversed, repeated, fluctuating stresses. Fatigue failure, Endurance limit- estimation of endurance limit, Design for finite and infinite life, Soderberg and Goodman design criteria, Fatigue design under combined stresses	8
5	I	**Design of Springs** Basic spring nomenclature, Various spring configurations viz. types, application & materials, Designing of Helical Compression & Tension springs for static and fatigue loads, Springs in series and parallel, Concentric helical springs, Leaf springs.	9
		Total No. of Hrs	**45Hrs**

Beyond the Syllabus
1. Design of eccentrically loaded components.

Course Outcome	
CO1	Students should be able to analyze the stress and strain of mechanical components and also identify failure modes for mechanical part.
CO2	Students should be able to design machine elements on the basis of strength/ rigidity concepts.
CO3	Students should be able to design different joints.
CO4	Students should gain the ability to design a mechanical system for fluctuating loads.
CO5	Students will be able to design springs for individual application.

List of Experiments	
Sr. No.	**Description**
1	Students have to complete any one design project from the below mentioned list. (A2 size sheet is preferred) 1) Knuckle Joint 2) Cotter joint 3) Flanged couplings
2	Students have to complete any one design project from the below mentioned list. (A2 size sheet is preferred) 1) Screw Jack 2) C-clamps along with the Frame 3) Leaf springs

3	Students have to complete any one design project from the below mentioned list. (A2 size sheet is preferred) 1) Bolted Joints 2) Welded joints 3) Design of Shafts

RecommendedResources	
Text Books	1. Bhandari V.B., "Design of Machine Elements", Tata McGraw Hill Publication Co. Ltd 2. C. S. Sharma and KamleshPurohit, "Design of Machine Elements", Prentice Hall India Publication. 3. Shigley J.E. and Mischke C.R., "Mechanical Engineering Design", McGraw Hill Publication Co. Ltd.
Reference Books	1. Robert L. Norton, "Machine Design: An Integrated Approach", Fifth Edition 2. Richard Budynas, Keith Nisbett,"Shigley's Mechanical Engineering Design", Mc Graw Hill, Ninth Edition 3. D. K. Aggarwal &P. C. Sharma, "Machine Design", S.K Kataria and Sons 4. Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Inc. 5. Spotts M.F. and Shoup T.E., "Design of Machine Elements", Prentice Hall International. 6. Design Data - P.S.G. College of Technology, Coimbatore. 7. Bhandari V. B., "Machine Design data book", Tata McGraw Hill Publication Co. Ltd 8. Machine Tool Design Handbook, CMTI.
E-Resources	1. https://nptel.ac.in/downloads/112105125/

SANDIP UNIVERSITY

School of Engineering and Technology
Department of Mechanical Engineering

Year: TE B Tech **Semester: V**

Course : Heat Transfer **Course Code: 17YME503**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Theory**	**Lab**	
3	-	2	4	10	20	10	10	-	50	50	150
Max. Time, End Semester Exam (Theory) – 3 Hrs									**End Semester Exam (Lab) – Viva**		

Prerequisite
1. **Fundamentals of Thermal Engg.**
2. **Fundamentals of Derivatives and Integration.**

Course Objectives	
1	To understand the important modes of heat transfer and their applications.
2	To get acquainted with knowledge of fin selection and lumped heat capacitance.
3	To understand the mechanism of convective heat transfer
4	To learn the various heat exchangers and their applications.
5	To determine the radiative heat transfer between surfaces.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Fundamentals of Heat Transfer:** General heat conduction equation in Cartesian, cylindrical and spherical coordinates, Poisson's, Fourier and Laplace Equations, isotropic, anisotropic, homogeneous and non-homogeneous materials; Boundary conditions, Steady state heat conduction: one-dimensional heat conduction without heat generation in slab; composite slab; cylinder and sphere, effect of temperature on conductivity,	5
	II	**critical thickness of insulation:** One-dimensional, steady state heat conduction without internal heat generation in slabs; composite slabs; cylinders and spheres	5
2	I	**Boundary Conditions: All cases with diagram** (No numerical treatment)	2
	II	**Conduction:** Heat transfer from extended surfaces with all boundary conditions and fin performance. Cooling of Electronics Components	4
	II	**Transient heat conduction:** lumped capacitance method.	3

3	I	**Convection :** Basic concepts, natural, forced and mixed convection, hydrodynamic and thermal boundary layers	3
	II	**Forced & Natural Convection: Determination of heat transfer coefficient using** dimensionless numbers, empirical correlations for forced and natural convection for different configurations. Introduction to boiling and condensation. Pool and forced boiling.	7
4	I	**Heat Exchanger:** Classification of heat exchanger, parallel, counter and cross flow heat exchangers, heat exchanger analysis – LMTD for parallel and counter flow heat exchanger, LMTD correction factor	5
	II	Effectiveness– NTU method for parallel and counter flow heat exchanger, performance of heat exchangers, Introduction of TEMA Standards	5
5	I	**Thermal Radiation:** Basic concept of surface and gas radiation, radiation properties, Kirchhoff's Law of Radiation, Weins Law, Planck Law, Lambart Law, radiation heat exchange between two finite black surfaces, shape factor, radiation heat exchange between two non-black and gray surfaces, radiation shield. Applications of radiation heat exchange.	9
		Total No. of Hrs	**45Hrs**

Beyond the Syllabus
1. Study of heat pipe applications. 2. Study of Heisler chart and it's application method

Course Outcome	
Students should able	
CO1	To differentiate different modes of heat transfer and their applications.
CO2	To analyse the phenomenon of conduction in Fins.
CO3	To estimate heat transfer due to convection in various applications.
CO4	To analyse the performance of Parallel and Counter flow heat exchangers..
CO5	To interpret the concept of thermal radiation in various geometries.

List of Experiments	
Sr. No.	**Description**
1	Determination of Thermal Conductivity of metal rod
2	Determination of Thermal Conductivity of insulating powder
3	Determination of Thermal Conductivity of Composite wall
4	Determination of heat transfer coefficient in Natural Convection
5	Determination of heat transfer coefficient in Forced Convection
6	Determination of temperature distribution, fin efficiency in Natural Convection

7	Determination of Emissivity of a Test surface
8	Determination of Stefan Boltzman's Constant
9	Study of pool boiling phenomenon and determination of critical heat flux
10	Determination of performance of heat exchanger.
11	Determination of temperature distribution, fin efficiency in Forced Convection

RecommendedResources	
Text Books	1. S.P. Sukhatme, A Textbook on Heat Transfer, Universities Press. 2. R.C. Sachdeva, Fundamentals of Engineering Heat and Mass Transfer, New Age Science. 3. P.K. Nag, Heat & Mass Transfer, McGraw Hill Education Private Limited. 4. M. M. Rathod, Engineering Heat and Mass Transfer, Third Edition, Laxmi Publications, New Delhi 5. V. M. Domkundwar, Heat Transfer, Dhanpat Rai Publications. 6. Dr. D. S. Kumar, Heat Transfer, Kataria Publication.
Reference Books	1. F.P. Incropera, D.P. Dewitt, Fundamentals of Heat and Mass Transfer, John Wiley. 2. Y. A. Cengel and A.J. Ghajar, Heat and Mass Transfer – Fundamentals and Applications, Tata McGraw Hill Education Private Limited. 3. S. P. Venkatesan, Heat Transfer, Ane Books Pvt. Ltd 4. Holman, Fundamentals of Heat and Mass Transfer, McGraw – Hill publication.
E-Resources	1. https://nptel.ac.in/courses/103103032/ 2. https://nptel.ac.in/courses/103103031/

SANDIP UNIVERSITY

School of Engineering and Technology

Department of Mechanical Engineering

Year: BTech Mechanical **Semester: V**

Course: Theory of Machines **Course Code: 17YME504**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
3	-	2	4	10	20	10	10	-	50	50	150
Max. Time, End Semester Exam (Theory) – 3 Hrs									End Semester Exam (Lab) - 2Hrs.		

Prerequisite	1. **Ability to visualize the object** 2. **Basic concepts of Mathematics (Geometry)** 3. **Concepts of Mechanics (Force, Pressure, Velocity, Acceleration, etc)**

Course Objectives	
1	To develop competency in understanding of theory of all types of gears.
2	To demonstrate different types of gear trains and its applications.
3	To acquaint with working principles and applications of gyroscope
4	To make the student conversant with synthesis of the mechanism.
5	To develop competency in drawing the cam profile and understand the follower motion.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Toothed Gearing,** Classification of Toothed Gearing , Spur gear: definition, terminology, fundamental law of toothed gearing, involute and cycloidal profile, path of contact, arc of contact, conjugate action, contact ratio, minimum number of teeth, interference and under cutting, Force analysis and Friction in gears. Introduction to helical, worm & worm wheel, Spiral and Bevel Gears	10
2	I	**Gear Trains**, Types of Gear Trains, analysis of epicyclic gear trains, Holding torque – Simple, compound and epicyclic gear trains, torque on sun and planetary gear train, compound epicyclic gear train. Types of gearboxes.	9
3	I	**Gyroscopes**, Gyroscopic forces and Couples, Gyroscopic stabilisation for ship and Aeroplane, Stability of four wheel drive vehicle moving on curved path, Stability of a two wheel vehicle.	8
4	I	**Synthesis**, Steps in synthesis process: Type, number and dimensional synthesis. Tasks of Kinematic synthesis: Path, function and motion generation (Body guidance). Precision Positions, Chebychev spacing, Mechanical and structural errors. Graphical synthesis: Two and three position synthesis using relative pole	8

		method and inversion method for single slider crank and four bar mechanism. Freudenstein's equation for four bar Mechanism, Three position function generation using the equation.	
5	I	**Cams and Followers**, Types of cams and followers, analysis of standard motions to the follower, Determination of cam profiles for different follower motions, analysis of circular arc cam with flat face follower. Methods of control: pressure angle, radius of curvature and undercutting. Jump phenomenon of Eccentric cam	10
		Total No. of Hrs	**45Hrs**

Beyond the Syllabus
1. Introduction to Advanced Cam.

Course Outcome	
Students should able to	
CO1	Understand the gear theory which will be the prerequisite for gear design.
CO2	Analyze and select gear trains.
CO3	Analyze gyroscopic effect on various applications.
CO4	Apply the concept of synthesis in design of mechanism.
CO5	Understand design of mechanism and cam profile.

List of Experiments	
1	Bifilar/Trifilar suspension.
2	Compound Pendulum
3	To draw conjugate profile for any general type of gear tooth
4	To generate involute gear tooth profile and to study the effect of undercutting and rack shift using model.
5	To study various types of gearboxes- constant mesh, sliding mesh, synchromesh gear box, Industrial gearbox, differential gearbox.
6	To measure holding torque of the epicyclic gear train.
7	To verify the gyroscopic principles.
8	To verify the cam jump phenomenon for an eccentric cam
9	Motion analysis and plotting of displacement-time, velocity-time, acceleration- time, jerk-time and Layout of cam profiles- 3 to 5 Problems

RecommendedResources	
Text Books	1. S. S. Ratan, “Theory of Machines”, Tata McGraw Hill
Reference Books	1. Thomas Bevan, “Theory of Machines”, C. B. S. Publishers 2. P. L. Ballaney, “Theory of Machines”, Khanna Publishers, Delhi 3. Amitabh Ghosh and A. Kumar Mallik, “Theory or Mechanisms and Machines” 4. J.J.Uicker, G.R.Pennock, J.E.Shigley, “Theory of Machines and Mechanisms”, Third Edition, International Student Edition, OXFORD 5. Sadhu Singh, “Theory of Machines”, Pearson 6. R L Norton, “Kinematics and Dynamics of Machinery”, First Edition, McGraw Hill Education (India) P Ltd. New Delhi
E-Resources	1. https://nptel.ac.in/courses/112104121/35

SANDIP UNIVERSITY

School of Engineering and Technology

Department of Mechanical Engineering

Year: TE B.Tech **Semester: V**

Course : Industrial Automation-I **Course Code: 17YME505**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Theory**	**Lab**	
2	-	2	3	10	20	10	10	-	50	50	150
Max. Time,End Semester Exam (Theory) – 3Hrs									**End Semester Exam (Lab) - 2Hrs.**		

Prerequisite 1. Basics of Fluid Mechanics

Course Objectives	
1	To understand different Actuators and Controls used in Automation Industry.
2	To understand various hydraulic circuits used in Industry.
3	To understand various Pneumatic Circuits used in Industry.
4	To design particular Hydraulic/Pneumatic System for given application.
5	To study various components used in Automation industry.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to Fluid Power** Fluid power system: Components, advantages and applications. Transmission of power at static and dynamic states. Pascal's law and its applications such as hydraulic press/Jack (Numerical treatment).	04
	II	**Fluids for hydraulic system**: Types, properties, selection. Additives, effect of temperature and Pressure on hydraulic fluid. Seals, sealing materials, compatibility of seal with fluids. Types of pipes, hoses, material, quick acting couplings. Pressure drop in hoses/pipes. Fluid conditioning through filters, strainers, sources of contamination and contamination control, heat exchangers.	04
2	I	**Pumps.** Types, classification, principle of working and constructional details of Vane pumps, gear pumps, radial and axial plunger pumps, screw pumps, power and efficiency calculations, characteristics curves, selection of pumps for hydraulic Power transmission	03
	II	**Power units and accessories.** Types of power units, reservoir assembly, constructional details, pressure switches, temperature switches, Temperature switches.	03
	III	**Accumulators.** Types, selection/ design procedure, applications of accumulators.	03

		Types of Intensifiers, Pressure switches /sensor, Temperature switches/sensor, Level sensor	
3	I	**Fluid Power Control.** Symbols for hydraulic and pneumatic circuits. Control of fluid power through different valves such as pressure control valves, directional control valves, and flow control valves (Principle, classification, constructional details, symbols, advantages, disadvantages and applications).	6
	II	Flow rate, working pressure, differential pressure Check valve, Servo valves, Proportional valves and Cartridge valves, cut off Valves.	4
4	I	**Hydraulics** **Actuators:** (i) Linear and Rotary. (ii) Hydraulic motors- Types- Vane, gear, Piston types, radial piston. (iii) Methods of control of acceleration, deceleration. (iv) Types of cylinders and mountings. (v) Calculation of piston velocity, thrust under static and dynamic applications, considering friction, inertia loads. (vi) Design considerations for cylinders. Cushioning of cylinders. (Numerical treatment)	05
	II	**Industrial circuits**. Simple reciprocating, Regenerative, Speed control (Meter in, Meter out and bleed off), Sequencing, Synchronization, transverse and feed, circuit for riveting machine, automatic reciprocating, fail safe circuit, counter balance circuit, actuator locking, circuit for hydraulic press, unloading circuit (Numerical treatment), motor breaking circuit. Cascade Circuit.	04
5	I	**Pneumatics** Principle of Pneumatics: (i) Laws of compression, types of compressors, selection of compressors. (ii) Comparison of Pneumatics with Hydraulic power transmissions. (iii) Types of filters, regulators, lubricators, mufflers, dryers. (iv) Pressure regulating valves, (v) Direction control valves, two way, three way, four way valves. Solenoid operated valves, push button, lever control valves. (vi) Speed regulating - Methods used in Pneumatics. (vii) Pneumatic actuators-rotary, reciprocating.(viii) Air motors- radial piston, vane, axial piston (ix) Basic pneumatic circuit, selection of components(x) Application of pneumatics in low cost Automation and in industrial automation	06
	II	Introduction to vacuum and vacuum measurement, Vacuum pumps, types, introduction to vacuum sensors and valves. Industrial application of vacuum	03
		Total No. of Hrs	**45Hrs**

Beyond the Syllabus
1. Study Hydraulic circuits used in JCB, Hydraulic cranes etc. 2. Study of Actuators used in robotics.

Course Outcome	
Students should able to	
CO1	Study of different types of fluids as well as systems used in Hydraulics and Pneumatics
CO2	Study of components used in Hydraulic and Pneumatic Systems.
CO3	Study of Industrial Circuits using Symbols for various components
CO4	Study and Design of Industrial Hydraulic circuits
CO5	Study and Design of Industrial Pneumatic circuits

List of Experiments	
Sr. No.	**Description**
1	Trial on Gear/Vane/Piston pump and plotting of performance characteristics.
2	Study and demonstration of following circuits using hydraulic trainer: 1. Regenerative circuit 2. Speed control circuit 3. Sequencing circuit 4. Transverse and feed circuit
3	Study and demonstration of following circuits using pneumatic trainer: a. Automatic reciprocating circuit b. Speed control circuit c. Pneumatic circuit involving shuttle valve/ quick exhaust valve d. Electro pneumatic valves and circuit
4	Design report of a hydraulic system
5	Design report of pneumatic system
6	Industrial visit to study automation by means of hydraulic systems
7	Study of compressed air generation and distribution systems.
8	Industrial visit to study automation by means of pneumatic systems
9	Demonstration of hydraulic system such as hydraulic press, Injection molding machines using software
10	Testing of linear actuator.

RecommendedResources	
Text Books	1. Pinches, Industrial Fluid Power, Prentice hall 2. D. A. Pease, Basic Fluid Power, Prentice hall 3. J. J. Pipenger, Industrial Hydraulics, McGraw Hill 4. H. L. Stewart, Hydraulics and Pneumatics, Industrial Press 5. A. Esposito, Fluid Power with application, Prentice hall
Reference Books	1. B. Lall, Oil Hydraulics, International Literature Association 2. Yeaple, Fluid Power Design Handbook 3. Andrew A. Parr, Hydraulics and Pneumatics, Elsevier Science and Technology Books.

4. Majumdar, Pneumatic Systems, Tata McGraw Hill
5. ISO - 1219, Fluid Systems and components, Graphic Symbols
6. Majumdar, Oil Hydraulics- Principle and Maintenance, Tata McGraw Hill.
7. Product Manuals and books from Vickers/ Eaton, FESTO, SMC pneumatics can be referred.

SANDIP UNIVERSITY

School of Engineering and Technology
Department of Mechanical Engineering

Year: TE B.Tech **Semester: V**
Course : Road Safety **Course Code: YMEA01**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
-	-	-	2	-	-	-	-	-	-	50	50
Max. Time,End Semester Exam (Theory) – NA									End Semester Exam (Lab) – 2Hrs		

Prerequisite
1. Awareness about traffic rules and road accidents.
2. Understanding the need of studying such topics.
3. Considerations to other, sensitivity and care while travelling/ driving.

Course Objectives	
1	To acquire knowledge and understanding of the road environment.
2	To inculcate decision making and behavioral skills necessary to survive in the road environment.
3	To impart knowledge and understanding of the causes and consequences of accidents.
4	To understand roles and responsibilities in ensuring road safety.
5	To study the efforts taken by the government on road safety

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to Road Safety** Road traffic accidents scenario in India and in the world. Road Safety and its importance. Traffic Rules and Driving Behaviour. Characteristics of accidents, accidents vs. crash.	06
2	I	**Planning for Road safety** Awareness about rules and regulations of traffic. Assisting Traffic control authorities. Multidisciplinary approach to planning for traffic safety and injury control. Vulnerable road users: crashes related to pedestrian and bicyclists, their safety, provision for disabled.	06
3	I	**Responsibility of Road accidents and Safety measures** People responsible for accident prevention: Police, Politicians, Community members, Policy makers, Teachers, Parents, Infrastructure authorities, Drivers and Official road safety body. Reasons of students/ children have accidents. 4 E's of Accidents Prevention: 1. Engineering - by altering the environment 2.	06

		Enforcement - by imposing laws 3. Encouragement - by the use of publicity campaigns 4. Education - by gaining and using knowledge.	
4	I	**Road Safety Education** Introduction to Road Safety Education. 5 P's of Road safety education: 1. Pre-school road safety education 2. Practical rather than theory education 3. Principles of own development as regards to road safety education 4. Presentations on road safety education 5. Place for road safety education in syllabus	06
5	I	**Road Safety Events** Discussions on efforts done by Government on Road Safety. Celebration of Road Safety week or Workshop on Road Safety week/ Organization of seminar on Road Safety. This is to be entirely organized by students under the mentorship of concerned Head of the Department.	06
		Total No. of Hrs	**30Hrs**

Course Outcome	
Students should able to	
CO1	Generate awareness about number of people dyeing every year in road accidents, traffic rules and characteristics of accident.
CO2	Gain information and knowledge about people responsible for accidents and their duties
CO3	Understand the importance of multidisciplinary approach to planning for traffic safety and rehabilitation
CO4	Acquire a certificate of coordination/ participation in compulsory events based on the topic under study
CO5	Appriciate the efforts taken by the government on road safety

RecommendedResources	
Text Books	1. Kadiyali L.R., Traffic Engineering & Transport Planning, Khanna Publishers, 2003 2. CROWN AGENTS Ref: TEA/A369, 1995. (Unpublished contractors report for Ministry of Transport and Communications, Ghana). Road safety study and the institutional strengthening of the vehicle examination and licensing division. 3. TRRL OVERSEAS UNIT, 1991. Towards safer roads in developing countries: a guide for planners and engineers. Crow Thorne: Transport and Road Research Laboratory.
Reference Books	1. Indian Roads Congress, Highway Safety Code, IRC: SP-44:1996 2. Indian Roads Congress, Road Safety Audit Manual, IRC:SP-88-2010

SANDIP UNIVERSITY

School of Engineering and Technology

Department of Mechanical Engineering

Year: TE B.Tech (Mechanical) **Semester: V**

Course : Value Education **Course Code: 17YMEA02**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	**T**	**P**	**C**	**CIA-1**	**CIA-2**	**CIA-3**	**CIA-4**	**Lab**	**Theory**	**Lab**	
-	-	-	2	-	-	-	-	-	-	50	50
Max. Time,End Semester Exam (Theory) – NA									**End Semester Exam (Lab) – 2Hrs**		

Course Objectives	
1	To enable the students understand the meaning of values and select their goals by self-investigation based on personal values.
2	To enable the students to understand the value of truth, commitments, honesty, sacrifice, care, unity, teamwork and relationship.
3	To educate and make the young generation aware of their social responsibilities.
4	To increase awareness among students about environment and create attitude towards sustainable lifestyle.
5	To aware the learners about Social Values and Ethical Values.

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction of Value Education** Value Education: Definition, Need, Content, Process and relevance to present day. Concept of Human Values, self-introspection.	04
2	I	**Salient values for life** Truth, commitment, honesty and integrity, forgiveness and love, empathy and ability to sacrifice, care, unity, punctuality, Interpersonal and Intra personal relationship, Team work , Positive and creative thinking.	06
3	I	**Human Rights** Universal Declaration of Human Rights, Right to Information Act - 2005, National Integration, Peace and non-violence, Dr. A P J Kalam's ten points for enlightened Citizenship. The role of media in value building.	08
4	I	**Environment and Ecology**	06

		Ecological balance, interdependence of all beings – living and non-living. Man and nature, Environment conservation and enrichment...	
5	I	**Social values** - Social consciousness and responsibility, Consumer rights and responsibilities**.** **Ethical values** - Professional ethics, Code of ethics of engineers, Influence of ethics on family life, Leadership qualities and Personality development.	06
		Total No. of Hrs	**30Hrs**

Course Outcome	
Students should able to	
CO1	Understood human values, their significance and role in life.
CO2	Promote self-reflection and critical inquiry that foster critical thinking of one's value and the values of others.
CO3	Practice respect for human rights and democratic principles.
CO4	Familiarized with various living and non-living organisms and their interaction with environment.
CO5	Understood the basics regarding the leadership and to become a conscious professional.

RecommendedResources	
Text Books	1. Dr. N. Venkataiah, "Value Education", APH Publishing Corporation, 2007 2. M. Govindarajan, S. Natarajan, V. S. Senthil Kumar, "Professional Ethics & Human Values", PHI Learning Press, 2013.
Reference Books	1. Chakravarthy S. K., "Values and ethics for Organizations: Theory and Practice", Oxford University Press, New Delhi, 1999. 2. Man Singh Das, Vijay Kumar Gupta, "Social values among young adults: A changing scenario", MD Publications Pvt. Ltd, 1995. 3. Ram Ahuja, "Social Problems in India", Rawat Publications, 2012. 4. Leah Levin, "HUMAN RIGHTS Questions and Answers", UNESCO Publishing, 2012. 5. P D Sharma, Ecology and Environment, Rastogi publications, 2005. 6. Kalam A P J, Arun Tiwari, "Wings of Fire", University Press Publications, 2003
Websites	1. http://www.ncert.nic.in/recent/env_edu.html 2. http://www.unipune.ac.in/pdf_files/Final%20Book_03042012.pdf 3. https://engineering.purdue.edu/MSE/Academics/Undergrad/ethics.pdf

Year: TE B.Tech **Semester: V**

Course : Fundamentals of Human Body Mechanics **Course Code: 17YMEA03**

Teaching Scheme (Hrs/Week)				Continuous Internal Assessment (CIA)					End Semester Examination		Total
L	T	P	C	CIA-1	CIA-2	CIA-3	CIA-4	Lab	Theory	Lab	
-	-	-	2	-	-	-	-	-	-	50	50
Max. Time,End Semester Exam (Theory) – NA									End Semester Exam (Lab) – 2Hrs		

Course Objectives	
1	This course provides background in musculoskeletal anatomy and principles of biomechanics.
2	The course applies and builds on the concepts of statics and, dynamics for human activities
3	To study the biomechanics of the human skeleton
4	To understand the concept of kinematics of different human joints
5	To understand the concept of kinetics of muscles and body parts

Course Content			
Unit No.	Module No.	Content	Hours
1	I	**Introduction to Biomechanics and Anatomy of Human Body.** Biomechanics: definition and perspective; Quantitative versus qualitative problems; Structure, movements and loads on the shoulder, elbow, wrist, hip, knee, spine, foot; Common injuries in shoulder, elbow wrist, hip knee, spine and foot.	06
2	I	**Equilibrium and Human Movement.** Equilibrium and Torque, Resultant Joint Torques; Equations of static and dynamic equilibrium; Center of gravity and locating the center of gravity; Locating the human body Center of Gravity, Stability and balance; Biomechanics of human skeletal muscle, Skeleton Articulation.	06
3	I	**Kinematic and Kinetic Concepts for Analyzing Human Motion.** Forms of motion -linear motion, angular motion general motion and mechanical systems; Directional terms, anatomical reference planes and axes joint movement terminology; Sagittal plane, frontal plane, transverse plane and other movements and spatial reference systems; Tools for measuring kinematic quantities video and film and other movement-monitoring systems; Basic concepts related to kinetics, inertia, mass, force, center of gravity, weight, pressure volume, density, torque, impulse	06
4	I	**Linear and Angular Kinematics of Human Movement.**	06

		Linear kinematic quantities distance, displacement, speed and velocity, acceleration average and instantaneous quantities; Kinematics of projectile motion horizontal and vertical components influence of gravity influence of air resistance; Analyzing projectile motion ,equations of constant acceleration; Relationships Between Linear and Angular Motion, Linear and Angular Displacement, Linear and Angular Velocity, Linear and Angular Acceleration.	
5	I	**Linear and angular Kinetics of Human Movement.** Newton's laws law of inertia law of acceleration, law of reaction, law of gravitation; Mechanical behavior of bodies in contact, friction, momentum, impulse, impact; Work, power, and energy, relationships conservation of mechanical energy , principle of work and energy; Angular analogues of Newton's laws of motion; Musculoskeletal soft and hard tissue Mechanics	06
		Total No. of Hrs	**30Hrs**

Course Outcome	
Students should able to	
CO1	Familiarize the students with the anatomical structure of the human body
CO2	Familiarize the students with the reference positions, planes, and axes associated with the human body
CO3	Study the interrelationships among kinematic and kinetic variables.
CO4	Study the interrelationships among linear and angular kinematic variables.
CO5	Study the interrelationships among linear and angular kinetic variables.

RecommendedResources	
Text Books	1. Susan .J. Hall, "Basic biomechanics", Tata Mcgraw Hill, Sixth edition, 2011. 2. Y. C. Fung, "Biomechanics",Springer Verlang, 2nd Edition, 1997.
Reference Books	1. D. J. Schneck and J. D. Bronzino, "Biomechanics- Principles and Applications", CRC Press, Second Edition, 2000 2. Kreighbaum, E. and Barthels, K., "Biomechanics: A Qualitative Approach for Studying Human Movement", Pearson, 1996. 3. Boston: Allyn and Bacon Alexander. R. Mc. Neill, "Biomechanics", Chapman and Hall, 1975