

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NHU-601	Subject Name: Industrial Management	
Course Outcomes:	1. Understand the basic principles, scope and the applications of industrial management	
	2. Conduct work study to develop standard time and method for jobs.	
	3. Apply scientific principles to manage inventory.	
	4. Understand the concept of Supply chain management system.	
	5. Understand and implement statistical techniques for process and product control.	
	6. Contribute significantly in the implementation of TQM philosophy in an organization.	
Syllabus: As per AKTU		
Unit 1	Introduction: Concept, Development, application and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.	
Unit 2	Management Function: Principle of Management – Time and motion study, work simplification – process charts and flow diagrams, Production Planning.	
Unit 3	Inventory Control: Inventory, Cost, Deterministic Models, Introduction to supply chain management.	
Unit 4	Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.	

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NME-602	Subject Name: Machine Design-II	
Course Outcomes:	1. Understand the fundamental of gear systems and select suitable materials and manufacturing methods for gear.	
	2. Design the spur gear, helical gear, bevel gear and worm gearing system as per the AGMA and Indian standards.	
	3. Understand modes of lubrication and select suitable lubricants.	
	4. Design a sliding contact/journal bearing.	
	5. Design/Select suitable rolling contact bearings and analyze for their life and reliability.	
	6. Design principal parts of an IC engine.	
Syllabus: As per AKTU		
Unit 1	Principle of transmission and conjugate action. Spur Gears Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear	

	<p>systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.</p> <p>Helical Gears Terminology, Proportions for helical gears, Forces components on a tooth of helical gear, Virtual number of teeth, Beam strength& wear strength of helical gears, Dynamic load on helical gears, Design of helical gears.</p>
Unit 2	<p>Bevel gears Terminology of bevel gears, Force analysis, Virtual number of teeth, Beam strength and wear strength of bevel gears, Effective load of gear tooth, Design of a bevel gear system.</p> <p>Worm Gears Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing system.</p>
Unit 3	<p>Sliding Contact Bearing Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing.</p>
Unit 4	<p>Rolling Contact Bearing Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing.</p>
Unit 5	<p>IC ENGINE parts: Selection of type of IC engine, General design considerations, Design of cylinder and cylinder head; Design of piston and its parts like piston ring and gudgeon pin etc.; Design of connecting rod; Design of crankshaft.</p>

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NME-603	Subject Name: Dynamics of Machine	
Course Outcomes:	1. Analyze static and dynamic forces in planer mechanisms.	
	2. Understand the gyroscopic action and its applications.	
	3. Understand the concept of mechanical vibration and its effects on machine elements.	
	4. Understand the concept of balancing and its application in IC engines.	
	5. Understand the working principle and performance characteristics of various types of governors.	

	6. Understand the various types of brakes and dynamometers.
Syllabus: As per AKTU	
Unit 1	Force analysis: Static force analysis of mechanisms, D'Alembert's principle, dynamics of rigid link in plane motion, dynamic force analysis of planar mechanisms, piston force and crank effort. Turning moment on crankshaft due to force on piston, Turning moment diagrams for single cylinder double acting steam engine, four stroke IC engine and multi-cylinder engines, Fluctuation of speed, Flywheel.
Unit 2	Gyroscope: Space motion of rigid bodies, angular momentum, gyroscopic couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths. Mech. Vibrations: Types of Vibration, Degrees of freedom. Longitudinal Vibration: Single degree free and damped vibration. Forced vibration of single degree under harmonic excitation, Vibration isolation, Whirling of shaft and critical speed.
Unit 3	Balancing: Introduction, static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of reciprocating masses, balancing of single cylinder engine, balancing of multi cylinder inline engines.
Unit 4	Governors: Introduction, types of governors, characteristics of centrifugal governors, gravity controlled and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors. Effort and Power of governor, Controlling force diagrams for Porter governor and spring controlled governors.
Unit 5	Brakes and dynamometers: Introduction, Law of friction and types of lubrication, types of brakes, effect of braking on rear and front wheels of a four wheeler, dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NME-604	Subject Name: Refrigeration and Air-conditioning	
Course Outcomes:	1. Explain air refrigeration cycle and its application in aircraft refrigeration system.	
	2. Analyze vapour compression refrigeration cycle using p-h and T-s diagrams.	
	3. Explain and analyze the vapour Absorption refrigeration system.	
	4. Explain properties and applications of refrigerants and their effect on environment.	

	5. Use psychometric properties for analyzing air-conditioning systems.
	6. Discuss the working of various equipments used in refrigeration and air-conditioning systems.
Syllabus: As per AKTU	
Unit 1	<p>Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.</p> <p>Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Coleman or Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature (DART).</p>
Unit 2	<p>Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-S and P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.</p>
Unit 3	<p>Vapour Absorption system; Working Principal of vapour absorption refrigeration system, Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram , Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison. Three fluid system.</p> <p>Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants. Ozone layer depletion and global warming considerations of refrigerants</p>
Unit 4	<p>Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point (ADP). Air Washers, Cooling towers & humidifying efficiency.</p>
Unit 5	<p>Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipments e.g compressors, condensers, evaporators & expansion devices, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts</p>

and fans, Basic difference between comfort and industrial air conditioning.

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NME-013	Subject Name: Mechanical Vibrations	
Course Outcomes:	1. Understand the basic concept of single degree undamped free vibrating system.	
	2. Understand the basic concept of single degree damped free vibrating system.	
	3. Analyze the different type of problems related to single degree forced vibration	
	4. Understand and analyze two degrees of freedom system.	
	5. Analyze the different vibrating systems of multi degrees freedom by exact analysis.	
	6. Apply numerical methods to solve multi degrees freedom system.	
Syllabus: As per AKTU		
Unit 1	Introduction, Classification of Vibration Systems, Harmonic motion, Vector re[presentation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods. Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.	
Unit 2	Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments	
Unit 3	Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.	
Unit 4	Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts.	
Unit 5	Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method. Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.	

Branch: MECHANICAL	Year: III	Semester: Even
Subject Code: NME-021	Subject Name: Fluid Machinery	
Course Outcomes:	1. Apply momentum and moment of momentum equation to flow through hydraulic machinery.	
	2. Calculate the force and work done by jet on fix and moving plates.	
	3. Understand working and performance of Reaction Turbines.	
	4. Understand working and performance of centrifugal pumps.	
	5. Understand working and performance of Positive Displacement Pumps.	
	6. Comprehend the working of Hydraulic ram, Jet pumps, Air lift pumps.	
Syllabus: As per AKTU		
Unit 1	Introduction: Impulse of Jet and Impulse Turbines: Classification of Fluid Machines & Devices, Application of momentum and moment of momentum equation to flow through hydraulic machinery, Euler's fundamental equation. Introduction to hydrodynamic thrust of jet on a fixed and moving surface (flat & curve), Classification of turbines, Impulse turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Governing of Pelton wheel.	
Unit 2	Reaction Turbines: Francis and Kaplan turbines, Constructional details, Velocity triangles, Power and efficiency calculations, Degree of reaction, Draft tube, Cavitation in turbines, Principles of similarity, Unit and specific speed, Performance characteristics, Selection of water turbines.	
Unit 3	Centrifugal Pumps: Classifications of centrifugal pumps, Vector diagram, Work done by impellor, Efficiencies of centrifugal pumps, Specific speed, Cavitation & separation, Performance characteristics.	
Unit 4	Positive Displacement and other Pumps: Reciprocating pump theory, Slip, Indicator diagram, Effect of acceleration, air vessels, Comparison of centrifugal and reciprocating pumps, Performance characteristics. Hydraulic ram, Jet pumps, Air lift pumps.	