

15ABS09-PROBABILITY AND STATISTICS

(Common for CE, ME and CSE)

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Objectives: To help the students in getting a thorough understanding of the fundamentals of probability and usage of statistical techniques like testing of hypothesis, Statistical Quality Control and Queuing theory

UNIT – I

Basic concepts of Probability – Random variables – Expectation – Discrete and continuous Distributions – Distribution functions. Binomial, Poisson and Normal distributions – Related properties.

UNIT – II

Test of Hypothesis: Population and Sample - Confidence interval of mean from Normal distribution - Statistical hypothesis - Null and Alternative hypothesis - Level of significance. Test of significance - Z test for means and proportions.

UNIT – III

Small samples - t- test, F-test and Chi-square test (testing of goodness of fit and independence).

UNIT – IV

Statistical Quality Control: Concept of quality of a manufactured product -Defects and Defectives - Causes of variations - Random and assignable - The principle of Shewhart Control Chart-Charts for attribute and variable quality characteristics- Constructions and operation of \bar{X} - Chart, R-Chart, p - Chart and C-Chart.

UNIT – V

Queuing Theory: Pure Birth and Death process, M/M/1 & M/M/S & their related simple problems.

Text Books:

1. Probability and Statistics for Engineers by Richard A. Johnson, 8th edition, PHI Learning Private Ltd.-2011.
2. Probability & Statistics by E. Rukmangadachari & E. Keshava Reddy, Pearson Publisher.
3. Probability & Statistics for engineers by Dr. J. Ravichandran WILEY-INDIA publishers.

References:

1. Operations Research by S.D. Sharma, KEDAR NATH RAM NATH, Publications.
2. Statistical methods by S.P. Gupta, S.Chand publications.

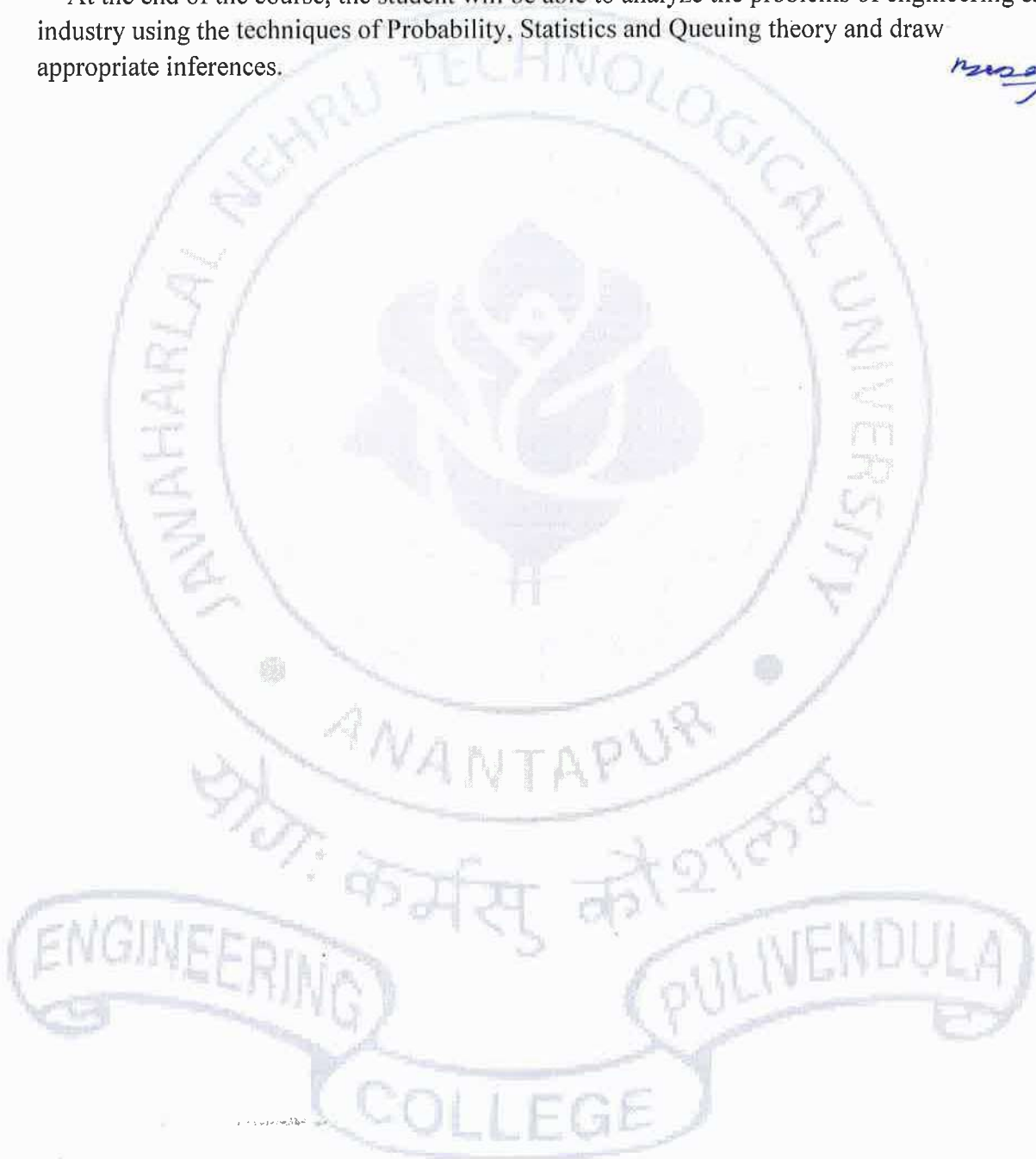
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3. Probability and Statistics for Engineers and Scientists by Ronald E. Walpole, Sharon L. Myers and Keying Ye, Pearson eighth edition.
4. Higher Engineering Mathematics, by B.V.Ramana, Mc Graw Hill publishers.

Outcomes:

At the end of the course, the student will be able to analyze the problems of engineering & industry using the techniques of Probability, Statistics and Queuing theory and draw appropriate inferences.

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II YEAR II SEM

15AME16-KINEMATICS OF MACHINERY

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Course Objectives:

On completing the course, the student will be able to:

- Understand the fundamentals of the theory of kinematics and dynamics of machines.
- Understand techniques for studying motion of machines and their components.
- Use computer software packages in modern design of machines.

UNIT – I

Mechanisms And Machines: Elements or Links – Classification – Rigid Link, flexible and fluid link. Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained. Mechanisms and machines – classification of mechanisms and machines – kinematic chain – inversion of mechanisms – inversions of quadric cycle chain – single and double slider crank chain. Mobility of mechanisms.

UNIT-II

Straight Line Motion Mechanisms- Exact and approximate, copied and generated types – Peaucellier, Hart and Scott Russel, Grasshopper, Watt, Tchebicheff and Robert Mechanisms. Pantograph.

Steering Mechanisms: Conditions for correct steering – Davis Steering gear, Ackermanns steering gear. Hooke's Joint (Universal coupling) -Single and double Hooke's joint — applications – Simple problems.

UNIT – III**Kinematics**

Velocity and Acceleration Diagrams- Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method – Slider crank mechanism, four bar mechanism. Acceleration diagrams for simple mechanisms, Coriolis acceleration, determination of Coriolis component of acceleration. Kleins construction. Analysis of slider crank mechanism for displacement, velocity and acceleration of slider using analytical method

Instantaneous Centre Method: Instantaneous centre of rotation, centrode and axode – relative motion between two bodies – Three centres in-line theorem – Locating instantaneous centres for simple mechanisms and determination of angular velocity of points and links.

UNIT – IV

Gears: Higher pairs, toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion, Forms of tooth- cycloidal and involute profiles. Velocity of sliding – phenomena of interference – Methods to avoid interference. Condition for minimum number of

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teeth to avoid interference, expressions for arc of contact and path of contact. Introduction to Helical, Bevel and Worm gearing.

Gear Trains: Introduction –Types of gears – Simple, Compound, Reverted and Epicyclic gear trains, Train value – Methods of finding train value or velocity ratio – Tabular column method for Epicyclic gear trains. Torque in epicyclic gear trains. Differential gear of an automobile.

UNIT – V

Cams: Definitions of cam and follower – uses – Types of followers and cams – Terminology. Types of follower motion - Uniform velocity, Simple harmonic motion, Cycloidal and uniform acceleration–and retardation Maximum velocity and maximum acceleration during outward and return strokes. Drawing of cam profiles.

Analysis Of Motion Of Followers: Tangent cam with roller follower – circular arc (Convex) cam with flat faced and roller follower.

Text Books :

1. Theory of Machines, S.S. Rattan, Tata McGraw Hill Publishers.
2. The Theory of Machines, J.E. Shigley, McGraw Hill .
3. Theory of Machines, Thomas Bevan, CBS.

References :

1. Theory of Machines, R.K.Bansal and J S Brar, Laxmi Publications.
2. Mechanism and Machine Theory, J.S. Rao and R.V. Dukkipati, New Age
3. Theory of machines, P.L. Ballaney, Khanna Publishers.
4. Kinematics and dynamics of machinery, R.L Norton ,Tata McGraw Hill Publishers

Course Outcomes

Upon successful completion of this course, the student will be able to:

- Distinguish kinematic and kinetic motion.
- Identify the basic relations between distance, time, velocity, and acceleration.
- Apply vector mechanics as a tool for solving kinematic problems.
- Create a schematic drawing of a real-world mechanism.
- Determine the degrees-of-freedom (mobility) of a mechanism.

Suggestions:

Students may visit nearby machine tool shops and automobile workshops to know about different mechanisms, gears, gear trains, flexible drives and cams. Students are suggested to search the web and identify different URLs which provide animations of mechanisms for better visualization and understanding purpose.


Web References :

<http://nptel.iitk.ac.in>

<http://ptumech.loremate.com/tom1/node/1>

<http://www.youtube.com/watch?v=6coD3oOuhr8>

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II YEAR II SEM

15AME17-THERMAL ENGINEERING

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Course Objectives

- To make students familiar with the design and operating characteristics of modern internal combustion engines
- To apply analytical techniques to the engineering problems and performance analysis of internal combustion engines
- To study the thermodynamics, combustion, heat transfer, friction and other factors affecting engine power, efficiency and emissions
- To introduce students to the environmental and fuel economy challenges facing the internal combustion engine
- To introduce students to future internal combustion engine technology and market trends

UNIT-I

I.C. Engines : Definition of Engine and Heat Engine, I.C Engine Classification – Parts of I.C. Engines, Working of I.C. Engines, Two Stroke & Four Stroke I.C. Engines SI & CI Engines, Valve and Port Timing Diagrams.

UNIT-II

S.I. Engine: Fuel Supply Systems, carburetor types Air Filters, Mechanical and Electrical Fuel Pump – Filters– Gasoline Injection Systems.

Cooling & Lubrication Systems: Cooling Requirements, Air Cooling, Liquid Cooling, Thermo Siphon, Water And Forced Circulation System, Lubrication Systems-Flash, Pressurized and Mist Lubrication.

Ignition System: Function Of An Ignition System, Battery coil Ignition System, Magneto Coil Ignition System, Electronic Ignition System using Contact Breaker, Electronic Ignition using Contact Triggers – Spark Advance And Retard Mechanism.

UNIT-III**Combustion Of I.C Engines**

S I engine :Normal Combustion and Abnormal Combustion – Importance of Flame Speed and Effect of Engine Variables – Type of Abnormal Combustion, Pre-Ignition and Knocking (Explanation) – Fuel Requirements and Fuel Rating, Anti Knock Additives, Combustion Chambers.

C.I. Engines: Stages Of Combustion – Delay Period And Its Importance – Effect Of Engine Variables – Diesel Knock– Combustion Chambers (DI And IDI), Fuel Requirements And Fuel Rating.

UNIT – IV

Testing and Performance : Parameters of Performance - Measurement of Cylinder Pressure, Fuel Consumption, Air Intake, Exhaust Gas Composition, Brake Power – Determination of Frictional Losses And Indicated Power – Performance Test – Heat Balance Sheet and Chart.

UNIT-V

Air Compressors: Reciprocating Compressors, Effect of Clearance volume in Compressors, Volumetric Efficiency, Single Stage and Multi Stage Compressors, Effect of Inter cooling and Pressure Drop in Multi - Stage Compressors, Problems Related to Reciprocating Compressors, Working principles of Roots blower, Vane type Blower, Centrifugal Compressor - Axial Flow Compressors.

- Students are advised to refer the text book of “Internal Combustion Engine Fundamentals” by John B. Heywood.

Text Books:

1. I.C. Engines / V. Ganesan- TMH
2. Thermal Engineering / Rajput / Lakshmi Publications.

References:

1. IC Engines – Mathur & Sharma – Dhanpath Rai & Sons.
2. Internal Combustion Engines by K.K. Ramalingam, Scitech Publications.
3. Engineering fundamentals of IC Engines – Pulkrabek, Pearson, PHI
4. Thermal Engineering, Rudramoorthy - TMH
5. Thermodynamics & Heat Engines, B. Yadav, Central Book Depot., Allahabad
6. I.C. Engines, Heywood, McGrawHill.
7. Thermal Engineering – R.S. Khurmi & J.K. Gupta – S.Chand
8. Thermal engineering data book-B.Srinivasulu Reddy, JK International Pub.
9. I.C Engines by S.S Thipse – Jaico

Course outcomes

After Completion of this course the student can be able to:

- Exposure to the engineering systems needed to set-up and run engines in controlled laboratory environments
- Develop skills to run engine dynamometer experiments
- Learn to compare and contrast experimental results with theoretical trends, and to attribute observed discrepancies to either measurement error or modeling limitations
- Develop an understanding of real world engine design issues
- Develop an ability to optimize future engine designs for specific sets of constraints (fuel economy, performance, emissions)

Web Resources

<http://autoclub.rso.siuc.edu/frange.html>

<http://www.howstuffworks.com/engine1.htm>

<http://inventors.about.com/library/inventors/blinternalcombustion.htm>

<http://www.animatedengines.com/>


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15AME18-FLUID MECHANICS AND HYDRAULIC MACHINERY

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Course Objectives:

- The purpose of this course is to learn the Fluid properties and fundamentals of Fluid statics and fluid flow
- To introduce the concepts of flow measurements and flow through pipes
- To introduce the concepts of momentum principles
- To impart the knowledge on pumps and turbines

UNIT - I : Fluid Statics: Dimensions and units: physical properties of fluids – specific gravity, porosity surface tension – vapour pressure and their influence on fluid motion – atmospheric gauge and vacuum pressure – measurement of pressure – Piezometer, U-tube differential manometers.

Fluid Kinematics: stream line, path line and streak lines and stream tube, classification of flows- steady & unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational flows- equation of continuity for one dimensional flow.

Fluid dynamics: surface and body forces – Euler's and Bernoulli's equations for flowing stream line, momentum equation and its application on force on pipe bend.

UNIT – II: Conduit Flow: Reynold's experiment – Darcy Weisbach equation – Minor losses in pipes – pipes in series and pipes in parallel – total energy line-hydraulic gradient line. Measurement of flow: pilot tube, venturimeter, and orifice meter, Flow nozzle, Turbine current meter.

UNIT – III: Turbo Machinery: hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done efficiency, flow over radial vanes.

Hydroelectric Power Stations: Elements of hydro electric power station-types-concept of pumped storage plants-storage requirements.


UNIT – IV: Hydraulic Turbines: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies hydraulic design-draft tube- theory- functions and efficiency.

Performance Of Hydraulic Turbines : Unit and specific quantities, characteristic c governing of turbines, selection of type of turbine, cavitation, surge tank, hammer.

UNIT – V: Centrifugal Pumps: Classification, working, work done – manometric head – loss efficiencies – specific speed – pumps in series and parallel – performance characteristic curves, NPSH.

Text Books :

1. Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.
2. Fluid Mechanics by FM Streeter, TMH
3. Fluid Mechanics by Dr.R.K.Bansal, Lakshmi Publications Pvt.Ltd.


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Reference Books :

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria &.
2. Fluid Mechanics and Machinery by D.Rama Durgaiyah, New Age Internat.
3. hydraulic Machines by Banga & Sharma, Khanna Publishers.
4. Instrumentation for Engineering Measurements by James W.Dally, Wiley Riley, John Wiley & Sons Inc. 2004

Course Outcomes

- Read and follow directions for laboratory experiments.
- Operate fluid flow equipment and instrumentation.
- Collect and analyze data using fluid mechanics principles and experimentation methods.
- Prepare reports following accepted writing and graphical techniques.
- Perform exercises in small teams.
- Demonstrate principles discussed in Fluid Mechanics lecture course.
- Student can able to identify the type of turbine with known specific speed.
- Student can able to identify and design the pumps with known specific speed and manometric head


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II YEAR II SEM

15AME19-MACHINE DRAWING

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Course Objectives:

- To make the students understand the concepts of I.S. conventions, methods of dimensioning, the title boxes, to draw the machine elements and simple parts.
- To make the students understand and draw assemblies of machine parts and to draw their sectional views

UNIT- I**Machine Drawing Conventions:** Need for drawing conventions- introduction to IS conventions

- a) Conventional representation of material, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs. Parts not usually sectioned.
- b) Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
- c) Title boxes, their size, location and details-common abbreviations & their liberal usage

Learning Outcomes & Suggested Student Activities

This unit is useful to prepare the students for representing their ideas at International standards and will be able to convey in without much effort globally with ease. Students will acquire skills to draft on a drawing sheet without much effect. Students are advised to visit machine shop.

UNIT-II**Drawing of Machine Elements and simple parts:** Selection of Views, additional views for the following machine elements and parts with drawing proportions:

- a) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws,
- b) Keys, cottered joints and knuckle joint,
- c) Rivetted joints for plates, welding joints.
- d) Shaft coupling, spigot and socket pipe joint.
- e) Journal and foot step bearings.

Learning Outcomes & Suggested Student Activities

Students can represent various details of an object quickly without much time and ambiguity. These drawings can be easily prepared and understood by both the people in a manufacturing industry and the consumers too. Students are advised to visit machine shop.


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UNIT- III

Assembly Drawings: Drawings of assembled views for the part drawings of the following.

- a) Engine parts- stuffing boxes, cross heads, Eccentrics, Petrol Engine-connecting rod, piston assembly.
- b) Other machine parts- Screw jack, Machine Vice, single tool post, swivel joint.
- c) Valves: Steam stop valve, feed check valve. Non return valve.

Learning Outcomes & Suggested Student Activities

Students can understand the working principles of an assembly or subassembly so that he/she will be able to produce the final product by procuring the units from various sources/suppliers and still produce any useful product serving effectively. It is not necessary that all the components to be made locally only. Students are advised to visit body building and assembly unit.

Note: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

Text Books:

1. Machine Drawing- K.L. Narayana, P.Kannaiah&K.Venkata Reddy, New Age Publishers
2. Machine Drawing- Dhawan, S.Chand Publications

References:

1. Machine Drawing- P.S. Gill.
2. Machine Drawing- Luzzader
3. Machine Drawing – Rajput
4. Textbook of Machine Drawing-K.C.John,2009, PHI learning

Suggestions:

1. Student should buy a book mentioned under Text books and study all the exercises given at the end of each chapter to equip him/her with the required ammunition.
2. Student should visit an automobile shop while the unit is being disassembled / assembled. Student should go through the exercises given under assembly drawings refereeing to various books in the library to improve his assimilation capacity.



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II YEAR II SEM

15AME20-MANUFACTURING TECHNOLOGY

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Course Objectives

- analyse the practical applications of a variety of forming and machining processes;
- analyse and formulate the costs of various manufacturing processes in terms of fixed and variable costs and break even point;
- formulate practical design methods to materials working techniques;
- interpret the geometry of tooling used on various metal cutting machines;
- analyse the effects of heat, lubrication and various cutting tool materials on the metal cutting process.

UNIT – I

Casting: Steps involved in making a casting– Types of patterns - Patterns and Pattern making — Materials used for patterns, pattern allowances and their Construction, Principles of Gating, Gating ratio and design of Gating systems, Solidification of casting – Concept – Solidification of pure metal and alloys, short & long freezing range alloys. Risers – Types, function and design, casting design considerations, special casting processes 1) Centrifugal 2) Die, 3) Investment.

Methods of Melting: Crucible melting and cupola operation, steel making processes.

UNIT – II

Welding: Classification of welding process types of welds and welded joints and their characteristics, design of welded joints, Gas welding, ARC welding, Forge welding, resistance welding, Thermit welding and Plasma (Air and water) welding.

Cutting of Metals: Oxy – Acetylene Gas cutting, Plasma Cutting , Inert Gas welding, TIG & MIG, welding, Friction welding, Induction welding, Explosive welding, Laser welding, Soldering & Brazing. Heat affected zones in welding; welding defects – causes and remedies – destructive non-destructive testing of welds.


UNIT – III

Hot working, cold working, strain hardening, recovery, recrystallisation and grain growth, Comparison of properties of Cold and Hot worked parts, rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements, plastic blow and injection moulding, Stamping, forming and other cold working processes: Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.

UNIT- IV

Extrusion Of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion Hydrostatic extrusion.

Forging processes: Principles of forging – Tools and dies – Types Forging – Smith forging, Drop Forging – Roll forging – Forging hammers: Rotary forging – forging defects.


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UNIT - V

Plastic –types, properties and their applications; processing of plastic – different methods – blow and injection molding, process capabilities and equipment details. Ceramic – Processing of different types of ceramics- compaction of metal powders, sintering, finishing operations, process capabilities.

Text Books:

1. Manufacturing Technology / P.N. Rao/TMH
2. Manufacturing Technology/ kalpakjian, Pearson education


References:

1. Production Technology / R.K. Jain
2. Process and materials of manufacturing –Lindberg/PE
3. Principles of Metal Castings / Rosenthal.
4. Welding Process / Paramar
5. Manufacturing Technology / R.K. Rajput, Laxhimi Pub
6. Workshop Technology Vol-, by Raghuvamsi

Course Outcomes

- examine the principles associated with basic operations involving the forming, machining and welding of engineering materials;
- interpret the advantages and limitations of each process and its influence on the properties of the material in the finished component;

analyse the basic processes used in performing forming, machining and welding operations on engineering materials;


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II YEAR II SEM

15AME21-THERMAL ENGINEERING LAB

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Course Description & Objectives: Students undergoing this course would gain knowledge about the working of I.C engines and will have the knowledge about the working of ignition and fuel system.

1. Valve Timing Diagram of 4 Stroke Diesel Engine
2. Port Timing Diagram of Single Cylinder 2 - Stroke Petrol Engine
3. Assembly and Disassembly of Diesel and Petrol Engines
4. Performance Test on 2 - Stage Reciprocating Air Compressor
5. Performance Test on 2 – Stroke Single Cylinder Petrol Engine Coupled to D.C Generator Loaded Resistance Rheostat with Motoring Test Rig
6. Performance Test on 4 – Stroke 4 Cylinder Petrol Engine Coupled to D.C Generator Loaded Resistance Rheostat with Motoring Test Rig
7. Performance Test on Refrigeration Test Rig
8. Performance Test on Air Conditioning Test Rig
9. Study of Boilers
10. Demonstration of Diesel and Petrol engines by cut models.

Course Outcomes:

Upon the successful completion of the course, learners will be able to:

- Explain the various working cycles of engine
- Describe the various types of combustion in IC engines.
- Illustrate the engine combustion parameters.
- Describe the different types of modern engines.

Explain the modern electronic engine management system (EMS) of IC engines.



II YEAR II SEM

15AME15-FLUID MECHANICS AND HYDRAULIC MACHINERY LAB**L T P C**
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Objective: The object of the course to make the students understand the fluid flow concepts and get familiarity with flow measuring devices.

Syllabus :

1. Impact of Jets on Vanes.
2. Performance test on Pelton wheel.
3. Performance test on Francis turbine.
4. Performance test on Kaplan turbine.
5. Performance test on Single Stage Centrifugal Pump.
6. Performance test on Multi Stage Centrifugal Pump.
7. Performance test on Reciprocating Pump.
8. Calibration of Venturimeter.
9. Calibration of Orifice meter.
10. Determination of Friction factor for a given Pipe Line.
11. Determination of Loss of Head due to Sudden Contraction in a Pipeline.
12. Turbine Flow meter.

Course outcomes:-

Students who successfully complete this course will have demonstrated an ability to:

- Identify, name, and characterize flow patterns and regimes.
- Understand basic units of measurement, convert units, and appreciate their magnitudes.
- Utilize basic measurement techniques of fluid mechanics.
- Discuss the differences among measurement techniques,

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