

BHAVNAGAR UNIVERSITY
B.E.SEMESTER –IV PRODUCTION ENGINEERING
P- 401 ELEMENTS OF MACHINE DESIGN

Teaching Scheme		<u>Examination Scheme</u>				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Pract/Oral Marks	Term work Marks	Total Marks
03	04	100	04	25	25 =	150

A. THEORY

1. Design Consideration in Machine Parts

Stress Concentration in m/c elements , stress concentration factor, methods of relieving stress concentration, Notch sensitivity, thermal stresses, contact stress.

2. Design of Shaft

Design of shaft for strength and rigidity consideration, combined and torsion of Shafts,

3. Design of Springs

Stresses in coil spring of round wire design of compression & tension springs, Bellevue spring , concentric springs, spiral springs.

4. Struts and Columns

design of connecting rod. Push rods and piston rods etc.,

5. Design of Presser Vessels

Design of thick & thin cylinders, pipes, tubes, cylinder covers, covers bolts, Initial tightening of bolts, design of pressure vessels according to different standard of design, design considerations in pressure vessels, design of pipes, hydraulic press, hydraulic intensifier.

6. Design of Mechanical Power transmission Elements

Design of flat belts , V – belts , design of pulleys, Design of flywheel etc.

B. TERM WORK

The term work shall be based on the course under machine design – I as Under.

1. Atleast two complete working drawing if Imperial size. (A2) for the details and Assembly of component designed.
2. Minimum six minor problems.

C. PRACTICAL/ ORAL

The practical / oral examination shall be based on the above topics.

D. BOOKS

- 1 Machine Design by Pandya & shah
2. Machine Design by Patel & Pandya Vol. II
3. . Machine Design by Nagpal
4. . Machine Design by Sunderajmurty
5. . Machine Design by Hall
6. . Machine Design by Bahal & Goel
7. . Machine Design by Sharma & Agrawal
8. . Machine Design by Khurmi & Gupta
9. . Machine Design by R.K. Jain.
10. Fundamental of mc. Design by Phelan.
11. Design of mc/ Elements by Fairs.
12. Machine Design by Dr. S. Singh Khanna.
13. Mech. Engg. Design by R.B. Gupta.

BHAVNAGAR UNIVERSITY
B.E.SEMESTER –IV PRODUCTION ENGINEERING
P- 402 MECHANICAL MEASUREMENT & METROLOGY

Teaching Scheme		Examination Scheme				
Theory Hrs. Hrs.	Practical	Marks	Theory Hrs.	Practical/Oral Marks	Term work Marks	Total Marks
04	02	100	03	25	25	150

A. THEORY

PART – I MECHANICAL MEASUREMENTS

- 1. Introduction to Measurements** Generalized Measurement system, static & dynamic characteristics of instruments, types of measurement system, Instrumental error & its analysis, etc.
- 2. Temperature Measurement** Expansion Thermometers, Change- of state thermometers parametric cones, electrical methods, pyrometry, radiation pyrometers, optical pyrometer, Calibration of temperature measuring instruments.
- 3. Pressure Measurement** Pressure standards and methods of pressure measurement, deadweight pressure gauge, manometers, elastic deformation gauges, electrical methods, piezoelectric pressure transducer, measurement of vacuum pressures, calibration, etc.
- 4. Flow Measurement** Types of flow measuring instruments, measurement of pressure differential, velocity probes, aerodynamic problem, total pressure probes, special methods, flow visualization methods, etc.
- 5. Measurement force, torque & power** Direct methods and indirect method, force measuring inst. Torque measuring inst. And power measuring inst. Etc.
- 6. Miscellaneous measurement** of displacement, velocity acceleration, speed, frequency and viscosity.

PART – II METROLOGY

1. Fundamentals of metrology, standard of measurement, method of measurement.
2. Linear measuring instrument Working principle, construction, Measurement procedure, error and
3. elimination, limitations and calibration of different linear measuring instruments.
4. Angular measurement: Working principle, construction, measurement procedure, error and
5. elimination, limitations and calibration of different angular measuring instruments.
6. Surface roughness measurement: Different surface roughness standards of measurements, mechanical and electrical and electronic surface roughness measuring instruments.
7. Metrology of Screw thread: Errors in threads, thread errors, pitch errors, Measurement of various
8. elements in threads, measurements of major diameter, minor diameter, effective diameter. Best wire, Measurement of pitch.
9. Measurement & Testing of Gears: Gear measurements, rolling tests, Parkston gear tester, Measurements of individual elements, Measurement of tooth thickness, base pitch. Gear tooth caliper,
10. David brown tangent comparator, tangential gear tooth caliper, Checking of profile of gear. Measurements
11. of gear pitch. Composite method of gear checking.
12. Geometrical Dimensioning & Comparators.
13. Straightness, flatness, squareness, parallelism, circularity, rotation & its measurements.

Types and characteristics of comparators, Merits and demerits, Toolmaker's microscope, profile projector, auto collimators, alignment telescope, optical dividing head, optical flat, their study & use. experiments

B. PRACTICAL The laboratory work shall consist of study type/ performance evaluation type experiments on the above topics.

C. TERM WORK Term work shall consist of laboratory/ practical work to be written and reported in the form of a JOURNAL.

D. BOOKS

1. Mechanical Measurement and Metrology by R.K. Jain
2. Mech. Meas. & Control by D.S. Kumar.
3. Measurement by Dobellin.
4. Metrology by R.K. Jain
5. Engineering measurements by C.V. Collet and Hope.

BHAVNAGAR UNIVERSITY
B.E.SEMESTER –IV PRODUCTION ENGINEERING
P- 403 Engineering Metallurgy

Teaching Scheme		Examination Scheme				
Theory Hrs. Hrs.	Practical	Marks	Theory Hrs.	Practica l/Oral Marks	Term work Marks	Total Marks
03	02	100	03	25	25	150

A. THEORY

- (1) Structure of Metals, Fracture, Macro-examination, Spark Test, Sculptures Print, Macro-etching, Microscopic examinations, Magnetic Testing, Chemical analysis of steel and iron for C, S &P.
- (2) Iron-Carbon diagram - plain carbon steels, Allotropy of iron.
- (3) Crystallization of metals, Solidification of an alloy solid solution types, Thermal Equilibrium, diagrams of binary alloys, Effects of Structure on Physical Properties.
- (4) Cast Iron : Grades, Alloy Cast Iron, Malleable Iron, S. G. Iron.
- (5) Wrought Iron : Properties and uses.
- (6) Steel : Properties and uses, Effects of alloying metals, Classification of Steels.
- (7) Heat Treatment Of Steels : Study of Heat-Treatment processes such as spheroid zing, hardening , tempering , austempering, attempting ,case-hardening, nit riding, cyaniding, induction hardening, flame-hardening, ageing.
Application of above processes in mechanical components such as gears, bearing, turbine blades, crankshafts, pistons, cutting tool materials also.
- (8) Important non-ferrous alloys and soon-metallic materials in specific Engineering applications.
- (9) Powder Metallurgy : Application and advantages, Production of powder, Compacting, Sintering, Equipment and process capability.
- (10) Metal coatings, Organic coatings, Lining and cladding, Use of Corrosion inhibitors, Cathodic protection against corrosion.
- (11) Different non distractive testing such as DPT, MPT, RGT, UST, and Jiminy test.

B. PRACTICAL

This shall consists of laboratory work pertaining to the topics listed above.

(Note: Reference to International Classification of Steels, Indian Standards and Engineering Handbooks should be made in the course of study wherever applicable.

C. TERM WORK

Term work shall consist of practical work done under

- (B) Practical and to be written and submitted in the form of report/journal.

D. BOOKS

- (1) Engineering Metallurgy and material science by S. P. Nayak.
- (2) Materials and Metallurgy by G. B. S. Narang and K. Manchanedy
- (3) Elements of Metallurgy by Dr. Swaroop and Dr. Saxena.
- (4) Material science and manufacturing processs by Dharmendrakumar and S. K. Jain.
- (5) Physical Metallurgy by Robert Read Hill
- (6) Metallurgy for engineers by V. Ragvan
- (7) Metallurgy for engineers by Bava.
- (8) Physical metallurgy by Rollason.
- (9) Physical metallurgy by Hyegins.

- (10) Tool steel by Rabert.
- (11) Material Science by Annver.
- (12) Material Science by O.P. Khanna.

BHAVNAGAR UNIVERSITY
B.E.SEMESTER –IV PRODUCTION ENGINEERING
P- 404 THERMAL ENGINEERING

Teaching Scheme		Examination Scheme				
Theory Hrs. Hrs.	Practical	Marks	Theory Hrs.	Practica l/Oral Marks	Term work Marks	Total Marks
04	02	100	03	25	25	150

A. THEORY

1. **Second Law of Thermodynamics** First law limitations, Concept of Reversibility , Different statements, II law limitations.
2. **Entropy** Concept of Entropy , clauses inequality , entropy change, III law of thermodynamics.
3. **Thermodynamics Cycles**
Power producing cycles like diesel , auto, dual , carnot, joule, sterling and ericsson.
4. **Reciprocating compressor** Types, construction and working of reciprocating compressor, single stage Compression with and without clearance, multi state reciprocating air compressor, minimum work input effect of intercooling and after cooling, Air compressor terminology.
5. **Refrigerating & air-conditioning** Introduction & application of refrigeration , Air refrigeration system , reversed Car not cycle , Bell Coleman air cycle , vapour compression refrigeration cycle,Factor effecting , Refrigerants – properties & types. Terms in air-conditioning , Psychometric & Psychometric processes, Application .
6. **Steam & Gas turbine** Principle of operation of steam turbine ,comparison with steam engines , types,Simple impulse turbines , compounding of impulse turbine , impulse – reaction & Pure reaction turbine , difference between impulse & reaction turbine. Classification of Gas turbine , Open cycle turbine , means of improving The efficiency , closed cycle gas turbine , advantages , Jet propulsion .
7. **Heat & Mass Transfer** Mode of heat transfer, basics in heat & mass transfer, laws governing heat Transfer, concept of black body, application heat transfer in heat exchanger.

B. TERM WORK

This shall consist of experiments and write –up based on topics of syllabus as above and the assessment will be on continuous basis.

C. Practical / Oral

This shall be based on term work prepared and syllabus topics as above.

D. Reference Books

1. Mechanical Technology (Thermal) By Khurmi
2. Elements of Heat Engines By R.C. Patel.
3. Thermal Engineering By A.S. Saraw.

BHAVNAGAR UNIVERSITY
B.E.SEMESTER –IV PRODUCTION ENGINEERING
P- 405 HYDRAULICS

Teaching Scheme		Examination Scheme				
Theory Hrs. Hrs.	Practical	Marks	Theory Hrs.	Practica l/Oral Marks	Term work Marks	Total Marks
04	02	100	03	25	25	150

A. THEORY

1. PROPERTIES OF FLUID

Introduction : Fluid , liquids and gases, physical properties such as density, specific weight, viscosity, compressibility, capillarity, surface tension, vapors pressure, cavitation its ill effects and remedies, Thomas's cavitation factor.

2. FLUID STATICS

Pressure at point, center of pressure, buoyant force, met center and met centric height analytical and experimental methods Equilibrium of floating and submerged bodies.

3 KINEMATICS OF FLUID FLOW

Stream line, path line, stream tube, classification of fluid flow. Continuity equations in two dimension and three dimension in Cartesian co-ordinates, velocity potential and stream function vertex flow -free and forced.

4 DYNAMICS OF FLUID FLOW

Euler's equation of motion, bernoulli's equation and it's application Venturimeter, plot tube, orifice etc, Momentum equation and moment of momentum equation.

5 VISCOUS FLOW

Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe, Flow of viscous fluid between two parallel fixed plates -HAGEN -POISEVILLE LAW, Flow of viscous fluid between two parallel plates having relative motion COUTESS LAW, Petroff equation for journal bearing, power absorbed in viscous flow through - journal ,Foot step and Collar bearing , Movement of piston in dash pot, Methods of Measurement of viscosity.

6 COMPRESSIBLE FLUID FLOW

Thermodynamic concept, speed of sound wave , Mach number, mach cone and Mach angle, flow with friction through pipes, adiabatic and isothermal flow jet propultion flow through variable area. Flow through nozzles. Back pressure variation.

7 DIMENSIONAL ANALYSIS

fundamental dimensions, dimensional homogeneity, Rayleigh's method and Buckingham's theorem for dimensional analysis, dimensionless force ratios, hydraulic similitudes, models testing.

8 TURBULENT FLOW

Characteristics of diff. types of flow, expression for coefficient of friction -DARCHY WEICHBACK EQUATION, moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.

B. PRACTICAL

This must be based on experimental work on the topics listed above.

C. TERM WORK

This shall be based on experimental work on the topics listed above.

D. REFERENCE BOOKS

- 1 . Fluid Mechanics and Hyd. M/c by Sheth & Modi.
- 2 Fluid power Engineering by Dr. D.S. Kumer
3. Fluid mech. & Hyd. M/c by r.K. bansal.
4. Fluid Mechanics by K.L. Kumar.