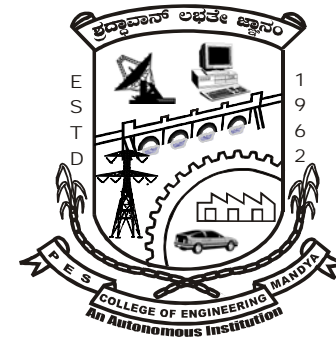


# Syllabus

## VI Semester B.E. Program Industrial Production Engineering



**P.E.S. College of Engineering**  
Mandya - 571 401. Karnataka  
( An Autonomous Institution under VTU Belgaum)

Grant -in- Aid Institution  
(Government of Karnataka)  
Accredited by NBA, New Delhi  
Approved by AICTE, New Delhi.  
Ph : 08232- 220043  
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Web : [www.pescemandya.org](http://www.pescemandya.org)

**P.E.S. COLLEGE OF ENGINEERING, MANDYA**  
(An Autonomous Institution under VTU)  
**SCHEME OF TEACHING AND EXAMINATION**

VI Semester B.E Industrial Production Engineering

Sl No.	Course Code	Course Title	Teaching Dept.	Credit Pattern L : T : P	Total Credits	Total Hours/Week	Examination Marks			Exam Duration in hours
							CIE	SEE	Total	
1	P08IP61	Theory of Metal Forming	IP	4:0:0	4	3	50	50	100	3
2	P08IP62	Engineering Economics	IP	4:0:0	4	3	50	50	100	3
3	P08IP63	Tool Engineering & Design	IP	4:0:0	4	3	50	50	100	3
4	P08IP64	Non Conventional Machining	IP	4:0:0	3	3	50	50	100	3
5	P08IP65	Quality Assurance Reliability	IP	4:0:0	4	3	50	50	100	3
6	P08IP66	Elective I (Group A)	IP	4:0:0	4	3	50	50	100	3
7	P08IPL67	Analysis Lab	IP	0:0:3	1.5	3	50	50	100	3
8	P08IPL68	Industrial Engineering	IP	0:0:3	1.5	3	50	50	100	3
				Total	26	24	400	400	800	

**Elective -1 (Group-A)**

SINo.	Course Code	Course Title
1	P08IP661	Value Engineering & Industrial Best Practice
2	P08IP662	Mechanical Vibrations
3	P08IP663	Finite Element Method
4	P08IP664	Human Resource Management
5	P08IP665	Advance Foundry Technology

# THEORY OF METAL FORMING

Course Code : P08IP61  
52  
Credits : 04  
04

Total Hours :

Hours per week :

## PART – A UNIT - 1

**ELEMENTS OF THE THEORY OF PLASTICITY:** Flow curves, True stress and strain, yield criteria for ductile metals, Von Mises's criterion, Tresca criterion. 6 Hours

## UNIT – 2

**FUNDAMENTALS OF METAL WORKING:** Classification of forming processes, Mechanics of Metal working – slab method, flow stress determination, temperature in Metal working, Hot working, Cold working, Warm working, strain - rate effects, metallurgical structure, friction and Lubrication. 8 Hours

## UNIT – 3

**FORGING PROCESS:** Classification of forging operation, forging equipment, forging strain, open die forging – closed die forging, die forging load forging defects. 6 Hours

## UNIT – 4

**ROLLING OF METALS:** Classification of rolling mills, hot and cold rolling forces and geometrical relationships in rolling, simplified analysis of rolling load, defects in rolled products, theories of cold and hot rolling, calculation torque and power required. 6 Hours

## PART – B UNIT – 5

**EXTRUSION:** Classification, equipments used, hot extrusion, deformation, lubrication and defects in extrusion, analysis of extrusion processes, hydrostatic extrusion, tube extrusion, production of seamless pipe and tubing. 6 Hours

## UNIT – 6

**DRAWING OF RODS, WIRES AND TUBES:** Rod and wire drawing process, drawing dies, analysis of wire drawing, Tandem drawing process, residual stress in rod, wire and tube drawing. Defects in drawing, tubedrawing. 6 Hours

## UNIT- 7

**SHEET METAL FORMING PROCESS:** Introduction, Forming methods, shearing, blanking, punching, bending, spring back, elimination of spring

back, spinning, deep drawing stretch forming, redrawing, reverse drawing, defects in drawing, factors affecting drawability ration. 8 Hours

## UNIT – 8

**HIGH ENERGY RATE FORMING (HERF):** Introduction to HERF, Process advantages, explosive forming electro discharge forming and electro magnetic forming, Rubber forming. 6 Hours

### TEXT BOOKS:

- Mechanical Metallurgy - Dieter. G. E - McGraw Hill, 2001
- Principle of Industrial metal working process—Rowe Edward Arnold, London, CBS Publishers - 2002.

### REFERENCE BOOK :

- ASM- Metals handbook, Sach G. fundamentals of working of metals, Pergamon Press.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

## ENGINEERING ECONOMICS

Course Code : P08IP62  
Credits : 04

Total Hours : 52  
Hours per week : 04

### PART – A UNIT – 1

**INTRODUCTION:** Engineering Decision- Makers, Engineering and Economics, Problem solving and Decision making, Intuition and Analysis, Tactics and Strategy. 6 Hours

### UNIT – 2

**INTEREST AND INTEREST FACTORS:** Interest rate, simple interest Compound interest, Cash- flow diagrams, Exercises and Discussion. 7 Hours

### UNIT – 3

**PRESENT WORTH COMPARISON:** Conditions for present worth comparisons, Basic Present worth comparisons, Present worth equivalence, Net Present worth, Assets with unequal lives, infinite lives, Future worth comparison, Pay – back comparison, Exercises, Discussions and problems 7 Hours

### UNIT – 4

**EQUIVALENT ANNUAL WORTH COMPARISONS:** Equivalent Annual Worth Comparison methods, Situations for Equivalent Annual Worth Comparison Consideration of asset life, Comparison of assets with equal and unequal lives, Use of sinking fund method, Annuity contract for guaranteed income, Exercises, Problems. 7 Hours

### PART – B UNIT – 5

**RATE OF RETURN CALCULATIONS:** Rate of return, Minimum acceptable rate of return, IRR, IR misconceptions, Cost of capital concepts, replacement models. 6 Hours

### UNIT – 6

**DEPRECIATION:** Causes of Depreciation, Basic methods of computing depreciation charges 3 Hours

**STRUCTURAL ANALYSIS OF ALTERNATIVES:** Identifying and Defining alternatives, IRR analysis of mutually exclusive alternatives, Capital Budget view point. 4 Hours

### UNIT – 7

**REPLACEMENT ANALYSIS:** Deterioration, obsolescence, inadequacy, Economic life for cycle replacements. 2 Hours

**ESTIMATING & COSTING:** Components of costs such as Direct Material Cost, Direct Labour Cost, Fixed, Over – Heads, Factory Costs, Administrative – Over Heads, First Cost, Marginal Cost, Selling price, Estimation for simple components. 4 Hours

### UNIT – 8

**EFFECTS OF INFLATION:** Causes, consequences and control of inflation. After tax actual cash flow comparisons, Lease/ Buy decisions 2 Hours

**BREAK-EVEN ANALYSIS:** Basic Concepts Linear & non-linear break even analysis. 4 Hours

### TEXT BOOKS :

1. Engineering economy- RIGGS J.L., McGraw Hill, 2002.
2. Engineering economy- PAUL DEGARMO, Macmillan Pub, Co. 2001.
3. Engineering –NVR. NAIDU, KM BABU and G. RAJENDRA Economy, New Age International Pvt. Ltd. – 2006

### REFERENCE BOOKS :

1. Industrial Engineering and Management OP KHANNA, Dhanpat Rai & Sons 2000.
2. Financial Management -I M PANDAY, Vikas Publishing House 2002.
3. Engineering economy -THUESENH.G. PHI, 2002

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

## TOOL ENGINEERING & DESIGN

Course Code : P08IP63  
Credits : 04

Total Hours : 52  
Hours per week : 04

### PART – A UNIT - 1

**METAL CUTTING:** Theory of Metal Cutting: Orthogonal and oblique cutting, Cutting action, Mechanism of chip formation, Types of Chips, Merchants Analysis. 8 Hours

### UNIT – 2

**TOOL MATERIALS:** Requirements, Properties, Types of Materials like high carbon Steel, HSS, coated HSS, ceramics, carbides, coated carbides, CBN, Diamond Tools. 6 Hours

### UNIT – 3

**DESIGN OF METAL CUTTING TOOLS:** Single point tool, Design consideration from strength, and Rigidity Consideration, chip Breakers Types, Form Tools. 8 Hours

### UNIT - 4

**DESIGN OF CUTTING TOOLS:** Twist Drill, Milling Cutter, Problem pertaining to the above 6 Hours

### PART – B UNIT – 5

**DESIGN OF MULTIPOINT CUTTING TOOL:** Reamers, Broach, taps, Problem pertaining to the above. 6 Hours

### UNIT – 6

**JIGS & FIXTURES:** Principles of Location, function of Jigs and fixtures, Types of Locators, Types of Clamps. 6 Hours

### UNIT – 7

**TYPES OF JIGS:** Types of Jigs like plate, Drill Jig, Box Jig, Leaf Jig. 6 Hours

### UNIT – 8

**FIXTURE DESIGN:** Turning Fixture, Milling fixture and planning fixtures. 6 Hours

### TEXT BOOKS :

1. Tools Design C Donaldson- G.H. Le CAIN V.C Goold, TMH - 1976.
2. Tooling data -P. H. Joshi, Wheeler Publication – 2005.
3. Metal Cutting and Tool design - Dr. B.J. Ranganath, Vikas Publishing house - 1993,

### REFERENCE BOOKS :

1. Metal cutting theory and Tool Design- Arshinav MIR Publications
2. Jigs & Fixtures- Grant – 1976.
3. Introduction to Jigs & Fixtures- Kempster. ELBS, Edn. 1974.
4. Fundamentals of Tools Design- ASTME – Prentice Hall India Publications – 1983.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

# NON-CONVENTIONAL MACHINING

Course Code : P08IP64  
Credits : 04

Total Hours : 52  
Hours per week : 04

## PART – A UNIT – 1

**INTRODUCTION:** History, Classification, Comparison between conventional and non-conventional machining process selection.

**MECHANICAL PROCESS:** Ultrasonic machining (USM) : Introduction, Equipment, tool materials & tool Size, Abrasive slurry, Cutting tool system design : Magnetostriction assembly, Tool cone (Concentrator), Exponential concentrator of circular cross section & rectangular cross section Hollow cylindrical concentrator. Mechanics of cutting : Theory of Miller & Shaw Effect of parameter : Effect of amplitude and frequency and vibration, Effect of grain diameter , Effect of applied static load, Effect of slurry, Tool and work material, USM process Characteristics ; Material removal rate, tool wears, Accuracy, surface finish., Applications, Advantages & Disadvantages of USM.  
8 Hours

## UNIT – 2

**ABRASIVE JET MACHINING (AJM):** Introduction, Equipment, Variables in AJM: carrier Gas Type of abrasive, Size of abrasive grain, velocity of the abrasive jet, Mean No. abrasive particles per unit volume of the carrier gas, Work material, stand off distance (SOD) nozzle design shape of cut.

Process characteristics – Material removal rate, Nozzle wear, Accuracy & surface finish. Applications, Advantages & Disadvantages of AJM. 6 Hours

## UNIT – 3

**ELECTROCHEMICAL AND CHEMICAL METAL REMOVAL PROCESS:** Electrochemical machining (ECM): Introduction, Study of ECM machine, Elements of ECM process : Cathode tool, Anode work piece, source of DC power, Electrolyte, Chemistry of the process ECM process characteristics – Material removal rate, Accuracy, Surface finish.  
6 Hours

## UNIT – 4

**ECM TOOLING:** ECM tooling technique 7 example, Tool & insulation materials, Tool size Electrolyte flow arrangement, Handling of slug., Economics of ECM, Applications such as Electrochemical turning, Electrochemical Grinding, Electrochemical Honing, deburring, Advantages, Limitations.  
6 Hours

## PART – B UNIT - 5

**CHEMICAL MACHINING (CHM):** Introduction, Elements of process Chemical blanking process :-Preparation of workpiece. Preparation of masters, masking with photo resists, etching for blanking, applications of chemical blanking, chemical milling (Contour machining) :-Process steps – masking, Etching, process characteristics of CHM :-material removal rate accuracy, surface finish, Hydrogen embrittlement, Advantages & application of CHM.  
8 Hours

## UNIT – 6

**EDM PROCESS:** Introduction, machine, mechanism of metal removal, dielectric fluid, spark generator, EDM tools (electrodes) Electrode feed control, Electrode manufacture, Electrode wear, EDM tool design : Choice of matching operation, electrode material selection, under sizing and length of electrode Machining time.  
6 Hours

## UNIT – 7

**EDM PROCESS CHARACTERISTICS:** Flushing – Pressure flushing synchronized with electrode movement, EDM process characteristic: Metal removal rate, Accuracy surface finish, Heat affected Zone. Machine tool selection, Application: EDM accessories / applications, electrical discharge grinding, Travelling wire EDM.  
6 Hours

## UNIT – 8

**PLASMA ARC MACHINING (PAM):** Introduction, equipment non-thermal generation of plasma, selection of gas, Mechanism of Metal removal, PAM parameters, Process characteristics. Safety precautions, Applications, Advantages and limitations.  
6 Hours

### TEXT BOOKS :

1. Modern machining process - PANDEY AND SHAH, TATA Mc Graw Hill 2000.
2. New Technology- BHATTACHARAYA 2000.

### REFERENCE BOOKS :

1. Production Technology, - HMT TATA McGraw Hill 2001.
2. Modern Machining Process - ADITYAN, 2002.
3. Fundamentals of Machining and Machine **Tools** by R.K.Singal – I K International Publishing house Pvt. Ltd,
4. “Thermal Metal Cutting Process -Dr. B.J. Ranganath, I.K. International, New Delhi. – 2008

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

# QUALITY ASSURANCE AND RELIABILITY

Course Code : P08IP65  
Credits : 04

Total Hours : 52  
Hours per week : 04

## PART – A UNIT – 1

**INTRODUCTION:** Definition of Quality, Quality function, Dimensions of Quality, Quality Engineering terminology, Brief history of quality methodology, Statistical methods for quality improvement, Quality costs – four categories costs and hidden costs. Brief discussion on sporadic and chronic quality problems. Introduction to Quality function deployment. 6 Hours

## UNIT – 2

**QUALITY ASSURANCE:** Definition and concept of quality assurance, departmental assurance activities. Quality audit concept, audit approach etc. structuring the audit program, planning and performing audit activities, audit reporting, ingredients of a quality program. 6 Hours

## UNIT – 3

**STATISTICAL PROCESS CONTROL:** Introduction to statistical process control – chance and assignable causes variation. Basic principles of control charts, choice of control limits, sample size and sampling frequency, rational subgroups. Analysis of patterns of control charts. Case Studies on application of SPC. Process capability – Basic definition, standardized formula, relation to product tolerance and six sigma concept of process capability, Seven QC tools. 6 Hours

## UNIT – 4

**CONTROL CHARTS FOR VARIABLES:** Controls charts for X bar and Range  $\bar{R}$ , statistical basis of the charts, development and use of X bar and R charts, interpretation of charts. Control charts for X bar and standard deviation (S), development and use of X bar and S chart. Brief discussion on – Pre control X bar and S control charts with variable sample size, control charts for individual measurements, cusum chart, moving-range charts. 8 Hours

## PART – B UNIT – 5

**CONTROL CHARTS FOR ATTRIBUTES:** Controls chart for fraction non-conforming (defectives) development and operation of control chart, brief discussion on variable sample size. Control chart for non-conformities (defects) – development and operation of control chart for constant samplesize and variable sample size. Choice between variables and attributes control charts. Guidelines for implementing control charts. 8 Hours

## UNIT – 6

**SAMPLING INSPECTION:** Concept of accepting sampling, economics of inspection, Acceptance plans – single, double and multiple sampling. Operating characteristic curves – construction and use. Determinations of average outgoing quality, average outgoing quality level, average total inspection, producer risk and consumer risk, published sampling plans, Gauge R and R and MSA. 6 Hours

## UNIT – 7

**STATISTICAL THEORY OF TOLERANCES:** Application of statistical theory of tolerances to design of tolerances in random assemblies and application in other areas. 6 Hours

## UNIT – 8

**RELIABILITY AND LIFE TESTING:** Failure models of components, definition of reliability, MTBF, Failure rate, common failure rate curve, types of failure, reliability evaluation in simple cases of exponential failures in series, paralleled and series-parallel device configurations, Redundancy and improvement factors evaluations. 6 Hours

### TEXT BOOKS :

1. Introduction to statistical Quality Control- D C Montgomery 3<sup>rd</sup> Edition, John Wiley and Sons.
2. Quality Planning & Analysis- J M Juran, Frank M Gryna; 3<sup>rd</sup> edition, Tata McGraw Hill.
3. Total Quality Management – NVR Naidu, KM Babu and G. Rajendra – New Age International Pvt. Ltd – 2006.

### REFERENCE BOOKS :

1. Statistical Quality Control- Grant and Leavenworth, 6th Edition McGraw Hill,
2. The QS9000 Documentation Toolkit- Janet L Novak and Kathleen C Bosheers, 2nd Edition, Prentice Hall PTR.
3. ISO 9000 a Manual for Total Quality Management-, Suresh Dalela and Saurabh, 1st Edition, S Chand and Co.
4. Total Quality Management-I Kesavan R.K. Intl, New Delhi – 2007.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any 5 full questions choosing 2 from Part- A. & 2 from Part-B.

## ANALYSIS LAB

## INDUSTRIAL ENGINEERING LAB

Course Code : P08IP67

Total Hours : 42

Credits :

Hours per week : 03

Course Code : P08IP68

Total Hours : 42

Credits :

Hours per week : 03

### PART - A

#### Study of a FEA package and modeling stress analysis of

- Bars of constant cross section area, tapered cross section area and stepped bar
- Trusses – (Minimum 2 exercises)
- Beam – Simply supported, cantilever, beams with UDL, beams with varying load etc ( Minimum 6 exercises )

### PART – B

- Stress analysis of a rectangular plate with a circular hole
- Thermal Analysis – 2 D problem with conditions ( Minimum 2 exercises )
- Fluid flow Analysis 0 Potential distribution in the 2 – D Bodies
- Dynamic Analysis
  - Fixed – fixed beam for natural frequency determination
  - Bar subjected to forcing function
  - Fixed – fixed beam subjected to forcing function

#### REFERENCE BOOKS :

- A first course in the finite element method by Daryl L Logan, Thomason, Third Editions
- Fundamentals of FEM by Hutton – Mc Graw Hill , 2004
- Finite element Analysis by George R. Buchanan, schaum Series

#### Scheme for Examination :

One Question for Part A	-	20 Marks ( 05 Write up + 15)
One Question form Part B	-	20 marks ( 05 Write up + 15)
Viva – voce	-	10 Marks
<b>Total</b>		<b>50 Marks</b>

### PART – A

- Recording Techniques : preparing the following charts and diagrams
  - Out line process chart
  - Flow process chart
  - Flow diagram
  - Multiple activity chart
  - String diagram, SIMO chart
  - Two handed process charts
- Application of principle of motion economy
- Measurement of effect of work on human body (Ergometer, Treadmill)
- Rating exercises

### PART – B

- Determining the standard time for simple operation using stop watches and PMTS
- Application of Acceptance Sampling Techniques (single sampling plan & Plotting the O.C. Curve)
- Experiments to generate data the results in normal distribution, and its interpretation.
- Effect of Noise on human efficiency
- Conceptual design of displays and controls.

#### Scheme for Examination :

One Question for Part A	-	20 Marks ( 05 Write up + 15)
One Question form Part B	-	20 marks ( 05 Write up + 15)
Viva – voce	-	10 Marks
<b>Total</b>		<b>50 Marks</b>

## VALUE ENGINEERING AND INDUSTRIAL BEST PRACTICE

Course Code : P08IP661  
Credits : 04

Total Hours : 52  
hours per week : 04

### PART – A UNIT – 1

**INTRODUCTION TO VALUE ANALYSIS:** Definition of Value, Value Analysis, Value Engineering, Value Management, Value Analysis versus Value Engineering, Value Analysis versus Traditional cost reduction techniques, uses, Applications, advantages and limitations of Value analysis. Symptoms to apply value analysis, Coaching of Champion concept. 6 Hours

### UNIT – 2

**TYPE OF VALUES:** Reasons for unnecessary cost of product, Peeling cost Onion concept, unsuspected areas responsible for higher cost, Value Analysis Zone, attractive features of value analysis. Meaning of Value, types of value & their effect in cost reduction. Value analysis procedure by simulation. Detailed case studies of simple products. 7 Hours

### UNIT – 3

**FUNCTIONAL COST AND ITS EVALUATION:** Meaning of Function and Functional cost, Rules for functional definition, Types of functions, primary and secondary functions using verb and Noun, Function evaluation process, Methods of function evaluation. Evaluation of function by comparison, Evaluation of Interacting functions, Evaluation of function from available data, matrix technique, MISS technique, Numerical evaluation of functional relationships and case studies. 7 Hours

### UNIT – 4

**PROBLEM SETTING & SOLVING SYSTEM:** A problem solvably stated is half solved, Steps in problem setting system, Identification, Separation and Grouping of functions. Case studies.

**PROBLEM SETTING & SOLVING SYSTEM:** Goods system contains everything the task requires. Various steps in problem solving, case studies. 6 Hours

### PART - B UNIT – 5

**VALUE ENGINEERING JOB PLAN:** Meaning and Importance of Value Engineering Job plan. Phases of job plan proposed by different value engineering experts,. Information phase, Analysis phase, Creative phase,

Judgement phase, Development planning phase, and case studies. Cost reduction programs, criteria for cost reduction program, Value analysis change proposal. 6 Hours

### UNIT – 6

**VALUE ENGINEERING TECHNIQUES:** Result Accelerators or New Value Engineering Techniques, Listing, Role of techniques in Value Engineering, Details with Case examples for each of the Techniques. 6 Hours

### UNIT – 7

**ADVANCED VALUE ANALYSIS TECHNIQUES:** Functional analysis system technique and case studies, Value analysis of Management practice (VAMP), steps involved in VAMP, application of VAMP to Government, University, College, Hospitals, School Problems etc., (service type problems). 8 Hours

### UNIT – 8

**APPLICATION OF VALUE ANALYSIS:** Application of Value analysis in the field of Accounting, Appearance Design, Cost reduction, Engineering, manufacturing, Management, Purchasing, Quality Control, Sales, marketing, Material Management Etc., Comparison of approach of Value analysis & other management techniques. 6 Hours

#### TEXT BOOKS :

1. Techniques of Value Engineering and Analysis - Lawrence D Miles McGraw Hill Book Co.
2. Value engineering for COST REDUCTION and PRODUCT IMPROVEMENT – M.S. Vittal, Systems Consultancy Services Edn 1993.

#### REFERENCE BOOKS :

1. Value Analysis – W.L. Gage, McGraw Hill Book Company.
2. Value Management, Value Engineering and Cost Reduction – Edward D Heller Addison Wesley Publishing Company 1971.
3. Value Analysis for Better Management – Warren J Ridge American Management Association Edn 1969.
4. Elements of Production Planning and Control – Samuel Eilon, Universal Book Corporation. Edn 1981.
5. Getting More at Less Cost (The Value Engineering Way) – G.Jagannathan Tata Mcgraw Hill Pub. Comp. Edn 1995.
6. Value Engineering–Arther E Mudge McGraw Hill Book Comp. Edn 1981.
7. An Introduction to Operational Research – C R Kothari Vikas Pub. House Ovt. Ltd., Edn. 1982.

#### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part –B.

# MECHANICAL VIBRATIONS

Course Code : P08IP662  
Credits : 04

Total Hours : 52  
Hours per week : 04

## PART – A UNIT – 1

**INTRODUCTION:** Types of vibrations, S.H.M, principle of super position applied to Simple Harmonic Motions, Beats. Fourier theorem and simple problems. Single degree of freedom systems and Simple problems. 6 Hours

## UNIT – 2

**UNDAMPED FREE VIBRATIONS:** Introduction, undamped free vibration – natural frequency of free vibration, stiffness of spring elements, effect of mass of spring. 6 Hours

## UNIT – 3

**DAMPED FREE VIBRATIONS:** Single degree freedom systems, different types of damping, concept of critical damping and its importance, study of response of viscous damped systems for cases of under damping, critical and over damping, Logarithmic decrement. 7 Hours

## UNIT – 4

**FORCED VIBRATION:** Single degree freedom systems, steady state solution with viscous damping due to harmonic force, solution by complex algebra. Concept of response, Reciprocating and rotating unbalance, vibration isolation – transmissibility ratio. Energy dissipated by damping, sharpness of resonance, base excitation. 7 Hours

## PART – B UNIT – 5

**VIBRATION MEASURING INSTRUMENTS:** Accelerometer and vibrometers. Whirling of shafts with and without air damping. Discussion of speeds above and below critical speeds. 6 Hours

## UNIT – 6

**SYSTEMS WITH TWO DEGREES OF FREEDOM:** Introduction, principal modes and normal modes of vibration, co-ordinate coupling, generalized and principal co-ordinates, free vibration in terms of initial conditions. Geared systems. Forced Oscillations – Harmonic excitation. Applications: (a) Vehicle suspension (b) Dynamic vibration absorber (c) Dynamics of Reciprocating Engines. 7 Hours

## UNIT – 7

**CONTINUOUS SYSTEMS:** Introduction, vibration of string, longitudinal vibration of rods, torsional vibration of rods, Euler's equation for beams, simple problems, M D OF systems. Introduction, Influence co-efficient, Maxwell reciprocal theorem. 7 Hours

## UNIT – 8

### NUMERICAL METHODS FOR MULTI DEGREE FREEDOM

**SYSTEMS:** Dunkerley's equation. Orthogonality of principal modes, Holzer's method, Geared and branched systems, Rayleigh's method, Stodola method. 6 Hours

### TEXT BOOKS :

1. Fundamental of Mechanical Vibration - S. Graham Kelly, Tata McGrawHill, 2000.
2. Mechanical Vibrations - Singireru. S. Rao, Pearson Education Inc., 4th Edition, 2003.

### REFERENCE BOOKS :

1. Mechanical Vibrations – Kelly, Schaum's Outline Series, 1996, McGraw Hill.
2. Vibrations- Tse, Morse & Hincle, Prentice Hall India, 1990.
3. Mechanical Vibrations - Austin. H. Church, John Wiley and Sons, 1963.
4. Theory & Practice of Mechanical Vibrations- J.S. Rao & K.Gupta, New Age Intl., Publication 2001
5. Theory of Vibration with applications - William T. Thomson and Maric Dillon Dahleh, Pearson Education Inc., 5<sup>th</sup> Edition, 2003.
6. Vibrations - Balakumar Balachandran and Edward B. Magrab, Thomson Asia, 2003.
7. Fundamentals of Vibrations - Leonard Mcirovitch, McGraw Hill, 2001.
8. Fundamentals of Mechanical Vibrations - S. Graham Kelly, Mc Graw Hill International Edition 2000.
9. Engineering Vibrations - William J Bottega - I K International Publishing house Pvt. Ltd. 2nd Edition.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

## FINITE ELEMENT METHOD

**Course Code : P08IP663**  
**Credits : 04**

**Total Hours : 52**  
**Hours per week : 04**

### PART - A UNIT – 1

**INTRODUCTION TO FEM:** Need for sue of FEM – Advantages and Disadvantages of FEM Matrix algebra – Terminologies relating ot matrices, methods of solution of linear algebraic equations. Eigen values and Eigen vectors, Simple numeric Gaussian Quadrature – 1 pt. 2pt and 3pt formula.  
7 Hours

### UNIT – 2

**BASIC OF THEORY OF ELASTICITY:**Definition of stress and strain, stress-strain relations; strain-displacement Relations in 2D and 3D Cartesian and polar coordinates.  
6 Hours

### UNIT – 3

**CONTINUUM METHODS:**Variational methods Rayleigh-Ritz methods applied to simple problems on axially loaded members cantilever. Simply supported and fixed beam with point loads and UDL Galerkin method as applied to simple elasticity problem.  
7 Hours

### UNIT – 4

**FEM-BASIC DEFINITIONS:** displacement method Nodal degrees of freedom different coordinate systems shape functions. Lagrangian polynomial; complete Formulation of bar-trussbeam- triangular-quadrilateral Tetrahedral hexahedral elements.  
6 Hours

### PART – B UNIT – 5

**BOUNDARY CONDITIONS :** SPC and MPC. Methods of handling boundary conditions eliminating method-penalty method. Simple numericals, ISO parametric sub parametric super parametric elements Convergence criteria – requirements of convergence of a displacement model.  
7 Hours

### UNIT – 6

**HIGHER ORDER ELEMENTS:** bar – triangular-quadrilateral elements. Tetrahedral and hexahedral elements (non-Formulation) – Pascal triangle – Pascal pyramid. Introduction to axis symmetric problems-formulation of axis symmetric triangular element.  
7 Hours

### UNIT – 7

**DYNAMIC ANALYSIS:** Formulating-element mass matrices for 1D and 2D element, computation of Eigen value and vector for simple one Dimensional analysis.  
6 Hours

### UNIT – 8

**ONE DIMENSIONAL STUDY :** One dimensional steady state heat conduction Formulation of 1D element simple numerical using 1D element. Structure of a commercial FE package. Pre-processor. Solver post processor.  
6 Hours

### TEXT BOOKS :

1. Finite Element Method – J.N.Reddy, Tat McGraw Hill edition 2002.
2. Introduction to Finite elements in engineering – Chandrapatla and Belegundu – Pearson Edn, 2002.

### REFERENCE BOOKS :

1. A First course in Finite Element methods - Daryl.L.Logon, Thomson Learning 3rd edi. 2001.
2. Fundamentals of Finite Element method - Hutton – Mc Graw Hill, 2004.
3. Concepts & applications of FEA - Robert Cook etal – Jonh willey & sons 2002.
4. Finite element analysis - Chandrupatla, University press, 2002.
5. Theory and Practice of Finite elements - Alexandre ERN - I K International Publishing house Pvt. Ltd – 2004.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

# HUMAN RESOURCE MANAGEMENT

Course Code : P08IP664  
Credits : 04

Total Hours : 52  
Hours per week : 04

## PART – A UNIT – 1

**INTRODUCTION:** Evolution of HRM, Objectives, Functions and Policies.  
6 Hours

## UNIT – 2

**HUMAN RESOURCE PLANNING:** Uses and benefits, Man Power Inventory, Man Power Forecasting, Methods of Man Power Forecasting, job Description, Job Specification  
7 Hours

## UNIT – 3

**RECRUITMENT:** Sources of Man power, Advertisement, Short Listing of Candidates calling Candidates for selection Process.  
6 Hours

## UNIT – 4

**SELECTION:** Selection procedure – Written Test, Group Discussion. Interview – Different methods, advantages and Limitations, Psychological testing – Advantages and limitations, Induction procedure, transfers, promotion exit interview, (Tutorial on written test, Group Discussion, Interviews)  
7 Hours

## PART – B UNIT – 5

**TRAINING AND DEVELOPMENT:** Identification of Training needs, Training Evaluation, Training Budget, Executive Development – Different Approaches, Non-executive development – Different methods.  
7 Hours

## UNIT – 6

**PERFORMANCE APPRAISAL:** Components (all round performance appraisal), Methods. Advantages and limitations of different methods, Personal Counselling based on Annual Confidential Reports.  
7 Hours

## UNIT – 7

**COUNSELLING AND HUMAN RESOURCE ACCOUNTING:** Characteristics, Need, Function, Types, Suggestions for personnel development, communication function, communication process, effective communication. Human resource records, Advantages of HR accounting, Various methods of accounting.  
6 Hours

## UNIT – 8

**INDUSTRIAL RELATIONS:** Indian trade union act, standing orders act, Indian factories act, ESI act.

**INDUSTRIAL DISPUTES AND SETTLEMENT:** Indian Industrial Disputes act, Industrial disputes settlement machinery. Works committee, Board of Conciliation, Voluntary Arbitration, Compulsory arbitration, Court of inquiry, Industrial tribunal, Adjudication.  
6 Hours

## TEXT BOOKS :

1. Human Resources Management – Dr. K Ashwathappa, Tata McGraw Hill, Edition 1999
2. Management of Organisations Behaviour – Hersey and Blanchard – Prentice Hall of India Edn – 1998
3. Industrial Relations – Arun Monappa – TMH, ISBN – 0-07- 451710-8

## REFERENCES BOOKS:

1. Personnel / Human resource Management – Decenoz and robbins – PHI, 2002.
2. Management of Human Resources – CB Mamoria – Himalaya Publication House, 2003
3. Industrial Acts - Jain, 2004

## Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.

## ADVANCED FOUNDRY TECHNOLOGY

Course Code : P08IP665  
Credits : 04

Total Hours : 52  
Hours per week : 04

### PART – A UNIT – 1

**FOUNDRY MANAGEMENT:** Planning of new foundry project – basic steps involved. Computer applications in foundries, Energy conservation methods. 6 Hours

### UNIT – 2

**FOUNDRY MECHANIZATION:** Needs for modernization and mechanization, Area of mechanization – sand reclamation etc., pollution control in foundries. Plant layout for foundries. 6 Hours

### UNIT – 3

**CASTING DESIGN:** Initial consideration in design Economic characteristics, Technical characteristics, process an alloy selection – casting process, property criteria and design, sources of design data for cast alloys. Physical design features – molding factors in casting. Design consideration at the casting stage, machining factors in casting design, Engineering aspects of casting geometry. 8 Hours

### UNIT – 4

**PATTERNS:** Types of patterns, pattern allowance, common pattern materials, pattern layout and preparation of patterns, core prints, their purpose, calculation of core print dimensions, Master pattern design and its use. 6 Hours

### PART – B UNIT – 5

**CORE BOX DESIGN:** Core and its functions, types of cores. Design of core box and its comparison with pattern. Use of CAD and CAM concept for pattern manufacturing. 6 Hours

### UNIT – 6

**SOLIDIFICATION OF CASTINGS:** Crystallization and development of cast Structure – Nucleation. Growth and dendritic growth, Independent nucleation, Eutectic Freezing, peritectic reactions. Structure of casings – significance and practical control cast structure, grain shape and orientation, grain size,

refinement and modification of cast structure. Concept of progressive and directional solidification, Solidification time and derivation of Chvorinov's equation influence of mould characteristics and cast metal. Properties of solidification, process numerical methods for heat flow 8 Hours

### UNIT – 7

**FEEDING OF CASTINGS:** Feeding characteristics of alloys, geometric influences on solidification. Methods of the feeding of casings – cost and concept of yield, orientations, gating technique, casting temperature and pouring speed, design and location of feeder heads. Aids to feeder head efficiency, junction of feeder head and castings, use of padding, chills and insulators. 6 Hours

### UNIT – 8

**CLEANING AND TESTING OF CASTINGS** Techniques for cleaning and testing of castings. 6 Hours

### TEXT BOOKS :

1. Foundry Technology - Beeley. P.R (Buttersworth) – 2001
2. Principles of Metal Casting –Heine, Loper and Rosenthal, TATA McGraw Hill, 2nd Edition - 2001

### REFERENCE BOOKS :

1. Metal Casting – ASME hand book
2. Metal Casting Technology - P.C. Mukerji – 1986.
3. Principles of Solidifications - B. Chalmers, John Willey and Inc – Co. Newyork – 1964.
4. Metal Casting – Principles & Practice by T.V. Raman Rao, New Age International (P) Ltd. 1st edition.

### Scheme of Examination :

Unit No.	1	2	3	4	5	6	7	8
No. of questions to be set	1	1	1	1	1	1	1	1

Student should answer any **FIVE** full questions Choosing **TWO** from Part - A. and **TWO** from Part – B.