

FACULTY OF ENGINEERING

Syllabus

for

T. E. (Production Engineering)

(w. e. f. 2014-2015)



UNIVERSITY OF PUNE
2014-2015

UNIVERSITY OF PUNE
COURSE STRUCTURE FOR
TE (Production Engineering) (2012 Course)
SEMESTER- I

Subject Code	Subject	Teaching Scheme(Hrs/Week)			Examination Scheme				
		Lect	Tut	Pr	In Semester Assessment	Pr/T W	Or/T W	End Semester Exam	Total Marks
311081	Metrology & Mechanical Measurements	3	-	-	30	-	-	70	100
311082	Industrial Engineering & Quality Assurance	3	-	-	30	-	-	70	100
311083	Material Forming	4	-	-	30	-	-	70	100
311084	Kinematics of Manufacturing Machines	4	-	-	30	-	-	70	100
311085	Cutting Tool Engineering	4	-	-	30	-	-	70	100
311086	Production Practice/Employable Skill Development	-	-	2	-	50	-	-	50
311087	Metrology & Mechanical Measurement	-	-	2	-	50	-	-	50
311088	Material Forming	-	-	2	-	-	50	-	50
311089	Kinematics of Manufacturing Machines	-	-	2	-	50	-	-	50
311090	Skill Development - Cutting Tool Engineering	-	-	2	-	-	50	-	50
	Total	18		10	150	150	100	350	750

SEMESTER II

Subject Code	Subject	Teaching Scheme(Hrs/Week)			Examination Scheme				
		Lect	Tut	Pr	In Semester Assessment	Pr/T W	Or/T W	End Semester Exam	Total Marks
311091	Production Management	3	-	-	30	-	-	70	100
311092	Numerical Techniques and Database	3	-	-	30	-	-	70	100
311093	Machine Tool Engineering	4	-	-	30	-	-	70	100
311094	Tool Design	4	-	-	30	-	-	70	100
311095	Process Planning and Industrial Statistics	4	-	-	30	-	-	70	100
311096	Seminar and Technical Communication	-	-	2	-	-	50	-	50
311097	Numerical Techniques and Database	-	-	2	-	50	-	-	50
311098	Machine Tool Engineering	-	-	2	-	50	-	-	50
311099	Process Planning and Industrial Statistics	-	-	2	-	50	-	-	50
311100	Tool Design	-	-	2	-	-	50	-	50
	Total	18		10	150	150	100	350	750

Lect: Lecture Tut: Tutorial Tw: Term Work Or: Oral Pr: Practical

311081 Metrology and Mechanical Measurements

Teaching Scheme:

Lectures: 3Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (7)

Introduction: Meaning of Metrology, Precision, Accuracy, Errors in Measurement, Calibration.

Linear Measurement: Standards, Classification of Standards, Precision and Non Precision Measuring instrument, Slip Gauges. Manufacturing of slip gauges

Angular Measurement: Sine bar, Sine Center, Uses of sine bars, angle gauges, AutoCollimator Angle Dekkor, Constant deviation prism.

Inspection of Geometric parameters: Straightness, flatness, Parallelism, Concentricity, Squareness and Circularity. Alignment testing- lathe/milling/ drilling m/c

Comparators: Uses, Types, Advantages and Disadvantages of various Comparators

Unit II (8)

Limits, Fits and Tolerances: Meaning of Limit, Fits and Tolerance, Cost -Tolerance relationship, concept of Interchangeability, selective assembly, Indian Standard System.

Design of limits Gauges: Types, Uses, Taylor's Principle, Design of Limit Gauges

Interferometry: Introduction, Flatness testing by interferometry, NPL Interferometer

Unit III (6)

Surface Finish Measurement: Surface Texture, methods of evaluation of surface roughness, Tomlinson's Surface Recorder, Taylor- Hobson Surface Meter and Talysurf for measuring all characteristics of surface texture, Grades of Roughness, Specifications.

Screw Thread Metrology: External Screw Thread terminology, effective diameter measurement methods, Pitch and flank Measurement of External Screw Thread, Application of Tool Maker's Microscope, Use of Profile Projector.

Gear Metrology: Spur Gear Parameters, Gear tooth thickness measurement: Gear tooth Vernier caliper, Constant chord method, Span Micrometer, Base tangent , roller method

Recent Trends in Engineering Metrology-Universal measuring machine coordinate measuring machine, laser interferometer.

Unit IV (7)

Mechanical Measurement; Basic concepts

Terminology, Calibration, Standards and units, Generalized block Diagrams of measuring systems, Input-output configuration of measuring systems, Standard deviation and variance.

Sensors & Transducers

Mechanical detector-transducers element, electrical transducers, transducer classification transducer sensitivity, variable resistance transducer, thermoelectric transducer, variable inductance transducer, capacitive transducer, photo electric transducer.

Unit V

(8)

Pressure Measurement

Definition of pressure, Units, Types of pressure measurement devices, Manometers, Dead weight tester, Bourdon tube pressure gauge, Diaphragms and bellows, Low pressure measurement, The McLeod gauge, Piezo electric transducer Selection of pressure measuring devices for specific applications , Calibration of pressure measuring devices.

Temperature Measurement

Temperature scales, Ideal gas, Temperature measuring devices, Thermometer, Bimetallic strip, Electrical resistance thermometer, Thermostats and thermocouples, Laws of thermocouples and their applications, Construction and calibration of thermocouples, Radiation pyrometers, total radiation pyrometers.

Flow Measurements

Types of flow measuring devices, Constructional features, Obstruction meters like orifice, Venturi nozzle and their calibration, Flow measurement by drag effects (rotameter), Pitot tube, Magnetic flow Meters.

Unit VI

(6)

Miscellaneous Measurements

Basic methods of force measurements, Torque measurement on rotating shaft, Poney brake and eddy current dynamometers, Stress and strain measurements, Types of strain gauges, Electric resistance strain gauges, Wheatstone bridge, Speedometer and stroboscope, Vibration measurement using accelerometer. Calibration systems, maintenance/replacement of measuring equipments.

Text Books:

1. K.J.Hume, "Engineering Metrology", Kalyani publication ISBN8170290015
2. K.W.B.Sharp, "Practical Engineering Metrology", Pitman Publication
3. F. M. Gryna, R. Chua & J. Defco, "Jurans Quality Planning and Analysis for Enterprise Quality", McGraw Hill series. ISBN0070618488
4. Nakra, B.C. and Chaudhry, K.K., "Instrumentation, Measurements and Control", Tata
5. McGraw Hill, 1985 ISBN0074517910
6. Beckwith, T. G. and W.L. Buck: "Mechanical Measurements", 2nd Edition, Addison
7. Wesley Publishing Company, Reading, Mass, 2000 ISBN8131702073
8. D. S. Kumar, "Mechanical Measurement & Control", Metropolitan Book Co. (P) Ltd.,
9. ISBN 81-200 0214-8.

Reference Books:

1. R.K. Jain, "Engineering Metrology", Khanna Publication.
2. I.C.Gupta, "A Text book of Engineering Metrology", Dhanpat Rai and Sons.
3. Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organisation, Series,
4. Tokyo.

311082 Industrial Engineering and Quality Assurance

Teaching Scheme:
Lectures: 3Hrs/Week

Examination Scheme:
In semester assessment – 30 marks
End Sem. Exam: 70 Marks

Unit I (7)

Industrial Engineering: History, Development, Definition, Functions & Applications of Industrial Engineering. Tools and techniques of industrial engineering, Contribution of F.W.Taylor, Gilberth, Gantt and Maynard to the field of Industrial Engineering.

Productivity Engineering

Productivity: factor productivity, total productivity; labor Productivity, measurement of Productivity, Productivity improvement techniques. Productivity improvement programme. Work content: Basic work content, added work content, ineffective time due to short comings of management.

Wages and incentives: Concept of wages, factors affecting wages, Job evaluation, merit rating.

Unit II (7)

Method Study

Steps, Tools and Techniques used in the Method Study, outline process Chart Flow process Chart, Symbols, Flow Diagrams, Two Handed Chart, String diagram Multiple Activity Chart, 5W and 1 H, Use of Motion Pictures and its analysis. SIMO chart, cyclegraph Chronocyclegraph. Developing, Presentation, Installation & Maintenance of new Methods.Principles of motion economy.

Unit III (7)

Work Measurement

Time Study: Aim & Objectives, Terminology & Tools, Use of stopwatch procedure in making Time Study. Time Study Forms, Performance rating, allowances and its types. Calculation of Standard Time. Time Study for indirect functions such as Maintenance and Marketing. Criticism of Time Study.

Work Sampling: Definition, Objectives. Theory of Work samplings, Confidence level, Sample Size, Determination of Standard time using work Sampling, Other application of Work Sampling, Errors in Work Sampling study.

Synthetic & Standard data Methods: Concepts, Introduction to PMTS, MTM1, WFS, and Basic Motion Time Study. MTM2 & Other second Generation Methods, MOST.

Unit IV (7)

Introduction to Quality Control

Meaning of Quality, Quality of Product, Quality of Service, Cost of Quality, Value of Quality, Difference between Inspection, Quality Control and Quality Assurance, Role of Quality in Present day environment. Introduction to Quality Control: Statistics in Selective inspection. Introduction to Statistical Quality Control: Control Charts, X, R, P and C Charts, Sampling inspection, OC Curves and Sampling Plan, Process Capability Index (PCI), Concept, Methods of determining PCI and uses of PCI.

Unit V

(7)

Quality Assurance systems

Total quality management (T.Q.M):- Approaches- Deming's Approach, Juran's Approach, Cause and Effect Diagram, Pareto Analysis, Q.F.D., Quality Circles, Taguchi's quality engineering, Kaizen, six sigma, T.P.M. Technical Specification (T.S) TS 16949 Standards.

Reliability Engineering: - Concept, Design of experiment: meaning, objective, types of research approaches.

Unit VI

(7)

ISO Standards

ISO 9001-2000 Series of Standards- History and Evolution of ISO 9000 Series, importance and overview of ISO 9000- 1998 Series standards, structure of ISO 9000-2000 Series standards, clauses of ISO 9000 series standards and their interpretation and implementation, quality system documentation and audit.

ISO 14000:- Environmental management concepts, and requirement of ISO 14001, benefit of Environmental Management Systems, Malcom Baldrige national quality award and other quality awards.

Text Books:

1. M. Telsang, "Industrial Engineering and Production Management", S. Chand Publication, ISBN 81 219 1773 5.
2. L.C. Jhamb, "Industrial Engineering", Everest Publication, Pune
3. F. M. Gryna, R. Chua & J. Defco, "Juran's Quality Planning and Analysis for Enterprise Quality", McGraw Hill Pub.Co.LTD, New Delhi, ISBN 0 07 06 1848 8.
4. R. M. Brans, "Motion & Time study design & measurement of work", John Wiley & Sons Inc.NY 7th edition, ISBN 0 471 08335 6.
5. O. P. Khanna, "Work Study", Dhanpat Rai Publications, New Delhi.
6. M. Mahajan, "Statistical Quality Control", Dhanpat Rai & Company.

Reference Books:

1. H. B. Maynard and others, "Industrial Engineering Handbook", IVth edition McGraw Hill Publications, ISBN 0-07-041084-4.
2. "Introduction to Work Study", ILO Universal Pub. Co,B'bay, ISBN 81 85027 06
3. Ralph M. Barnes, "Motion and Time Study: Design and Measurement of Work" J. Wiley & sons
4. Juran J M "Quality Control Handbook", Tata McGraw Hill, ISBN 0 07 033175 8.
5. E.L.Grant & R.S. Leavenworth, "Statistical Quality Control", Tata McGraw Hill, ISBN 0 07 024162 7.
6. Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organization, Tokyo.
7. Singh A N , "ISO 9000 Quality System", Dolphin Books, Delhi.
8. "ISO 9000 Quality Management System", International Trade Center, Geneva.

311083 Material Forming

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (08)

Fundamentals of Material Forming

Introduction of forming processes. Concept of plastic deformation Classification of material forming process, True stress-True strain, Strain hardening, flow stress determination, Theory of plasticity, Yield criteria for ductile materials: Von- mises criteria, Tresca criteria. Effect of temperature, strain rate, friction, metallurgical microstructure. Concept of Formability, formability limits and formability diagram.

Unit II (10)

Forging

Introduction, Classification of forging processes. Forging equipment- Hammers, presses, Upstter etc., construction, working, capacities and selection of equipment. Basic forging operations such as fullering, edging, drawing, blocking,finishing etc., Types of forging dies, Forgeability tests, design of forging as a product, friction in forging. Cleaning and finishing of forgings, Forging defects and the remedies. Analysis of forging with sliding and sticking friction, New technologies: Liquid metal forging, isothermal forging, No draft forging, P/M forging, Rotary swaging, roll forging, Lubrications in forging.

Unit III (08)

Wire, Rod and Tube Drawing

Introduction to rod and wire drawing machines - construction and working. Preparation of stock for wire drawing. Wire drawing dies, material and design. Analysis of wire drawing operation, Variables in wire drawing, Maximum reduction in wire in one pass, forces required in drawing. Multiple drawing, work hardening, lubrication in wire drawing, strip drawing.

Tube Drawing: Methods, force calculation, stock preparation. lubrication in tube drawing.

Unit IV (08)

Rolling of Metals

Scope and importance of rolling. Types of Rolling Mills - Construction and working. Roll bite, reduction, elongation and spread. Deformation in rolling and determination forces required. Process variables, redundant deformation. Roll flattening, Roll cambering, Mill spring – its effect on rolling process. Defects in rolling. Automatic gauge control(AGC), Roll pass classification & design. Lubrication in rolling.

Unit V**(08)****Extrusion**

Types: Direct, Indirect, impact, hydrostatic extrusion. Dies for extrusion, stock preparation. Extrusion ratio, Circumscribing circle diameter (CCD), Shape factor. Equipment (with and without friction), Work done in extrusion, Metal flow in extrusion, defects. Role of friction and lubricants. Manufacture of seam-less tubes.

Unit VI**(10)****Advances in Metal Forming**

High Energy Rate Forming process (HERF), High Velocity Forming(HVF) - principles, comparison with conventional forming processes. Explosive forming, Magnetic pulse forming, Electro hydraulic Forming. Petro-forging forming , Micro forming, Micro coining, micro extrusion, Micro bending, Stretch forming, coining embossing, curling spinning, flow forming advantages, limitations and application of the process, methods of measuring friction in metal forming.

Text Books:

1. Dieter, "Mechanical Metallurgy" ISBN0071004068
2. P.N. Rao, "Manufacturing Technology", Tata-McGraw Hill ISBN0070087695
3. 3.G.W. Rowe, "Principles of Industrial Metal Working Process", Edward Arnold ISBN8123904282.
4. Juneja B. L., "Fundamentals of metal forming processes", New Age International Ltd.

Reference Books:

1. Dr. R. Narayanswamy, Metal Forming Technology, Ahuja Book Co., ISBN8176190020
2. Surender Kumar, Principles of Metal Working.
3. ASM: Metal Handbook, Volume 14, "Forming".
4. SME:Tool and Manufacturing Engineers Handbook, Volume 2, "Forming"

311084 Kinematics of Manufacturing Machines

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (8)

Synthesis and Analysis of mechanisms

Computer Aided Analysis and coupler curves for four bar mechanism and slider crank mechanism, dimensional synthesis of mechanisms, three position synthesis of slider crank mechanism, Over lay method, Bloch Synthesis, Least square technique.

Kinematics analysis of machine tool structure

Machine tool motion and their transmissions, Kinematic balancing equation for motion transmitting elements, Kinematic analysis of machine tool structure: gear hobbling, gear shaping, bevel gear generator.

Unit II (8)

Gear

Terminology, involute and cycloidal profile, path and arc of contact, interference, undercutting, terminology of worm and worm gears, bevel gears.

Gear Trains

Simple, compoud, epicyclic gear trains, differentials, Computation of velocity ratios and torque transmitted in epicyclic gear trains

Unit III (8)

Cams

Types of cams and followers, terms used in radial cams, analysis of motion of follower, displacement, velocity, acceleration, and jerk diagrams, and determination of cam profile for various types of follower motions: uniform velocity, SHM, uniform acceleration and retardation, cycloidal motion for roller , knife edge and flat faced followers. cams with specified contours: tangent cam, circular arc cam, and eccentric cams.

Unit IV (8)

Flywheel

Introduction, Turning Moment Diagram ,Fluctuation of speed, Fluctuation of energy, Coefficient of fluctuation of speed, Maximum fluctuation of energy, Energy stored in flywheel, flywheel in engines & punching presses.

Unit V (8)

Balancing

Need for balancing, Static balance, balancing of rotating masses in same and different planes, Dynamic balancing, balancing of reciprocating masses, Balancing of locomotives, Partial balancing of locomotives, swaying couple, hammer blow, variation in tractive effort, Balancing of multi cylinder in line engines, direct and reverse crank concept, Balancing of V and radial engines, balancing machines

Unit VI

(8)

Mechanical Vibrations

Introduction, Degree of freedom, Types of vibrations, Damped vibrations; under damped, critically damped and over damped systems, response curves for single degree of freedom system. Rotating and reciprocating unbalance, base excitations, Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating Unbalance. Materials used in vibration isolation, Longitudinal and Transverse Vibrations, whirling of shaft Vibration measuring instruments.

Text Books

1. S.S.Ratan , "Theory of Machines", Tata McGraw Hill [ISBN0070591202]
2. R.S.Khurmi, J.K.Gupta, "Theory of Machine", S Chand Co. Delhi. [ISBN812192524X]
3. P.L.Ballaney, "Theory of Machine", Khanna Publisher.
4. G.C. Sen & A. Bhattacharya, "Principles of Machine Tools" [ISBN8173811555]

Reference books

1. J. E. Shigley and J.J.Uicker Jr., "Theory of Machines and Mechanism", McGraw Hill [ISBN019515598X]
2. G K Grover', "Mechanical Vibration", Nemchand and brothers. [ISBN8185240752]
3. S. Graham Kelly, Schaum's Outline of Mechanical Vibrations, McGraw Hill Professional, 1996, [ISBN: 0070340412]

311085 Cutting Tool Engineering

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (8)

Theory of Metal Cutting

Geometry of single point tool, Concept of speed, feed, depth of cut, Effect of cutting parameters on tool geometry, Chip formation, Types of Chips, Orthogonal & oblique cutting, Determination of shear plane angle, Cutting force components in orthogonal, Merchant model for orthogonal cutting, Ernst Merchants theory, Chip velocity, Strain in chip, Estimation of cutting forces and cutting power.

Unit II (8)

Cutting tool standards, Materials & Cutting force measurement

Tool angle specification systems, British system, American system, German system, ISO system .

Cutting tool materials, Desirable properties of tool material, Coating tools, Coating techniques on tool, Heat treatment of tools.

Classification of dynamometers , Study of working principles in Lathe ,Milling ,Drilling, Grinding dynamometers.

Nonconventional tool geometry: Koleshov tool, Antichatter tool, Gustin tool, Throwaway inserts.

Unit III (8)

Heat generation, tool life & Economic of cutting tools

Sources of heat generation, Tool wear and its type, Tool wear mechanism, Types of cutting fluids, Selection of cutting fluids.

Tool life equation of Taylor. Factors affecting tool life, Tool failure criteria.

Machinability and its rating, Machinability criteria, Economics of machining. Criteria for minimum cost & maximum production.

Unit IV (8)

Design of cutting tools

Chip breakers, Throwaway inserts and methods mounting, Design of single point cutting tool, Design of circular & tangential form tools, drill, reamer, milling cutter and broach.

Manufacturing of Cutting tools

Unit V (8)

Fundamentals of Jigs and Fixtures

Six degrees of freedom, Six point location principle 3-2-1, , Types of locators, Redundant location, Types of clamping devices , Types of drill bushes, Types of support pins, Fool proofing, Classifications of jigs and fixtures. Indexing mechanisms.

Unit VI

(8)

Design of Jigs & Fixtures

General guidelines & procedures for design of Jigs and fixtures Economics of Jigs and fixtures, Pneumatics & Hydraulics for jig & fixtures. Concept of modular fixtures & tool presetting fixtures

Text Books:

1. Wilson, "Fundamentals of tool design", A.S.T.M.E.
2. M.H.A. Kempster, "Introduction to Jigs and fixtures design".ISBN8185617856.
3. 3.Dr.B.J.Runganath"Metal Cutting and Tool Design",Vikas Publication,ISBN0706975103
4. G. Kuppuswamy, "Principles of Metal Cutting",University press, ISBN 81 73710287.
5. Basu, Mukherjee and Mishra, "Fundamentals of Tool Engineering and Design",
6. Oxford publishing. ISBN812040016X.

Reference Books:

1. P C Sharma, "Production Engg". , Khanna publishers. ISBN8121904218.
2. P.C. Sharma, "Machine tools & Tool Design". Khanna publishers, ISBN812192362X.
3. Surender Kumar, "Production Engineering Design",Sataya Publication
4. Dolalson, Lecain and Goold, "Tool design", Tata McGrawhill.ISBN0070992746.
5. Hoffman, "Introduction to Jigs and fixtures".Delnar Cengage Learning Publication
6. "Tool Engineering Handbook", A.S.T.M.E.
7. R. K. Jain, "Production Technology", Khanna Publishers.ISBN8174090991
8. Milton Shaw, "Metal cutting principle"CBS Publication.
9. P .H. Joshi, "Jigs & Fixtures". Wheeler Publication ISBN074601695.

311086 Production Practice/Employable Skill Development

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Practical: 50 Marks

Each candidate shall be required to complete and submit the following term work.

A composite job involving different machining operations.

Part A:-

1. **Lathe:** external and internal threading (Vee, Square or Acme threads), taper turning, grooving, knurling, drilling operations on lathe.
2. **Milling:** helical or bevel gear cutting on a milling machine.
3. **CNC Job:** Demonstration / job on CNC machine. It should consist of step turning, taper turning, and fillet (Radial) & chamfering.

Part B: - Journal consisting of:

1. Calculation and procedure for above gear cutting on milling machine.
2. Safety aspects used in the machine shop:- Precautions and care to be taken while working on various machine tools e.g. lathe, milling, drilling, grinding etc.
3. CNC programming for:
 - a) Lathe job
 - b) Milling job

Note: - A practical examination of 12 hours duration shall be conducted.

311087 Metrology and Mechanical Measurement

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Practical: 50 Marks

Experiments: (Any Eight)

1. Measurement of straightness, flatness, roundness.
 2. Study of limit gauges.
 3. Measurement of the Surface roughness.
 4. Measurement of angle by sine bar / Sine center.
 5. Measurement of Optical surface using Interferometer.
 6. Measurement of Screw thread parameters using Floating Carriage Micrometer.
 7. Measurement of Gear tooth thickness using Gear tooth Vernier caliper and Span Micrometer.
 8. Study and Experiment on Profile Projector.
 9. Study and Experiment on any type Comparator.
 10. Calibration of instrument using Calibration setup.
 11. Alignment Test on Lathe/ Drilling/Milling Machine.
 12. Calibration of thermocouple.
 13. Calibration of Bourdon tube type pressure gauge.
 14. Calibration of rotameter.
- .

311088 Material Forming

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Oral: 50 Marks

Term work;

Term work shall consist of:

1. Assignment based on each topic of syllabus
2. Study of roll pass design for one structural shapes -Round or Square

311089 Kinematics of Manufacturing Machines

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Term-work: 50 Marks

Term Work

Term work will be based on following practical/design assignments

1. To write a computer program for analysis and animation of any mechanism and test it.
2. To draw a conjugate profile for any general shape of gear tooth.
3. Determination of holding torque in epicyclic gear train.
4. To draw a cam profile for specific follower motion
5. Study of flywheel.
6. Experiment on balancing of mass.
7. Experiment on free undamped and free damped vibration of single degree of freedom system

311090 Skill Development - Cutting Tool Engineering

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Oral: 50 Marks

List of Experiments:

1. Experiments on chip formation.
2. Verification of Metal cutting Theories.
3. Measurement of cutting forces (anyone) in Turning / Milling / Drilling.
4. Effect of tool geometry, cutting speed, feed, depth of cut on cutting parameters.
5. Design and working drawing of any three of following cutting tools:
Single point tools, Form tool, Reamer, Milling cutter, Broaches and Drills.
7. Design and Working drawing of one jig. (Drilling, Reaming, Tapping)
8. Design and Working drawing of one fixture. (Turning, Milling, Broaching)

311091 Production Management

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (7)

Scope of Production Management

Scope of production/operation management, relationship with other functions, history of operation management, types of production system-operation and organization, Operation strategies: competing on cost, quality, flexibility, speed, productivity, efficiency & effectiveness.

Unit II (7)

Production Planning & Control

Need for production planning & control, preplanning functions, product design & development, product life cycle, new product development process, marketing aspects, product characteristics, production aspects, economic aspects, cross functional product design, concurrent engineering, design for manufacturing, FMECA, QFD.

Unit III (7)

Facility Planning

Facility location, important factors affecting location decision, location theories, basic types of layouts, layout planning & designing, hybrid layouts, dynamic layout, computerized layout planning, design of operation line, line balancing, Maintenance planning, Total Productive Maintenance.

Unit IV (7)

Capacity Planning

Importance of forecasting, long term & short term forecasting techniques, forecasting errors, method of planning, routing & estimating, capacity planning-strategies, analysis of machine capacity, aggregate capacity planning & manpower planning. Introduction to Supply chain management, just in time & Lean manufacturing.

Unit V (7)

Loading & Scheduling

Concept of loading & scheduling, master production schedule, basic sequencing & scheduling techniques-Johnson method, critical ratio scheduling, uses of CPM & PERT, RAMPS (Resource Allocation & Manpower Scheduling), dispatching rules, expediting & evaluating the production plans, design of production planning & control system for intermittent & continuous production. Computerized production management system

Unit VI (7)

Inventory Theory

Introduction, Meaning of Inventory Control, Functional classifications of Inventories, advantages of Inventory Control. Costs associated with Inventories, selective control of inventories, Deterministic Inventory Models: economic lot size with instantaneous replenishment with and without shortage costs, economic lot size with finite

replenishment with and without shortage, economic lot size models with quantity discount. Economic manufacturing quantity (EMQ), fixed order quantity and fixed order interval system.

Text Books:

1. Paneerselvam R., "Production and Operations Management", Prentice Hall India 2012, 3rd Edition ISBN9788120345553
2. Chary S. N., "Production and operations management", Mc Graw Hill Education 5th Edition, ISBN9781259005107
3. Riggs. J. L., "Production system, planning, analysis and control", John Weily and sons, New York.ISBN0471858889.
4. James Dilworth, "Production and operation management", McGraw Hill Book Company, New York. ISBN 9780070169876
5. Martand Telsang, "Industrial Engineering and Production Management", S Chand & Co, New Delhi.ISBN8121917735
6. 6.Prasanna Chandra, "Project Planning Analysis Selection Implementation and Review".ISBN0074620495.

Reference Books:

1. Buffa. E.S., "Modern Production and Operation Management", Willey, New Delhi. ISBN9971511630.
2. Adam EE & RJ Ebert, "Production and operation management:", Prentice Hall Englewood Cliff, N.J. ISBN8120308387.
3. Garg A. K., "Production and operations management", Mc Graw Hill Education 1st Edition, ISBN9781259005107
4. Samuel Eilon, "Production planning and control". Universal Publishing Corporation ISBN8185027099.
5. Joseph Monks, "Operation Management Theory and Problems", McGraw Hill Book Company, New York.(1991), ISBN007100579X.
6. F. L. Francis, J. A. White, L. F. McGinnis, "Facilities Layout and Location", Prentice Hall of India Pvt. Ltd., ISBN 81-203-1460-3. 8120314603.
7. Richard Muther, "Systematic Layout Planning, Van Nostrand Reinhold; 2nd edition ISBN978-0933684065

311092 Numerical Techniques and Database

Teaching Scheme:

Lectures: 3 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (7)

Introduction to Databases

Introduction, Organization & component of database management system (DBMS), data models, entity relationship model, advantages & disadvantages in database processing, hierarchical & network databases.

Introduction to oracle, SQL, Database creation, database retrieval, use of compound conditions like AND, OR, Joining and updating tables.

Unit II (7)

Database Management:

Database design- dependencies and normalization (1st & 2nd order), database storage and querying, aggregate functions. – Group by, having order by, sub-queries and various SQL operators.

Unit III (7)

Information technology for competitive Advantages

Introduction to information technology, Inter-organizational and global information systems, Electronic Data Interchange (EDI) and Electronic Fund Transfer (EFT). Functional and Enterprise system- Production & operation systems, human resource management systems, marketing and sales systems, human resource management systems, marketing and sales systems.

Intelligent systems in Business- Artificial intelligence and intelligent systems, expert systems, intelligent agents. Electronic Commerce(E-Commerce)- foundations, business-to-consumer and business-to-business applications.

Unit IV (7)

Numerical methods-I

Revision of „C□ syntax/matlab. Errors & approximations: types of errors, error propagation. Numerical solution of algebraic and transcendental equations by bisection method, Newton-Raphson Method.

Numerical solution of Linear Simultaneous Equations by Gauss Elimination Method, Gauss-Siedel Method.

Unit V (7)

Numerical methods -II

Curve Fitting, methods of curve fitting. Least square criterion- 1st and 2nd order Interpolation: Lagrange's formula, Newton forward difference method. Methods of moment for curve fitting.

Unit VI

(7)

Numerical methods -III

Manufacturing Optimization- Method of Lagrange multipliers, Generalized reduced gradient Method. Ordinary Differential Equations.- Runge-Kutta Method. Partial Differential Equations -Finite difference method.

Text Books:

1. Silberschatz, Korth H F, Sudarshan, "Database System Concepts", McGraw Hill Intl., 4th Edition, 2002, ISBN 0071005293.
2. A.M. Muzumdar and P. Bhattacharya, "Database management System", Tata McGraw Hill Publication, New Delhi, ISBN 0074622390.
3. Turban, Rainer & Potter-John, "Introduction to Information Technology", Wiley & Sons, 2000, ISBN 8126509686.
4. Ivan Bayross, "SQL. PL/SQL – The programming language of oracle" BPB publication, New Delhi, ISBN 81-7656-964-X.

Reference Books:

1. Rajashekhar Sundarraman, "Oracle91 Programming: Primer", A Pearson Education, 2004, ISBN 8129703629.
2. Dr. Sadhu Singh, "Computer aided Design and Manufacturing", Khanna Publication, New Delhi.
3. Y. Kanetkar, "Let Us C", BPB Publications, 4th revised edition 2002, ISBN 8176566217.
4. B.S. Gottfried, "Programming with C", McGraw Hill Intl., Schaum's Outline Series, ISBN 00071006214.
5. S.C. Chapra, R.P. Canale, "Numerical Methods for engineers with programming and software applications", Tata McGraw Hill Co. Ltd, New Delhi, ISBN 0071158952.

311093 Machine Tool Engineering

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (8)

Turret and automat machine

Automation Concepts, Automatic and Semiautomatic Machine Tools and their Classification, Turret and Capstan Lathes. Single Spindle and Multi-spindle Automats, setup of automatics and semi automatics. Tooling Layout and operation Sheet, Cam Tool Layout for Single spindle automat. Concepts of Transfer Machines/ Lines.

Unit II (8)

NC/CNC/DNC Machines

NC/CNC Machining: Introduction to NC,CNC,DNC Machines, Tape format and basic G and M codes, Comparison between NC and Conventional Machine Tools, Basic Principles of NC Machines, its Advantages, Tooling Requirements, Introduction to Turning and Machining Center.

Unit III (8)

Material Handling Systems

Material Handling: Objectives, engineering & economic considerations, principles of material handling, selection & classification of material handling equipments. Automatic Storage and Retrieval System (ASRS) Interfacing of Advanced Material Handling Equipment with Manufacturing Equipment. Use of Advance Technology for Material Handling Equipment like Vision System, Adaptive Control System, etc.

Unit IV (8)

Non-conventional machining process

Detail study with respect to working principle , process parameter, theoretical analysis, experimental results & comparative assessment of abrasive jet machining, Ultrasonic machining, Chemical machining, Electrochemical machining, Electro discharge machining, Electron beam machining, laser beam machining, Plasma arc machining, Ion Beam machining, wire cut EDM.

Unit V (8)

Special manufacturing Processes

Different methods of Gear manufacture – Gear hobbing and gear shaping machines - specifications – gear generation – different methods – gear finishing and shaving – Grinding and lapping of hobs and shaping cutters – gear honing – gear broaching. Thread manufacturing – Review of thread chasing, die threading& taps, thread rolling, thread, milling, thread grinding, & thread whirling

Unit VI (8)

Control, Maintenance, Reliability & Installation of machine Tool

Machine Tool Operator's Control Systems: Need of Standardization, Classification, Controls in Conventional and NC/CNC Machines, Adaptive Control. Machine

Tool Installation and Maintenance, Selection of Machine Specification, Chip Disposal Systems, Recovery of Material from Disposal. Cutting Tool manufacturing Machines, Cutting Oil/ Coolant Type and Selection. Control in conventional and NC CNC machines, installations and maintenance of machine tool ,reliability of machine tool and its components, analysis of reliability, availability and maintainability

Text Books:

1. HMT, "Production Technology"
2. Chapman; "Workshop Technology", Edward Arnold Publishers, ISBN 0 7131 3287 6
3. P. N. Rao, "Manufacturing Technology, Foundry, Forming and Welding", Tata McGraw Hill, ISBN 0 07 451863 1.
4. K.K AHUJA - "Production and Operations Management ", Prentice Hall of India, 1995.
5. Allegri Theodore, "Material Handling Principles and practice" (CBS Publisher Delhi)

Reference Books:

1. Degarmo, Black and Kohser; "Material and Processes in Manufacturing", Prentice Hall of India Ltd, Delhi.
2. P C Sharma; "Production Technology" (Manufacturing Processes), S Chand & Co., ISBN 81 219 114.
3. Roy Lindberg; "Processes and Materials of Manufacture", Prentice Hall of India.
4. Kalpakjian S, "Manufacturing Engineering and Technology", Pearson Education.
5. Pabla Adithan, "CNC Machines", New age International Pub,ISBN 81 7808 157 1
6. Kundra B S, P N Rao,M Tiwari; "Numerical Control and Computer Aided Manufacturing "TATA McGraw Hill Pub. ISBN 0 07 451740 6.
7. Mikell P. Groover; "Automation, Production Systems and Computer Integrated Manufacturing" ,Prentice Hall of India Ltd, Delhi, ISBN 81 203 0618 X
8. G C Sen. and A.Bhattacharya , "Principles Of Machine Tools", New Central Book Agency Pvt Ltd, Calcutta, ISBN 81 7381 155 5.
9. PH Joshi, "Cutting Tools", Press Tool Design & Construction, Wheeler Pub., ISBN 8185814 465.
10. Pandey, Shan; "Modern Machining Processes".
11. Ghosh Amitabh,A. Malik; "Manufacturing Science", East-West Press Pvt. LTD,ISBN 8185095 85 X.
12. Surenderkumar and Umeshchandra; "Production Engineering Design"
13. P.N.Rao, "CAD/CAM/CIM Principles", Tata McGraw Hill Publication, ISBN 007058373 0.
14. RadhaKrishanan P., Subramayan S., "CAD/CAM/CIM", New Age International Pub.Delhi,ISBN 81 224 1248 3.
15. D. E. Mulcahy, "Material Handling Handbook", McGraw-Hill

311094 Tool Design

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit I (8)

Introduction to press working:

Press working terminology, Basic operations, types of presses- mechanical, hydraulic, pneumatic and their mechanisms, elements of die sets, types of die sets, types of dies: simple, compound, progressive, combination and inverted dies, types of punches, Methods of reduction of shear force, types of strip layouts, types of strippers, types of pilots, types of stoppers, selection of dowel pins and screws. Design of Blanking die.

Unit II (8)

Design of Drawing and Bending Dies

Design of shallow and deep drawing die: Calculation of blank size by area and graphical method and standard formula, percentage reduction in each stage, number of draws, drawing force, blank holding force, press capacity, ironing force.

Types of Bending dies: Developed length calculation, bending force, spring back & methods used to overcome it in a press brake.

Unit III (8)

Design of Progressive, compound and combination dies

Strip layout, percent utilization, Calculation of force, Press capacity, clearances, die and punch size, center of pressure, methods of piloting, Design and drawing of progressive, compound and combination die.

Die castings dies: Die casting machines-Hot & cold chamber, metals for die casting, die locking methods, interlocks & safety devices, specific details of die constructions, casting ejection, cores, slides, loose die pieces, types of cores, directional solidification, types of feeders, die venting, water cooling, classification of dies- single, combination, multi-impression. General details of die design, inserted impressions, die casting defects & their remedies, die lubrication- types & methods

Unit IV (8)

Design of Forging Dies

Design of forging die for multi-impression die-: selection of parting line, drafts, fillet & corner radii, ribs and webs, stock size calculation, flash and gutter, design of fullering, edging, blocking, finishing impressions, trimming dies, Die block dimensions, die inserts. Rules for upset forging.

Unit V (8)

Plastics processing

Compression, transfer, injection, extrusion, blow & rotational moldings Thermoforming. General construction of injection moulds, types of nozzles splits, side cores & side cavities, molding internal undercuts.

Unit VI

(8)

Design of Injection mould

Determination of number of cavities, types of cooling system, design of cooling channels, heat transfer considerations, types of ejectors, determination of mould opening force & ejection force, types of runners & gates, design of runners & gates, use of CAD for mould design.

Text Books:

1. Donaldson, Lecain and Goold, "Tool Design", Tata McGraw Hill, ISBN 0 07 0992746.
2. J R Paquin, "Die design Fundamentals", Industrial Press Inc., ISBN 0 8311 1172 0.
3. Doehler H.H, ."Die Casting", Mc Graw Hill
4. P.N. Rao, "Manufacturing Technology, Foundry, Forming and Welding ", Tata McGraw Hill, ISBN 0 07 451863 1.

Reference Books:

1. P.H. Joshi, "Press Tools Design & Construction", Wheeler Pub., ISBN 81 85814465.
2. P. C. Sharma, "Production Engineering", S. Chand, ISBN 81 219 0421 8.
3. Dr. Surender Kumar, "Production Engg. Design" (Tool Design), Satya Prakashan
4. R.G. W. Pye, "Injection Mould Design(Design manual for plastic industry)", EWP
5. A.S. Athalye, "Plastics Materials handbook", Multitech Pub. Co., ISBN 81 7671 007

311095 Process Planning and Industrial Statistics

Teaching Scheme:

Lectures: 4 Hrs/Week

Examination Scheme:

In semester assessment – 30 marks

End Sem. Exam: 70 Marks

Unit-I (8)

Product and Process Engineering:

Product Engineering, role of product engineering department, process engineering and its functions, Co-ordination of process Engineering with other departments., Organization chart, general manufacturing processes, concept of design for manufacturing, communication in engineering Industry, glossary of terms used in process planning.

Analysis of part print:

Method of reading and interpreting the part print, identification of nature of work to be performed, Identification of functional surfaces, grouping of related surfaces to be machined, Identification of basic process for processing and sequence of operation from part print.

Unit- II (8)

Dimensional Analysis:

Types of dimensions, concept of baseline dimensions, datum selection, dimensional chain and linkage analysis, concept of straightness, flatness, roundness, concentricity and other geometrical forms, Surface Quality and surface finish/surface integrity and its effect on product properties.

Tolerance Analysis:

Producing accuracies and attainable accuracies- process capability relation with statistical accuracies, prime accuracies, tolerance chart, tolerance grades and its calculations, tolerance stack, tolerance analysis for assembly.

Unit-III (8)

Work-piece control and selection of operations:

Causes of work-piece variations, variables influencing work-piece control, equilibrium theories, mechanical, geometrical and dimensional control, Concept of location – fundamentals of locating, datum features, errors in location and clamping, establishing process areas, guidelines for identifying holding areas, supporting areas and critical areas.

Study of basic process operations, principal processes and auxiliary processes, Identification of major, critical, qualifying, re-qualifying and supporting operations. Selection of single or combined operations, Identification of finishing operations, Establishing manufacturing sequence.

Unit- IV (8)

Equipment & Tooling Selection:

Factors to be considered in equipment/machine selection, Prime and producible accuracies of equipment, Determining machining condition and computing manufacturing time.

Types of tooling, Factors affecting selection of tooling, use of multi-tooling set-up, Stock preparation and blank selection with material estimates.

Process Sheet Design: Study of the part-print , logical design of process plan, stock preparation, blank size selection with material estimates, Selection of datum surfaces, identification of machining surfaces, dimension and tolerance analysis, selection of machining methods with time estimates and standard time for each operation, Preparation of process picture sheet and operation route sheet for complete manufacturing part.

Computer Aided Process Planning (CAPP), Automatic time Standards (ATS), Benefits of CAPP.

Unit-V

(8)

Industrial Statistics:

Basic statistical concepts, Sampling, Probability distribution, (Binomial, Poisson's, Exponential, Normal), Sampling distribution of 't', χ^2 , 'F' , elementary sampling theory, Correlation and regression , Linear regression model, test of hypothesis & It's Significance. Role of statistics in industries.

Unit- VI

Design and Analysis of Experiments:

(8)

Important of experiments, Experimental strategies, Basic principles of design, terminology, ANOVA, steps in experimentation, two and three full Factorial experiments, Taguchi Methods, Design using Orthogonal Arrays, S/N ratios, Data Analysis.

Text Books:

1. Eary D. F., Johnson G. E., "*Process Engineering for manufacture*" Prentice Hall of India Pvt. Ltd.
2. Narayana K. L., Kannaiah P., Vankata Reddy K., "*Production Drawing*", New age international Publishers.
3. Gupta S. P., "*Statistical Methods*", Dhanpat Rai & Sons, New Delhi.
4. Grover, Mikell P., "*Fundamentals of Modern Manufacturing – Materials. Processes and Systems*", Second Edition, Wiley, 2002.
5. Ranjit K. Roy, "A primer on the Taguchi method", *Van Nostrand Reinhold, New York*, (1996).

Reference Books:

1. Scallan P., "*Process Planning- Design/Manufacture Interface*", John Wiley & Sons, 1995.
2. Montgomery D. C., "*Design and Analysis of Experiments*", 7th Edition, Wiley India Pvt. Ltd.
3. Phillip J. Rose, Taguchi Technique for quality engineering, McGraw Hill 1996.

311096 Seminar and Technical Communication

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Oral: 50 Marks

1. The objective of Seminar is to test the student on his/her ability for self-study and his/her ability to communicate - Written and oral.
2. Seminar will be in the form of a report submitted by the student:
 - a) On topic of his/her choice based on literature survey/ a case study wherever applicable/possible, and approved by the staff- in- charge.
 - b) A report with 20-25 pages of A-4 size paper, 1.5 spaced typed material, and appropriately bound.
 - c) Title font/figures/graphs shall be black and white.
3. The Oral examination will be based on the report submitted and (orally) presented.

311097 Numerical Techniques and Database

Teaching Scheme:

Practical: 2 Hrs./Week

Examination Scheme:

Practical: 50 Marks

Practical:

1. Introduction to creation of database using Microsoft access.
2. Creation of database using SQL.
3. Addition/Deletion Modification of existing Database using SQL.
4. Creation of Database Application for Purchase/Manufacturing/Logistics and its report generation using Oracle/VB/VC++/Microsoft Access.
5. Solution of Algebraic/ Transcendental Equation using C/Matlab.
6. Solution of Linear simultaneous equations using C/Matlab.
7. Solution of Curve Fitting using C/Matlab.
8. Solution of Numerical Interpolation using C/Matlab.
9. Study on any two of the following:
 - a) Inter-organizational and global information systems
 - b) Functional and enterprise system
 - c) Intelligent systems in Business.
 - d) Electronic Commerce (E-Commerce).

311098 Machine Tool Engineering

Teaching Scheme:
Practical: 2 Hrs./Week

Examination Scheme:
Term Work: 50 Marks

Term Work:

Term work shall consist of:

1. Assignments based on each topic of the syllabus.
2. A industrial visit to any gear manufacturing/thread manufacturing/automation industry and report based on it.

311099 Process Planning and Industrial Statistics

Teaching Scheme:
Practical: 2 Hrs./Week

Examination Scheme:
Term Work: 50 Marks

Term Work:

Term work shall consist of assignments based on following topics:

1. Part print analysis of one industrial component drawing.
2. Process sheet design of one component on GPM for Batch Production.
3. Process sheet design of one component for mass production.
4. Time estimation for assembly using flow-charting techniques.
5. One case study on two level full factorial experimental design using DOE technique.
6. One case study on Taguchi Analysis using Orthogonal Arrays.

Process sheet design shall include detailed analysis of part print, planning the best sequence of machining operations, selection of proper equipment and tooling, Selection of datum surfaces, stock preparation and blank size selection, machining time calculations, time estimates and standards, design of jigs & fixtures, design of special tooling such as form tool if required, suggest appropriate inspection methodology, preparation of process picture sheets and operation route sheet etc.

311100 Tool Design

Teaching Scheme:
Practical: 2 Hrs./Week

Examination Scheme:
Oral: 50 Marks

Term Work (Any four of the following)

1. Design and drawing of Progressive die.
 2. Design and drawing of die.
 3. Design and drawing of Forging die.
 4. Design & Drawing of Blanking die.
 5. Design and drawing of single cavity injection mould.
- (All drawings on A2 size drawing sheet)