



RKDF UNIVERSITY, BHOPAL
MASTER OF TECHNOLOGY
(PRODUCTION & INDUSTRIAL ENGINEERING)

FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Advanced Mathematics	MTPIE-1001	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,

CO1-Understand the basic principles of sets and operations in sets.

CO2-Apply counting principles to determine probabilities.

CO3-Demonstrate different traversal methods for trees and graphs.

CO4-Write model problems in computer science using trees and graphs.

UNIT 1

Linear Algebra:- Linear transformation, vector spaces, hash function, Hermite polynomial, Heaviside's unit function and error function. Elementary concepts of Modular mathematics

UNIT 2

Laplace, Poisson's, Parabolic:- Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE using finite difference methods, Elementary properties of FT, DFT, WFT, Wavelet transform, Haar transform.

UNIT 3

Probability:- compound probability and discrete random variable, Binomial, Normal and Poisson's distributions, Sampling distribution, elementary concept of estimation and theory of hypothesis, recurred relations.

UNIT 4

Queuing Theory:- Queuing system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/ Infinity/ FC FS), (M/M/1: N/Infinity/ FC FS), (M/M/S: Infinity/ Infinity/ FC FS)

UNIT 5

FEM:- Variation functional, Euler Lagrange's equation, Variational forms, Ritz method, Galerkin's method, discretization, finite elements method for one dimensional problem.

Text Book/References Books/ Websites:

1. Higher Engineering Mathematics by B.V. Ramana, Tata Mc Hill.
2. Advance Engineering Mathematics by Ervin Kreszig, Wiley Eastern Edd.
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
4. Numerical Solution of Differential Equation by M. K. Jain
5. Numerical Mathematical Analysis By James B. Scarborough
6. Fourier Transforms by J. N. Sheddon
7. Advance Mathematics for Engr and Sc, Spiegel, Schaum Series, TMH



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Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Advance Production Technology	MTPIE-1002	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,

CO1-To acquire abilities and capabilities in the areas of advanced manufacturing methods.

CO2- Students will understand the fundamentals of control in automation as they apply to manufacturing.

CO3- Design of Pneumatic Circuit for manufacturing application.

CO4- Able to implement concepts of automation in machine tools and plant.

Unit I

Metrology:- Standards of Measurements, Linear and angular instruments; slip gauges, comparators, sine bar, angle gauges, clinometers, tape gauge, screw thread measurements limit gauging ,Gauge design; fits and tolerance.

Rolling:- General description of machines and process; Rolling of structural sections plates and sheets; construction of halls; hot and cold rolling techniques

Unit II

Metal cutting:- Principles of metal cutting, tool geometry ,Tool life plots , Mach inability, Tool wear ,Cutting force analysis ,Cutting tool materials & Cutting fluids ,Economics of metal machining

Unit III

Pattern Making:- Pattern and pattern making, pattern allowances; pattern design considerations, core, core boxes, types of patterns.

Foundry: molding and core sands and their properties molding machines, centrifugal casting, dye casting shell molding; cupola description and operation. Lost wax molding; continuous casting.

Unit IV

Forging:- Theory and application of forging processes description; principle of toleration of drop and horizontal forging machines; General principle of designs.

Press working: Description and operation of processes, process of shearing, punching, piercing, blanking, trimming, perfecting, notching, lancing, embossing, coining, bending, forging and drawing press, tool dies, auxiliary equipment, safety devices, stock feeders, scrap cutters, forces, pressure and power requirements, requirements of stock material.

Unit V

Welding:- Gas welding, Electric arc welding, A.C. and D.C. welding machines and their characteristics. Flux, Electrodes, Pressure welding, electric resistance welding spot, seam and built welding, submerged arc welding; thermit and TIG & MIG Welding, Brazing Gas cutting , Spinning: Introduction of spinning.

Text Book/References Books/ Websites:

1. Anderson and Tetro; Shop Theory;TMH
2. Kaushik JP; Manufacturing Processes; PHI
3. Bawa; Manufacturing Processes; TMH
4. Rao PN; Manufacturing Tech- Foundry, forming welding; TMH
5. Rao PN; Manufacturing Tech- Metal cutting and machine tools; TMH
6. Chapman; Workshop Technology :
7. Begeman; Manufacturing Process : John Wiley
8. Raghuvanshi; Workshop Technology ;; Dhanpat Rai.
9. Ravi B; Metal Casting- CAD analysis; PHI.
10. Hajra Choudhary; Workshop Technology:, Vol I
11. Pandya & Singh;Production Engineering Science

Suggested List of Laboratory Practical (Expandable): Nil



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Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Production Planning & Inventory Control	MTPIE-1003	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,
CO1-Use and analysis of inventory models for independent and dependent demand (including determining and evaluating the impact of inventory holding, ordering, and setup costs).

CO2-Application of various Materials Requirement Planning models (including the analysis of various lot-sizing techniques and order policies and the development and evaluation of Master Production Plans and Master Scheduling).

CO3-Application and evaluation of scheduling and sequencing methodologies.

CO4-The course enables the students to acquire the ability to design and conduct experiments, analyze and interpret data, develop implementation strategies, shape recommendations so that results will be achieved and findings will be communicated effectively.

Unit 1

Sales Operation Planning:- Nature of sales operation planning, relevant costs, Sales & operation planning Methods.

Unit 2

Master Production Schedule:- NATURE OF MASTER Production Schedule, Master production Scheduling Techniques, Time Fencing and Master Production Schedule stability, Final assembly Schedule, Managing master production Schedule.

Unit 3

Material Resource Planning:- Nature of Material Resource planning, Using MRP and MRP-II system; order control and flow control; routing, scheduling and priority , Buffering Concepts.

Unit 4

Production Activity Control:- Shop floor control concepts, Techniques, performance measurement, Gantt Chart, Finite Loading systems, concept of JIT manufacturing system; logistics, distribution, and supply chain management technology- Process planning layout designs, manufacturing Planning & Control. ;

Unit 5

Inventor:- functions, costs, classifications, deterministic and probabilistic inventory models, quantity discount; perpetual and periodic inventory control systems.

Text Book/References Books/ Websites:

1. Thomas E. Vollmann William L. Berry “ Manufacturing Planning and Control for supply chain management” fifth edition Mc Graw Hill International edition – 2005.

2. Edward A. Silver “ Inventory Management and Production, Planning And Scheduling” Third Edition John Wiley & sons `1998.
3. Seetharama L. Narsinham , Dennis W Mcleavy “ Production , Planning and Inventory Control” Second Edition Prentice Hall of India .
4. Richard J. Tersine “ Production/ Operations Management” Second Edition North Holland 1985.
5. A.C.Hax and D. Candea “ Production & Inventory management” Prentice Hall Eaglewood cliffs. NJMetallurgy techniques.

Suggested List of Laboratory Practical (Expandable): Nil



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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Theory of Metal Cutting and Tool forming	MTPIE-1004	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,
CO1-Overview of Machining Technology.

CO2-Theory of Chip Formation in Metal Machining.

CO3-Force Relationships and the Merchant Equation.

CO4-Power and Energy Relationships in Machining & Cutting Temperature.

Unit 1

Lathe:- Classification of machine tools and their basic components; lathe- specification, components & accessories, various operations on lathes, capstan & turret lathes, tool layout, methods of thread production, machining time, single point cutting tools, tool signature and nomenclature

Grinding:- Types of grinding machines, surface, cylindrical and internal grinding, grinding wheels, specifications, wheel turning and dressing without eccentricity, centre-less grinding.

Unit 2

Milling:- Vertical, horizontal and universal type machines, specifications and classifications of milling machines, universal dividing head plain and different indexing, gear cutting, milling cutters.

Drilling & Broaching:- Fixed spindle, radial and universal drilling machines, drilling time, broaching principle, broaches and broaching machines

Unit 3

Shapers:- Classification and specifications, principle parts, quick return mechanism, shaper operations, speed feed, depth of cut, machining time. Surface qualities, equipment used for rating surfaces, rms. CLA value, causes for surface irregularities.

Gear Cutting: Die casting, methods of forming gears, generating process, Gear shaping, gear shaving, gear grinding gear testing.

Unit 4

Design of Metal working Tools:- Design of press working tools, shearing, piercing, blanking, dies, compound die design principles for forging dies, bending, forming drawing dies, tooling for forging design principles for forging dies, drop forging, upset forging, design principles and practice for rolling, roll press design

Unit 5

Design of Jigs and Fixtures:- Principles of location, locating method and devices, principles of clamping, clamping devices, drilling jigs, types, drill bushes, fixture and economics, types of fixture, milling, grinding, broaching, assembly fixtures indexing jig and fixtures, indexing devices.

Text Book/References Books/ Websites:

1. Groover MP; Fundamentals of modern manufacturing; Wiley India

2. Kaushish JP; Manufacturing processes; PHI
3. Boothroyd G, Knight WA; Fundamentals of machining and machine tools; CRC-Taylor and Francis
4. Munoz J and Oswald PF; Manufacturing processes and systems; Wiley India;
5. Boston; Metal Processing.
6. Hazra Chowdhary; Workshop Tech.II
7. Lindberg – Materials & Processes of Manufacture.
8. Work shop technology by Raghuvanshi-Vol-II
9. Production Processes by HMT



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FIRST YEAR

Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Operation Research	MPIE-1005	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,
CO1-Students will be able to apply and analyse mathematical optimization functions to various applications
CO2- Students will be proficient to recognize the importance and value of Operations Research and mathematical modeling in solving practical problems in industry by Linear programming problems
CO3-Students will be capable to understand the mathematical tools that are needed to formulate & solve transportation problems for optimization.
CO4-Students will be able to formulate & analyze a managerial decision problem into a mathematical model using game theory & investment analysis.

Unit 1

Linear Programming:- Introduction, history and development of OR, model building, process of OR, linear programming– formulation, graphical method, simplex method, big- M-method, two-phase method, degeneracy in LPP, unrestricted variables, duality in LP, convex sets, revised simplex, sensitivity analysis, parametric linear programming, introduction to integer programming, branch and bound algorithm, cutting plane algorithm, single and multiple goal programming algorithms.

Unit 2

Allocations in LPP:- assignment model- Hungarian method, unbalanced, traveling sales man and miscellaneous problem; **transportation-** optimality test, degeneracy unbalanced problems, transshipment.

Unit 3

Decision and Game theory:- Decision tree, decision making models under certainty, risk and uncertainty; rectangular, two persons zero sum games, maximum and minimax principles, saddle point, dominance, graphical and algebraic methods of solution, solution by transforming into linear programming problem

Unit 4

Dynamic programming:- Characteristics of dynamic optimization model, Bellman's principle, typical problems, salesmen problem, forward and backward recursion, use of software to solve LP and DP problems.

Unit 5

Network (NW) models for projects:- Activity and event presentation on NW, summary and detailed blowup NW, work breakdown structure, manageable work units; dummy activity, node numbering rule, time scaled NW, activity and event times, forward and backward pass calculations of earliest/ latest start/ finish time, slack and floats, critical path; resource leveling and critical chain; activity-cost tradeoff and crashing of NW; use of PERT for activity duration uncertainty, probability of completing project in estimated times.

Text Book/References Books/ Websites:

1. Taha H. A., Operation Research, PHI.
2. Hillier and Lieberman Introduction to OR; TMH
3. Sharma JK; OR Theory and Application; macMillan Pub;
4. Banerjee B., Operation Research; Business Publicity, Bombay.
5. Hira & Gupta, Operation Research, S. Chand.
6. Rao S. S., Optimization, Jain Bros., Delhi.
7. Chitale A. K., J. Negi, Text Book of Operation Research, Jain Bros., Delhi.
8. Sharma S. D., Kedarnath, Operation Research, Ramnath & Co., Meerut.



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Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Lab-I Advanced Production Process	MTPIE-1006	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1-To study the basics of metal machining and mechanics of metal machining.

CO2-To study the different cutting tool materials and types & geometry of cutting tools.

CO3-To learn introductory concepts of various advanced machining processes.

CO4-To learn introductory concepts of roughness during the metal cutting.

Course Content

In this lab the students will learn the requirement of different testing of Material. They are going to learn To make a complicate job on lathe machine with all operations like turning, step turning, drilling, tapper turning, thread cutting and knurling, Study of center less grinding machine/ tool and cutter type grinding machine, Learn horizontal/ universal milling machine, diving head and indexing mechanism of it, To study cut a spur gear on milling machine using rapid indexing method, Study of radial drilling machine and preparing a job on it, To study a sapping machine to learn about working of quick return.

Suggested List of Laboratory Practical (Expandable):

1. To make a complicate job on lathe machine with all operations like turning, step turning, drilling, tapper turning, thread cutting and knurling.
2. Study of center less grinding machine/ tool and cutter type grinding machine.
3. Study of horizontal/ universal milling machine, diving head and indexing mechanism of it.
4. To cut a spur gear on milling machine using rapid indexing method.
5. Study of radial drilling machine and preparing a job on it.
6. To study a sapping machine to learn about working of quick return



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Semester – I

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Lab-II Operation Research	MTPIE-1007	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1-Identify necessity and development of mathematical models for various industries.

CO2- Describe basic optimization and simulation techniques applied to various industries.

CO3-Carry out investment analysis and game theory.

CO4-Determine and analyse the industrial systems under the conditions of certainty, uncertainty and risk.

CO5- Construct and solve the network models and to understand the concept of reliability concept.

Course Content

In this lab the students will learn the Linear Programming of various application, Types & Classification of Linear Programming and Allocations in LPP- assignment, Decision and Game theory, Dynamic programming & Network (NW) models for projects.

Suggested List of Experiments (Pl. expands it):

Use computer and software to solve problems contained in the syllabus.



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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Reliability and Quality Management	MTPIE-2001	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,

CO1- Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability.

CO2- Use control charts to analyze for improving the process quality.

CO3- Describe different sampling plans.

CO4- Acquire basic knowledge of total quality management.

Unit 1

Introduction:- Reliability function - MTBF - MTTF - mortality curve -Availability - Maintainability. FAILURE DATA ANALYSIS: Repair time distributions - exponential, normal, log normal. Gamma and Weibull- reliability data requirements - Graphical evaluation.

Unit 2

Reliability Prediction:- Failure rate estimates - Effect of environment and stress - Series and Parallel systems - RDB analysis - Standby Systems – Complex Systems.

Unit 3

Reliability Management:- Reliability demonstration testing – Reliability growth testing - Duane curve -Risk assessment - FMEA, Fault tree.

Unit 4

Total Productive Maintenance:- Causes of Machine Failures - Downtime-Maintenance policies - Restorability predictions - Replacement models - Spares provisioning - Maintenance management - Cleanliness and House Keeping.

Unit 5

Quality Management:- Quality – concept and costs, quality circles, quality assurance; statistical quality control, acceptance sampling, zero defects, six sigma; total quality management; ISO 9000; design of experiments – Taguchi method.

Text Book/References Books/ Websites:

1. Paul Kales, Reliability for technology, "Engineering"; and Management ", Prentice Hall, New Jersey, 1998.
2. Modarres, "Reliability and Risk Analysis ", MeralDekkerInc., 1993.
3. Gopalakrishnan.P, and Banerji A.K., " Maintenance and Spare Parts Management ", Prentice Hall of India, New Delhi, 1996.

Suggested List of Experiments (Pl. expands it): Nil



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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Simulation Modeling Process	MTPIE-2002	3L-1T-0P	4

Course Outcomes: After studying this course, students will be able to,

CO1- The student will be able to appreciate the utility of the tools like ANSYS or FLUENT in solving real time problems and day to day problems

CO2- Use of these tools for any engineering and real time applications.

CO3- Acquire knowledge on utilizing these tools for a better project in their curriculum as well as they will be prepared to handle industry problems with confidence when it matters to use these tools in their employment.

Unit 1

Introduction to modeling and simulation:- Modeling and simulation methodology, system modeling, concept of simulation; gaming; static, continuous and discrete event simulation.

Unit 2

Basic concept of probability:- Generation and characteristics of random variables, continuous and discrete variables and their distributions; mapping uniform random variables to other variable distributions; linear, nonlinear and stochastic models

Unit 3

Introduction to Queuing Theory:- Characteristics of queuing system, Poisson's formula, birth death system, equilibrium of queuing system, analysis of M/M/1 queues. Introduction to multiple server Queue models M/M/c Application of queuing theory in manufacturing and computer system

Unit 4

System Dynamics modeling:- Identification of problem situation, preparation of causal loop diagrams and flow diagrams, equation writing, level and rate relationship, Simulation of system dynamics models.

Unit 5

Verification and validation:- Design of simulation experiments, validation of experimental models, testing and analysis. Simulation languages comparison and selection, study of simulation software – Arena, Pro-model, SIMULA, DYNAMO, STELLA, POWERSIM.

Text Book/References Books/ Websites:

1. Law AM and Kelton WD; Simulation Modeling and Analysis; TMH
2. Gordon G., System simulation, PHI Learning.
3. Taha H, Operations Research; PHI.
4. Hillier FS, Liberman GJ; Introduction to OR; TMH.
5. Deo N; System Simulation with Digital Computer; PHI Lea
6. Payer T., Introduction to system simulation, McGraw Hill.
7. Sushil, System Dynamics, Wiley Eastern

Suggested List of Experiments (Pl. expands it): Nil



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FIRST YEAR

Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Metrology and Measurement	MTPIE-2003	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to,

CO1-The student shall be measuring the various parameters like length, height, angle, displacement, flatness etc., by using various instruments like vernier calipers, micrometer, dial indicator, etc.

CO2-The student shall be able to measure the threads, gear tooth profiles and surface roughness using appropriate instruments and analyze the data.

CO3-The student shall be able to recognize various types of governors and gyroscopes, and improve their performance as per requirement.

CO4-The student shall be able to determine the balancing forces, inertial forces of rotating and reciprocating components in real life problems

Unit 1

General concepts of measurement:- definition-standards of measurement, errors in measurement, limit-gauging, various systems of limits, fits and tolerance, interchangeability, ISI and ISO system. basic principles and design of standards of measuring gauges, types of gauges and their design, accuracy and precision, calibration of instruments, principles of light interference, interferometer, measurement and calibration.

Unit 2

Linear and angular measurements:- Slip gauges, micrometers, verniers, dial gauges, surface plates, comparators- mechanical, electrical, pneumatic and optical comparator, angular measuring instruments- sine bar, angle gauges, spirit level, autocollimators, clinometers; measurement of straightness, flatness and sphericity.

Unit 3

Measurement of surface finish and measuring machines:- surface finish- definitions, types of surface texture, surface roughness measurement methods, comparison, profile-meters, pneumatic and replica, measurement of run out and concentricity, length bar measuring machine, optical projection, comparator, tool makers microscope.

Unit 4

Metrology of screw threads and gears:- internal/external screw thread, terminology, measurement of various elements of threads, thread micrometer method, two wire and three wire methods; gear-terminology, measurement of various elements, constant chord method, base tangent method, plug

method; gear tester, gear tooth measurement; rolling gear tester.

Unit 5

Computer aided and laser metrology:- Co-ordinate measuring machine; applications; laser micrometer, laser interferometer, laser scanning gauge, non contact and in- process inspection, vision system.

Text Book/References Books/ Websites:

1. ASTE; Handbook of industrial metrology; Prentice hall of india ltd
2. Jain R.K.; Engineering metrology; Khanna publishers
3. Gupta. I.C. “A text book of engineering metrology”, Dhanpat rai and sons;
4. Galye G.N et al; Metrology for engineers; elbs,
5. Rajput R.K; Engineering metrology and instrumentation; Kataria &sons publishers

Suggested List of Experiments (Pl. expands it): Nil



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Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Method Study & Engineering Economy	MTPIE-2004	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to

CO1-Evaluate The Economic Theories, Cost Concepts And Pricing Policies.

CO2-Understand The Market Structures And Integration Concepts.

CO3- Understand The Measures Of National Income, The Functions Of Banks And Concepts Of Globalization.

CO4-Apply Quality Engineering Tools For Process Control And Improvement.

Unit 1

Method Study:- Definition and concept, scope of method study, indicators of method study Elements of method design, Process charts, procedures of method study.

Unit 2

Work Measurement:- Definition & objectives of work measurement, Procedure for time study time estimates & production standard, level of performance, Allowances, Recording techniques in time study, **stop watch**.

Micro motion Study:- Introduction, objectives of micro motion study. SIMO charts

Unit 3

Job Evaluation:- Definition and concept need for job evaluation, Methods of job evaluation Essentials for success of job evaluation programme

Unit 4

Economy And Costing:- Elementary cost accounting and methods of depreciation; break-even analysis, techniques for evaluation of capital investments, financial statements.

Text Book/References Books/ Websites:

1. Sharma S.K. “ Industrial Engineering & operations management “ Kataria Publications
2. Barnes R.M. “ Work Design And Measurement “ Wiley & Sons
3. Maccormic E.J. “ Human factors in Engg. & Design “ Tata Mc Graw Hil
4. Mahajan M .S. “ Industrial Engg & Production Management”
Dhanpat Rai & Sons Delhi
5. Shah H.S. “ Work Study & Ergonomics “ Dhanpat rai & Sons.

Suggested List of Experiments (Pl. expands it): Nil



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Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Machines of Dynamics	MTPIE-2005	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to,

CO1- Students will be able to understand about control of sound.

CO2- Students will be able to carry out noise analysis of simple systems.

CO3-Students will be able to model and analyze simple, two degrees of freedom vibration systems.

CO4- Students will be able to measure the vibration methods.

Unit -1

Dynamics of Engine Mechanisms: Displacement, velocity and acceleration of piston; turning moment on crankshaft, turning moment diagram; fluctuation of crankshaft speed, analysis of flywheel.

Unit-2

Governor Mechanisms: Types of governors, characteristics of centrifugal governors, gravity and spring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.

Unit -3

Balancing of Inertia Forces and Moments in Machines: Balancing of rotating masses, two plane balancing, determination of balancing masses (graphical and analytical methods), balancing of rotors, balancing of internal combustion engines (single cylinder engines, in-line engines, V-twin engines, radial engines, Lanchester technique of engine balancing.

Unit -4

Friction: Frictional torque in pivots and collars by uniform pressure and uniform wear rate criteria. Boundary and fluid film lubrication, friction in journal and thrust bearings, concept of friction circle and axis, rolling friction. Clutches: Single plate and multi plate clutches, Cone clutches.

Unit -5

Belt drives; Velocity ratio, limiting ratio of tension; power transmitted; centrifugal effect on belts, maximum power transmitted by belt, initial tension, creep; chain and rope drives;
Brakes: Band brake, block brakes, Internal and external shoe brakes, braking of vehicles. Dynamometer: Different types and their applications.
Dynamic Analysis of Cams: Response of un-damped cam mechanism (analytical method), follower response analysis by phase-plane method, jump and cross-over shock.

Text Book/References Books/ Websites:

1. Ambekar, AG; Mechanism and Machine Theory; PHI
2. Rattan SS; Theory of machines; TMH
3. Bevan; Theory of Machines;
4. Norton RL; kinematics and dynamics of machinery; TMH
5. Grover; Mechanical Vibration



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Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Lab-I Metrology and Measurement	MTPIE-2006	0L-0T-2P	2

Course Outcomes:- After studying this course, students will be able to,

CO1-Identify various gauges for measurement.

CO2-Demonstrate linear and angular measurement using precision instruments.

CO3- Apply the load cell to measure the force and torque

CO4- Use thermocouple and vibrometer for taking measurement.

CO5- Measure pressure and surface roughness

CO6- Measure length and angles using line-graduated instruments, i. e. vernier callipers, micrometers, bevel protractor, sine bar and surface plates.

Course Content

In this lab the students will learn the various gauges for measurement, linear and angular measurement using precision instruments, measure the force and torque, thermocouple and vibrometer for taking measurement, Measure pressure and surface roughness, Measure length and angles using line-graduated instruments, i. e. vernier callipers, micrometers, bevel protractor, sine bar and surface plates.

Suggested List of Experiments (Pl. expands it):

1. To Study Identify various gauges for measurement.
2. To Demonstrate linear and angular measurement using precision instruments.
3. To Study Apply the load cell to measure the force and torque.
4. To Study thermocouple and vibrometer for taking measurement.
5. To Study Measure pressure and surface roughness
6. To Study Various Types of Measure length and angles using line-graduated instruments, i. e. vernier callipers, micrometers, bevel protractor, sine bar and surface plates.



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Semester – II

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Lab-II Dynamics of Machine	MTPIE-2007	0L-0T-2P	2

Course Outcomes:- After studying this course, students will be able to,

CO1-Recall and study the motion of different mechanisms.

CO2-Understand the working principle of governor and gyroscope and demonstrate the effect of forces and moments on their motion.

CO3-Analyze the motion and the dynamical forces acting on cams.

CO4-Demonstrate the effect of unbalances resulting from rotary motions.

Course Content

In this lab the students will learn the various Dynamics of Engine Mechanisms, Governor Mechanisms, Balancing of Inertia Forces and Moments in Machines, Friction, Belt drives, Brakes, Dynamometer, Analysis of Cams.

Suggested List of Experiments (Pl. expands it):

- 1- Study of various models of governors.
- 2- Study of gyroscopic motion and calculation of value of gyroscopic couple.
- 3- Study of various types of Cams and followers and drawing the cam profile with the help of test kit.
- 4- Study of various first order vibration systems.
- 5- To study working of friction clutches using models in this Course Content.



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Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	ELECTIVE-I Computer Integrated Manufacturing	MTPIE-3001 (A)	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to,

CO1-Students will be able to apply knowledge about Computer Aided Quality control and Process Planning Control.

CO2-Students will be able to Design Flexible manufacturing cell after carrying out Group technology study and finally creating FMS

CO3-Students will be able to apply knowledge about various methods of communication in CIMS.

CO4-They will be able apply data management and its importance for decision making in CIMS environment.

Unit 1

Computer Integrated manufacturing System

Definition, CIM wheel concept, Evolution of CIM, CIM and system view of manufacturing, and CIM IT & Concurrent Engineering, Elements of CIM system, CIM hardware and software.

Unit2

Computer Aided Design

Historical background, Development of CAD, CAD system hardware, Software, Graphics standards, Basic definitions, Modes of graphic operation, User interface, Software modules, Modeling and viewing.

Unit3

2D - Representation and Transformation of Points - -transformation of Lines -Rotation. Reflection. Scaling and combined transformations - 3Dsealing - shearing - Rotation - Reflection - Translation – Projections parametric representation of Ellipse, Parabola, Hyperbola.

Unit 4

CNC Machine Tool and Programming

Development of CNC Technology, Principles, Features, NC, CNC, DNC concepts, Classification of CNC Machine Tools, CNC Controller, CNC Programming for various. Controllers -SI numeric, Fanuc Program, G&M codes, Part Programming of Prismatic and revolved components, APT part programming using CAD, CAM S/w.

Unit 5

Manufacturing Planning and Control - CAD/CAM Integration - Principles of Computer Integrated Manufacturing - Hierarchical Network of Computers - Local Area Networks – Process Planning: Computer Aided Process Planning - Retrieval and Generative approaches.

Text Book/References Books/ Websites:

1. Groover, Production System & CIM: PHI
2. Zeid, CAD/CAM Theory & Practice: Mc Graw Hills

Suggested List of Experiments (Pl. expands it): Nil



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SECOND YEAR

Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	ELECTIVE-I Entrepreneurship and Management Concepts	MTPIE-3001 (B)	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to,

CO1-Understand the process of entrepreneurship and the institutional facilities available to an entrepreneur in India

CO2- Know the process of starting a new venture and create their business plan.

CO3-Know about valuation of business and the sources for financing new venture.

CO4-Gain the knowledge on legal aspects and government policy relating to entrepreneurship.

Unit-1

System Concepts: Types, definition & characteristics; supra & subsystems, key component; boundary & interface complexity; feedback (pull) & feed forward (push) controls, open flexible-adaptive system, computer as closed system, law of requisite variety; system coupling, stresses and entropy; functional & cross functional system.

Unit-2

Management: Importance, definition and functions; schools of theories, knowledge driven learning organization and e-business; environment, uncertainty and adaptability; corporate culture, difficulties and levels of planning, BCG matrix, SWOT analysis, steps in decision making, structured and unstructured decision; dimensions of organizations, size/specialization, behavior formalization, authority centralization, departmentalization, span and line of control, business process reengineering and process of change management, HR planning placement and training, MIS; attitudes and personality trait, overlap and differences between leader & manager, leadership grid, motivation, Maslow's need hierarchy and Herzberg two factor theory, expectation theory, learning process, team work and stress management.

Unit-3

Marketing: Importance, definition, core concepts of need want and demand, exchange & relationships, product value, cost and satisfaction (goods and services) marketing environment; selling, marketing and societal marketing concepts; four P's, product, price, placement, promotion; consumer, business and industrial market, market targeting, advertising, publicity, CRM and market research.

Finance: Nature and scope, forms of business ownerships, balance sheet, profit and loss account, fund flow and cash flow statements, breakeven point (BEP) and financial ratio analysis, pay-back period, NPV and capital budgeting.

Unit-4

Productivity and Operations: Productivity, standard of living and happiness, types of productivity, operations (goods and services) Vs project management, production processes and layouts, steps in method improvement, time measurement, rating and various allowances; standard time and its utility, predetermined motion and time method, product and process specification, TQM, cost of quality, introduction to lean manufacturing (JIT), QFD, TPM & six sigma quality.

Unit 5

Entrepreneurship : Definition and concepts, characteristics, comparison with manager, classification, theories of entrepreneur, socio, economic, cultural and psychological; entrepreneur traits and behavior, roles in economic growth, employment, social stability, export promotion and indigenization, creating a venture, opportunity analysis competitive and technical factors, sources of funds, entrepreneur development program.

Text Book/References Books/ Websites:

- 1- Daft R; The new era of management; Cengage.
- 2- Bhat Anil, Arya kumar ; Management: Principles , Processes and Practices; Oxford higher education.
- 3- Davis & Olson; Management Information System; TMH.
- 4- Steven Alter; Information systems, Pearson,
www.stevenalter.com
- 5- Kotler P; Marketing management;
- 6- Khan, Jain; Financial
Management;
- 7- ILO; Work study;
ILO.
- 8- Mohanty SK; Fundamental of Entrepreneurship; P

Suggested List of Experiments (Pl. expands it): Nil



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Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	ELECTIVE-I Principals of Robotics and Applications	MTPIE-3001 (C)	3L-1T-0P	4

Course Outcomes:- After studying this course, students will be able to,

CO1- Identify a Robot for a specific application.

CO2- Interface various Servo and hardware components with Controller based projects.

CO3- Identify parameters required to be controlled in a Robot.

CO4- Develop small automatic / autotronics applications with the help of Robotics.

Unit -1

Introduction: Definition, configurations, work envelopes, specifications, and other basic parameters of robots.

Unit- 2

Kinematic principles: Position and orientation, co-ordinate systems, relative frames, homogeneous co-ordinates, direct and inverse kinematics, differential motions and the Jacobians.

Unit- 3

Introduction to dynamics: Types of motions: slew – joint-interpolated – straight line interpolated motions. Path planning – trajectory planning and control. Drives: electrical, hydraulic, and pneumatic drives – basics and relative merits. Components: harmonic reduction units, servo valves, and grippers. Sensors: basic types including vision, force – torque wrist sensors.

Unit -4

Robot application: Robot motion planning – configuration space concepts. Robot programming concepts: off line programming and simulation – work cell application. Development: requirements – modeling – work cell calibration – layout planning. Case studies.

Text Book/References Books/ Websites:

1. Shiman Y., “Handbook of industrial robotics”, John Wiley & Sons, 1985
2. Deh S. R., “Robotics technology and flexible automation”, Tata McGraw Hill, 1994
3. Craig, J. J., “Robotics: mechanics and control”, Addison Wesley, 1989
4. Groover M. P., “Fundamentals of modern manufacturing materials, processes, and systems”, Prentice Hall, 1996

Suggested List of Experiments (Pl. expands it): Nil



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Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Industrial Training (6 month)	MTPIE-3002	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1-Recall recognizes, visualize, illustrate, demonstrate, criticize and appraise the aspects of Mechanical engineering systems.

CO2- Interaction among the industrial people.

Course Content

In this Industrial Training the students will learn basic principles of technology, configurations, control and programming, Capability to acquire and apply fundamental principles of engineering, Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills, Ability to identify, formulate and model problems and find engineering solution based on a systems approach, Awareness of the social, cultural, global and environmental responsibility as an engineer.



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Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Seminar	MTPIE-3003	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1-Recognize and examine ethical situations that affect engineering.

CO2-Identify and anticipate professional issues as a Production & Industrial engineer.

CO3-Prepare for management of ethical and legal issues that Production & Industrial engineers face as Professionals. CO4-Understand the need to be knowledgeable of contemporary issues.

Course Content

In this Seminar the students will learn Objective of Group Discussion and it is to improve the mass communication Skill, It is to give student an opportunity to exercise their rights to express them & to enhance understanding skills of students, to improve convincing power of students.



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Semester – III

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Dissertation Part- I (Literature Review/Problem Formulation/ Synopsis	MTPIE-3004	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1- To define and limit of the research.

CO2- To place your study in an historical perspective.

CO3- To avoid unnecessary duplication.

CO4- To evaluate promising research methods.

Course Content

The objective of Dissertation Part-I is to promote a systematic understanding of the knowledge, critical awareness of current problems, originality in the application of knowledge and the quality of work. The ideal work may be characterized by a new result in design, development and implementation. It should have the potential of industrial/scientific acceptance. The first part of the Dissertation should be to determine the interest of students and broadly identify the area of work, finalize the research problem based on literature survey. Also, by now the students should have familiarity with the concepts, tools, techniques required to carry out the Dissertation work. Student is expected to start the research work. Outcome of Dissertation Part-I should be to conclude the work on the identified problem its importance, its justification, literature survey, field work, research work etc. Minor variation may be accepted depending upon nature of title.



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Semester – IV

Course Content & Grade

Branch	Subject Title	Subject Code	Contact Hours per Week	Total Credit
PIE	Dissertation Part- II	MTPIE-4001	0L-0T-2P	2

Course Outcomes: After studying this course, students will be able to,

CO1- The programme of instruction will consist of advanced subjects of the respective specialization.

The complete programme is distributed over four semesters with two semesters per academic year.

Course work is offered in the first two semesters (except for PG programme in Mechanical engineering where it is extended up to third semester) and the dissertation work will be carried out during third and fourth semesters. Every branch of M.E/ M. Tech programme will have a curriculum and syllabi for the courses recommended by the board of studies and approved by the academic council. The academic programmes of the Institute follow the credit system.

CO2- Every candidate shall be required to submit the record of dissertation work at the end of fourth semester.

Course Content

The objective of Dissertation Part-I is to promote a systematic understanding of the knowledge, critical awareness of current problems, originality in the application of knowledge and the quality of work. The ideal work may be characterized by a new result in design, development and implementation. It should have the potential of industrial/scientific acceptance. Dissertation Part-II should be seen in continuation with Dissertation Part-I. The researcher should continue the research work in the two parts.