# RKDF UNIVERSITY, BHOPAL

**Scheme of Examination**  
First Semester- M.Tech (Production and Industrial Engineering)

<table>
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<th>S.no</th>
<th>Subject Code</th>
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<th>Credits</th>
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L: Lecture - T: Tutorial - P: Practical
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
Solution of Partial Differential Equation (PDE) by separation of variable method, numerical solution of PDE (Laplace, Poisson’s, Parabolic) 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 system, transient and steady state, traffic intensity, distribution queuing system, concepts of queuing models (M/M/1: Infinity/Infinity/FCFS), (M/M/1: N/Infinity/FCFS), (M/M/S: Infinity/Infinity/FCFS).

UNIT 5
FEM: Variational functionals, Euler Lagrange’s equation, Variational forms, Ritz method, Galerkin’s method, discretization, finite elements method for one dimensional problems.

Reference Books:
3. Applied Numerical Methods with MATLAB by Steven C Chapra, TMH.
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
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, coreboxes, 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.
References:

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

REFERENCES
5. A.C.Hax and D. Candea “ Production & Inventory management” Prentice Hall Eaglewood cliffs. NJMetallurgy techniques.
R.K.D.F. UNIVERSITY, BHOPAL
MASTER OF TECHNOLOGY
(PRODUCTION & INDUSTRIAL ENGINEERING)
FIRST YEAR
Semester – 1
Course Content & Grade

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<tr>
<th>BRANCH</th>
<th>SUBJECT TITLE</th>
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<tr>
<td>PIE</td>
<td>Theory of Metal Cutting and Tool forming</td>
<td>MTPIE-1004</td>
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**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.
References:

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
8. Work shop technology by Raghuvanshi-Vol-II
9. Production Processes by HMT

List of Experiment (Pl. expand it):

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
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 salesman 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, maximin 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.

References:
1. Taha H. A., Operation Research, PHI.
2. Hillier and Lieberman Introduction to OR; TMH
3. Sharma JK; OR Theory and Application; macMillan Pub;
5. Hira & Gupta, Operation Research, S. Chand.
Suggested List of Experiments (Pl. expand it):

Use computer and software to solve problems contained in the syllabus
## RKDF UNIVERSITY, BHOPAL

### Scheme of Examination

**Second Semester- M.Tech (Production and Industrial Engineering)**

<table>
<thead>
<tr>
<th>S. No</th>
<th>Subject Code</th>
<th>Subject Name</th>
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<td>Tests (Two)</td>
<td>Assignments /Quiz</td>
<td>End Sem. Practical/Viva</td>
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|       | Total        |                                           |                  |          |                |                              |             |             |           |
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|       |              |                                           | 3 1 12 32 350 100 | 50      | 180            | 120                         | 800         |

L: Lecture - T: Tut
R.K.D.F. UNIVERSITY, BHOPAL

MASTER OF TECHNOLOGY
(PRODUCTION & INDUSTRIAL ENGINEERING)
FIRST YEAR
Semester – II
Course Content & Grade

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<tr>
<td>PIE</td>
<td>Reliability and Quality Management</td>
<td>MTPIE-2001</td>
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Unit 1

Unit 2

Unit 3
RELIABILITY MANAGEMENT: Reliability demonstration testing – Reliability growth testing - Duane curve - Risk assessment - FMEA, Fault tree.

Unit 4

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.

Reference Book
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.

References:
1. Law AM and Kelton WD; Simulation Modeling and Analysis; TMH
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
7. Sushil, System Dynamics, Wiley Eastern
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 squareness.

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.

References:
1. ASTE; Handbook of industrial metrology; Prentice hall of India ltd
2. Jain R.K.; Engineering metrology; Khanna publishers
4. Galye G.N et al; Metrology for engineers; elbs,
5. Rajput R.K; Engineering metrology and instrumentation; Kataria & sons publishers
R.K.D.F. UNIVERSITY, BHOPAL
MASTER OF TECHNOLOGY
(PRODUCTION & INDUSTRIAL ENGINEERING)
FIRST YEAR
Semester – II
Course Content & Grade

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<tr>
<td>PIE</td>
<td>Method Study &amp; Engineering Economy</td>
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**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.

**MICROMOTION 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.

**REFERENCES:**

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.

References:
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

List of Experiment (Pl. expand 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 Course Content &
RKDF UNIVERSITY, BHOPAL

Scheme of Examination
Third Semester- M.Tech Production and Industrial Engineering

<table>
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<th>S. No.</th>
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L: Lecture - T: Tutorial - P: Practical

ELECTIVE-

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<th>Subject code</th>
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<td>MTPIE-3001(A)</td>
<td>Computer Integrated Manufacturing</td>
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<td>MTPIE-3001(B)</td>
<td>Entrepreneurship and Management Concepts</td>
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<tr>
<td>MTPIE-3001(C)</td>
<td>Principals of Robotics and Applications</td>
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Unit 1

Computer Integrated manufacturing System
Definition, CIM wheel concept, Evolution of (‘1M, CIM and system view of manufacturing, and CIM IT & Concurrent Engineering, Elements of CIM system, CIM hardware and software.

Unit 2

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.

Unit 3


Unit 4

CNC Machine Tool and Programming

Unit 5


Reference Books:
1. Groover, Production System & CIM: PHI
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.

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, spam 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.

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.

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.
Entrepreneurship: Definition and concepts, 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.

References:

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
### 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


### Unit-4


### References:

5. Craig
RKDF University Bhopal launched a programme "RAIN WATER HARVESTING" with coordination of all the staff members and students. Our achievements.


RKDF University, Bhopal, Madhya Pradesh. ESTD 2012. Private University.

The history of RKDF University establishment lies long back in the 1990s, when RKDF Group felt the need of quality higher education in central India and decided to open a series of colleges across various cities of Madhya Pradesh. Soon by the year 1995, the group has successfully established a group of colleges across the state offering education in the field of Engineering, Medical, Management, Nursing, and others. RKDF University, Bhopal - Know more about affiliated Colleges, Admissions notices, Results and timetables.

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