### Scheme of Teaching & Examination

**M.E. Mechanical Enng. (Production Engineering)**

**I Semester**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
<th>Periods per Week</th>
<th>Scheme of Examination</th>
<th>Total Marks</th>
<th>Credit</th>
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<tbody>
<tr>
<td></td>
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<td>L</td>
<td>T</td>
<td>P</td>
<td>ESE</td>
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<tr>
<td>1</td>
<td>Mech. Engg.</td>
<td>542111 (37)</td>
<td>Advanced Manufacturing Engineering</td>
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<td>2</td>
<td>Mech. Engg</td>
<td>542112 (37)</td>
<td>CAD/CAM Applications</td>
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<td>3</td>
<td>Mech. Engg</td>
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<td>Production &amp; Materials Management</td>
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<td>Mech. Engg</td>
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<td>Refer Table -I</td>
<td>Elective-1</td>
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<td>6</td>
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<td>542121 (37)</td>
<td>Advanced Manufacturing Engineering Lab</td>
<td>-</td>
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<td>CAD/CAM Applications Lab</td>
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<td><strong>Total</strong></td>
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<td><strong>5</strong></td>
<td><strong>6</strong></td>
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</tbody>
</table>

**L- Lecture**  
**T- Tutorial**  
**P- Practical**  
**ESE- End Semester Exam**  
**CT- Class Test**  
**TA- Teacher's Assessment**  

**Table-I**

### ELECTIVE I

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Board of Study</th>
<th>Subject Code</th>
<th>Subject</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mech. Engg.</td>
<td>542131 (37)</td>
<td>Applied Fuzzy logic &amp; Fuzzy Sets</td>
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<tr>
<td>2</td>
<td>Mech. Engg</td>
<td>542132 (37)</td>
<td>Finite Element Methods</td>
</tr>
<tr>
<td>3</td>
<td>Mech. Engg</td>
<td>542133 (37)</td>
<td>Accounting &amp; Management Control</td>
</tr>
<tr>
<td>4</td>
<td>Mech. Engg</td>
<td>542134 (37)</td>
<td>Advanced Metrology And Computer Aided Inspection</td>
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</tbody>
</table>

**Note (1)** - 1/4th of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a Particular academic session.

**Note (2)** - Choice of elective course once made for an examination cannot be changed in future examinations.
UNIT – I
Competitive Aspects of Manufacturing Processes

UNIT – II
Casting
Alloys: Ferrous, Non ferrous, properties, processes – Ingot, shapes, expendable mould – permanent pattern, expendable mould – expendable pattern, permanent, centrifugal, melting practices, design considerations, quality assurance, foundry mechanization.

UNIT – III
Bulk Deformation Process
Rolling - Classification, products, processing sequence, mill types, mill line equipments, accessories for flat and shape rolling, variables, load, torque, power calculations, rolling mill controls, defects – causes and remedies.
Forging - Types, tools and dies, equipment, recent trend in forging, design considerations, defects, causes and remedies.
Press working - Material properties – Formabilities, yield point phenomenon, Anisotropy, metals, shearing process – types, forces, finish blanking, equipments, bending-stresses and spring back, methods, flanging and necking, special processes – spinning, bulging, peen forming, stretch forming, deep drawing dies, design considerations in metal working.
Extrusion - Process, tooling, analysis and variables.
Wire and tube drawing - Operations and Analysis.

UNIT - IV
Joining Process
Adhesive bonding – Types of adhesive, adhesive systems, surface preparation, application, design, process capability, welding of plastics, thermal cutting.

UNIT – V
Advanced Machining Processes
Rapid Prototyping – Processes, process parameters, capability and products, application of various methods.
Fabrication of Micro electronic devices – Process sequence, basic techniques, thick and thin film techniques, application.

TEXT BOOKS

REFERENCE BOOKS
1. Manufacturing Science – A. Ghosh & A. Mallik – Affiliated East West Press, Delhi
Chhattisgarh Swami Vivekanand Technical University,
Bhilai (CG)


Semester: M. E. I  Branch: Mechanical Engineering
Subject: CAD/CAM Applications  Code: 542112 (37)
Total Theory Periods: 40  Total Tutorial Periods: 12
Total Marks in End Semester Exam.: 100
Minimum number of class test to be conducted: 02

UNIT– I
CAD/CAM Software
Graphics Standards, Basic definitions, Software modules, Applications of software in CAD/CAM.

Wire Frame models

UNIT– II
Surface and Solid Modelling
Surface model, Surface Representation, Parametric Representation of Analytic and Synthetic Surfaces, Surface Manipulations.

UNIT – III
Modelling Analysis
Geometric Transformations, Mechanical Assembly, Mass Property Calculations, Finite Element Modelling and Analysis.

UNIT - IV
NC Machining
NC, CNC & DNC, NC programming, NC programming languages, Generation of Tool path, Verification of Tool path.

Prismatic Machining
Facing, pocketing, profile contouring, curve following, point to point transition path.

UNIT - V
Three axes surface machining
Sweep roughing operation, sweeping operation, Iso-parametric machine operation, spiral milling operation.

Lathe Machining Techniques
Roughing, grooving, recessing, profile finishing, groove finishing, threading,

Multi-Axes Machining
Sweeping, contour driven operation, curve machining operation, iso parametric machining operation, axes drilling operation. Numerical Control- Advanced

TEXT BOOKS

REFERENCE BOOKS
1. CAD/CAM/CIM – P. Radhakrishnan and S. Subramanyam, New Age International
UNIT – I
Production System & Advanced Forecasting Method
Generalized Model of production system, design, optimization & control of production system.
PPC – Production Planning, integrated part of corporate planning process, Integrative nature of production plans, centralized and decentralized production planning.
Advanced Forecasting – Principles, SWOT analysis, and 7S approach, Advanced Techniques – multi item forecasting, slow item forecasting.

UNIT - II
Capacity Planning
Measurement measures, estimating future capacity needs, factors influencing, factors favouring over capacity and under capacity, MPS.
Production Control Functions
Loading, sequencing, assignment models
High Volume Production System
Detroit type automation, automated flow lines, transfer mechanism, buffer storage, control function, automation for machining operation, Design and fabrication considerations.

UNIT – III
Inventory Management
Inventory models and safety stocks – Relevant costs, behaviour of costs in relation to level of inventory, optimal order quantity, EOQ, EBQ, Joint cycle for multiple products, model with purchase discounts, approaches to determine buffer stock, fixed order period models.
ABC and other classification of Materials selective management control, VED analysis, combination of ABC and VED analysis, purpose classification.
Material requirement planning (MRP – I) – Concepts, structure, working output reports, classes of users.

UNIT – IV
Material Management
Spare parts Management – Characteristics, codification concept, stocking, policy analysis, Maintenance or breakdown capital, insurance, rotatable spares.
Other aspects of Material Management
Codification, characteristics, standardization, material handling, stores management.

UNIT – V
Physical Distribution Management
Transportation problem, Route scheduling problem, logistics management.
Material Management
An integrated view, Adaptability considerations, inventory – a part of production strategy, organization, effectiveness, a multi level interactive process.

TEXT BOOKS
1. Production and Operation Management – S.N. Chary – TMH, Delhi
2. Production Planning & Inventory Control – Seetharama L. Narasimham – Dennis W. Mc.
3. Automation, Production System and CIM – M.P. Groover – PHI, Delhi

REFERENCE BOOKS
1. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Company - Delhi
2. Production & Operation Management – Adam and Elbert – PHI, Delhi
5. Elements of Production Planning & Control – Samuel Eilon – Universal Publishing Corporation, Bombay
UNIT- I
Maintenance, Reliability and Maintainability – Objectives, Productivity, reliability, redundancy maintainability, quality circle in maintenance, maintenance job and technologies.
Defect/Failure Analysis
Defect Generation, failure types, failure analysis, detect reporting and recording and breakdown analysis.

UNIT - II
Maintenance Systems and Condition Monitoring

UNIT- III
Maintenance Planning and Scheduling and CMMS
Job Planning & Scheduling, Short-term & long term plans, Capital Repair, Renovation, Codification Cataloguing; Maintenance Operation Liasons work permit job monitoring, maintenance records and documentation, selection and scope of computerization. Equipment classification, Material Management Module, Standardization Rationalization, Process planning.

UNIT - IV
Total Productive Maintenance & Concept of Maintenance
Terotechnology, scope and Concept of TPM, Basic System of TPM, Productivity Circle, TPM vis-a-vis TQM; 5-Zero Concept, Reliability Based Maintenance, Evaluation of RBM programmes; Value Engineering in Maintenance, Productivity Measurement, Maintenance Audit.
Maintenance Organization
Formal & Informal Organization, Line & Staff Organization; Centralized. & Decentralized Organization, External Maintenance Services; Captive Shop facilities.

UNIT - V
Maintenance Budget and Cost-Control
Maintenance cost behaviour, cost factors influencing Maintenance, Budgeting of Maintenance Cost, Cost Controls, Budgetary Control.
Training of Maintenance Personnel
Profile and need of Maintenance, Objectives & Ten Commandments of training, Categories of training; Modes of training and developments, training sources, agencies, institutions, Planning & designing of training programmes.

TEXT BOOKS

REFERENCE BOOKS
1. Maintenance Planning, Control and Documentation – E.N. White
Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

4. Reliability Engg. – LS. Srinath– Affiliated East West Press, New Delhi

Semester: M. E. I  Branch: Mechanical Engineering
Subject: Applied Fuzzy logic & Fuzzy Sets  Code: 542131 (37)
Total Theory Periods: 40  Total Tutorial Periods: 12
Total Marks in End Semester Exam. : 100
Minimum number of class test to be conducted: 02

UNIT - I
Classification of sets and Fuzzy sets
Basic concepts of classical set and Fuzzy set, Basic operations & properties of classical & Fuzzy sets, Basic concepts of classical relation & Fuzzy relation.

UNIT - II

UNIT - III
Classical Logic, Fuzzy Logic & Fuzzy Rule Based Systems.

UNIT - IV
Fuzzy Non linear Simulation & Fuzzy Decision Making

UNIT - V
Fuzzy Control system & Fuzzy Optimization
Simple Fuzzy logic controllers, Industrial Applications, Fuzzy Optimization, Fuzzy One Dimensional Optimization, Fuzzy maximum & minimum.

TEXT BOOKS
2. Fuzzy sets & Fuzzy Logic, Theory & Applications – G.J. Klier, Boyuan – Prentice Hall of India

REFERENCE BOOKS
2. Fuzzy sets uncertainty and Information – By G.J. Klr and T.A. Folger, Prentice Hall
Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: M. E. I Branch: Mechanical Engineering
Subject: Finite Element Methods Code: 542132 (37)
Total Theory Periods: 40 Total Tutorial Periods: 12
Total Marks in End Semester Exam.: 100
Minimum number of class test to be conducted: 02

UNIT – I
General Concept

UNIT – II
Formulation and variation method.

UNIT – III
Element shape function

UNIT – IV
Problem in Solid Mechanics
Formulation of problem, Axial, Torsional and Flexural, Deformation of Beams. Axisymmetric problem of plane stress and plane strain. Free vibration beam and staff.

UNIT – V
Plane Elasticity

TEXT BOOKS
1. Introduction of Finite Element – J.N. Reddy – TMH

REFERENCE BOOKS
1. Finite Element Analysis – Krishnamurty C.S. – TMH
Chhattisgarh Swami Vivekanand Technical University,
Bhilai (CG)

Semester: M. E. I
Subject: Accounting & Management Control
Branch: Mechanical Engineering
Code: 542133 (37)
Total Theory Periods: 40
Total Tutorial Periods: 12
Total Marks in End Semester Exam.: 100
Minimum number of class test to be conducted: 02

UNIT – I
Introduction to Financial Accounting

UNIT – II
Introduction to Cost Accounting
Cost Classification, Allocation and absorption, Preparation of Cost Sheet.

UNIT – III
Variance Analysis & Budgetary Control
Cost Analysis for decision making, Direct Costing, Break Even Analysis (CVP Analysis), Cost Analysis for Control (Variance Analysis), Budgetary Control & Preparation of Budgets(Cash Budget, & Other Types of Budget.)

UNIT – IV
Cash Flow & Fund Flow Analysis
Preparation of Cash Flow & Fund Flow Statement, Responsibility Accounting (Cost Centre, Profit Centre, Budget Centre) and Transfer Pricing.

UNIT – V
Working Capital Management
Concept need & influencing factors, Estimation of Working Capital, General idea of Control of Service Organizations & Control of Multi National Companies.

TEXT BOOKS
2. Financial Management – Prasanna Chandra – TMH, New Delhi

REFERENCE BOOKS
2. Cost & Management Accounting – Khan & Jain – TMH, Delhi
5. Modern Accountancy – Haneef & Mukherjee – TMH, Delhi
UNIT – I
Advanced Metrology
Measurement standards and systems, Gauging principles, machine tool accuracy and performance testing, computer assisted sensor systems for machine testing.

UNIT – II
Inspection principles and practices
Inspection fundamentals, inspection procedure, inspection accuracy, Type I and Type II inspection errors, error sources, sampling theory, uncertainty analysis, automated inspection, offline and online/in-process inspection, quantitative analysis of inspection, measurement standards and systems.

UNIT – III
Co-ordinate Measuring Machine (CMM)
Co-ordinate Metrology, CMM Basics, CMM Construction, CMM operation and programming, accessory elements, probing systems, probe and stylus, non contact sensors, probe calibration, error compensation of co-ordinate measuring machines, algorithms and sampling methods used in data analysis, thermal and environmental effects, compensation of probing errors. CMM Software, scanning, reverse engineering applications, performance evaluation of co-ordinate measuring machines.

UNIT – IV
Advanced surface metrology
 Constituents of surface texture, stylus, optical, atomic force microscope and other advanced methods of measuring surface texture, two and three dimensional measurement of surfaces, separation of form, waviness and roughness, random process analysis techniques, use of transforms for filtering, numerical evaluation of surface texture.

UNIT – V
Laser metrology and Machine vision
Laser metrology, laser interferometer, laser scanners, applications, non contact non optical inspection techniques, Machine Vision, sensing, low and higher level vision, image acquisition and digitization, cameras, CCD,CID, CPD etc., illumination, image processing and analysis, feature extraction, applications.

TEXT BOOKS

REFERENCE BOOKS
2. Robinson S L and R K. Miller : Automated Inspection and Quality Assurance Marcel Dekker Inc. USA
3. ASME, Handbook of Industrial Metrology - Prentice Hall of India Ltd.
4. ISO Guide to the expression of Uncertainty in Measurement
List of Experiments

1) Inspection procedures, codes and standard
2) Magnetic Particle Testing
3) Die Penetrant Testing
4) Liquid Penetration Report
5) Eddy Current Testing
6) Ultrasonic Inspection
7) Radiography
8) Study of IS standards in molding material, sand testing
9) Study of IS Standard in welding (weld material, weld testing, welding symbol)
10) Design of gating and feeding system for simple casting
11) Industrial Visit of industries to study the various manufacturing processes.
List of Experiments

1) Making of casting using extrusion method in Pro-E.
2) Making of casting using removal method in Pro-E
3) Assembly of different machine components (Wheel-shaft assembly) in Pro-E
4) Impairing motion to Assembled components.
5) Working with Basic feature of ANSYS Software