

***Chhattisgarh Swami Vivekanand Technical University,
Bhilai (CG)***

**Scheme of Teaching & Examination
M.E. Mechanical Engg. (Production Engineering)
I Semester**

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
				L	T	P	Theory / Practical				
							ESE	CT	TA		
1	Mech. Engg.	542111 (37)	Advanced Manufacturing Engineering	3	1	-	100	20	20	140	4
2	Mech. Engg	542112 (37)	CAD/CAM Applications	3	1	-	100	20	20	140	4
3	Mech. Engg	542113 (37)	Production & Materials Management	3	1	-	100	20	20	140	4
4	Mech. Engg	542114 (37)	Maintenance Engineering	3	1	-	100	20	20	140	4
5	Refer Table –I		Elective-1	3	1	-	100	20	20	140	4
6	Mech. Engg	542121 (37)	Advanced Manufacturing Engineering Lab	-	-	3	75	-	75	150	2
7	Mech. Engg	542122 (37)	CAD/CAM Applications Lab	-	-	3	75	-	75	150	2
Total				15	5	6	650	100	250	1000	24

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

Table-I

ELECTIVE I			
S.No.	Board of Study	Subject Code	Subject
1	Mech. Engg.	542131 (37)	Applied Fuzzy logic & Fuzzy Sets
2	Mech. Engg	542132 (37)	Finite Element Methods
3	Mech. Engg	542133 (37)	Accounting & Management Control
4	Mech. Engg	542134 (37)	Advanced Metrology And Computer Aided Inspection

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.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**

Subject: **Advanced Manufacturing Engineering**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: 02

Branch: **Mechanical Engineering**

Code: **542111 (37)**

Total Tutorial Periods: **12**

UNIT – I

Competitive Aspects of Manufacturing Processes

Selection of Material, product, design and quality of material, substitution of material, selection of manufacturing process, process capabilities, manufacturing considerations. Heat treatment of steel, Designation of steel.

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

Welding – Solid state bonding – cold, diffusion, forge friction, liquid state – Joint, weldability, weld quality, material, resistance, arc, thermal, high energy beam. Liquid solid – brazing soldering. Recent development in welding – under water, high pressure vessel etc. Inspection & testing of welded joints.

Adhesive bonding – Types of adhesive, adhesive systems, surface preparation, application, design, process capability, welding of plastics, thermal cutting.

UNIT – V

Advanced Machining Processes

Non traditional machining – Processes, Process parameters and comparative study of AJM, ECM, USM, EDM, LBM, EBM, PAM 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

1. Manufacturing Engineering Technology – S. Kalpakjian & S.C. Schemid – Pearson Education – New Delhi
2. Introduction to Manufacturing Processes – J.A. Schey – McGraw Hill, New York

REFERENCE BOOKS

1. Manufacturing Science – A. Ghosh & A. Mallik – Affiliated East West Press, Delhi
2. Mechanical Metallurgy – G.E. Dieter – McGraw Hill, New York
3. Principles of Manufacturing Material and Processes – J.S. Cambell – TMH, New Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**

Subject: **CAD/CAM Applications**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: 02

Branch: **Mechanical Engineering**

Code: **542112 (37)**

Total Tutorial Periods: **12**

UNIT – I

CAD/CAM Software

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

Wire Frame models

Wire Frame entities, Curve representation, Parametric representation of Analytical curves. Parametric representation of synthetic curves. Curve manipulations, Design & Engineering applications.

UNIT – II

Surface and Solid Modelling

Surface model, Surface Representation, Parametric Representation of Analytic and Synthetic Surfaces, Surface Manipulations.

Solid Models, Solid entities, Solid Representation, Fundamentals of Solid Modelling, Half spaces, Boundary Representation, Constructive Solid Geometry, Sweep Representation, Analytic Solid Modelling.

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

1. CAD/CAM Theory & Practice – Ibrahim Zeid – Tata McGraw Hill Pub.
2. Computer Aided Design and Manufacturing – M. P. Groover and E.W. Zimmers, Prentice Hall, India

REFERENCE BOOKS

1. CAD/CAM/CIM – P. Radhakrishnan and S. Subramanyam, New Age International
2. Mathematical elements of computer graphics – David F. Rogers and J. Alan Adams, McGraw Hill.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**

Subject: **Production & Materials Management**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: 02

Branch: **Mechanical Engineering**

Code: **542113 (37)**

Total Tutorial Periods: **12**

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
3. Handbook of Material Management – Gopal Krishnan – PHI, Delhi
4. Industrial Engineering & Management – G. Nadha Muni Reddy – Newage International, Delhi
5. Elements of Production Planning & Control – Samuel Eilon – Universal Publishing Corporation, Bombay
6. Production & Operation management – S. Buffa – John Wiley & Sons – New York
7. Computer Aided Production Management – P.B. Mahapatra – PHI, Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**

Subject: **Maintenance Engineering**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**

Code: **542114 (37)**

Total Tutorial Periods: **12**

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, defect reporting and recording and breakdown analysis.

UNIT - II

Maintenance Systems and Condition Monitoring

Planned, & Unplanned, Corrective opportunistic, Preventive, Predictive, Condition Based Maintenance, Design-out Maintenance, On-line & Off-line Monitoring, Visual, Temperature & Leakage Monitoring, Crack & Thickness Monitoring, Vibration Monitoring – selection of condition monitoring techniques, benefits.

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; 5Zero 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

1. Industrial Maintenance Management – S.K. Shrivastava – S. Chand & Compay – New Delhi
2. Integrated Maintenance Management concept to computerization – B. N. Saha – S. B. A. Publication, New Delhi

REFERENCE BOOKS

1. Maintenance Planning, Control and Documentation – E.N. White
2. Industrial Maintenance – H.P. Garg – S. Chand Publication
3. Maintenance Planning & Control – A. Kelly – Affiliated East West Press, New Delhi
4. Reliability Engg. – LS. Srinath– Affiliated East West Press, New Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**

Subject: **Applied Fuzzy logic & Fuzzy Sets**

Total Theory Periods: **40**

Total Marks in End Semester Exam. : **100**

Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**

Code: **542131 (37)**

Total Tutorial Periods: **12**

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

Membership Function & Fuzzy Arithmetic, Numbers, Vectors and the Extension Principle.

Features of the Membership Function, Standard Forms and Boundaries, Fuzzification, Membership value Assignments, Extension Principle, Fuzzy Transform, Fuzzy Numbers, Approximate Methods of Extension, Fuzzy Vectors.

UNIT - III

Classical Logic, Fuzzy Logic & Fuzzy Rule Based Systems.

Classical Predicate logic, Fuzzy Logic, Approximate Reasoning, Fuzzy Tautologies, Contradictions, Equivalence & Logical Proofs, Natural Language, Linguistic Hedges, Rule-Based Systems.

UNIT - IV

Fuzzy Non linear Simulation & Fuzzy Decision Making

Fuzzy Relational Equations, Partitioning, Non linear simulation using Fuzzy Rule-Based systems, Fuzzy Synthetic Evaluation, Fuzzy ordering, Preference & Consensus, Fuzzy Bayesian Decision method.

UNIT - V

Fuzzy Control system & Fuzzy Optimization

Simple Fuzzy logic controllers, Industrial Applications, Fuzzy Optimization, Fuzzy One Dimensional Optimization, Fuzzy maximum & minimum.

TEXT BOOKS

1. Fuzzy Logic with Engineering Applications – Timothy. J. Ross – McGraw Hill Publications
2. Fuzzy sets & Fuzzy Logic, Theory & Applications – G.J. Klir, Boyuan – Prentice Hall of India

REFERENCE BOOKS

1. Fuzzy set Theory and its application – By H.J. Zimmermann, Allied Publishers, LTD
2. Fuzzy sets uncertainty and Information – By G.J. Klir and T.A. Folger, Prentice Hall
3. Mathematical Principles of Fuzzy logic – By Novak, Kluwer Academic Publishers.
4. Fuzzy Logic and Soft computing – By Chen, Kluwer Academic Publishers.

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**
Subject: **Finite Element Methods**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **542132 (37)**
Total Tutorial Periods: **12**

UNIT – I

General Concept

Introduction, Finite Element method Advantages and Disadvantages, Historical background, Review of Basic Concepts of Elasticity, Solution of Differential equation. Principle of minimum potential energy.

UNIT – II

Formulation and variation method.

Boundary value problems. Approximation Method of solution. Review of variational calculus, Eigen value problems, weighted Integral and weak formulation. Rayleigh Reitz Method, Method of weighted residually.

UNIT – III

Element shape function

Basic steps of finite element analysis. One dimensional Element, Model Boundary value problem, Finite Element Error Analysis. Convergence of solution, accuracy of solution, natural coordinates, numerical integration.

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

Assumption of Plane Elasticity, Weak formulation, Finite Element Model Analysis, Virtual work statement, Displacement field education. Interpolation function.

TEXT BOOKS

1. Introduction of Finite Element – J.N. Reddy – TMH
2. Applied Finite Element Analysis – J. Larry – John Wiley and Sons Pub.

REFERENCE BOOKS

1. Finite Element Analysis – Krishnamurty C.S. – TMH
2. Finite Element Method for Engineers – K.H. Hubner and E.A. Thornton – John Wiley and Sons Pub.

***Chhattisgarh Swami Vivekanand Technical University,
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Semester: **M. E. I**
Subject: **Accounting & Management Control**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **542133 (37)**
Total Tutorial Periods: **12**

UNIT – I

Introduction to Financial Accounting

Basic accounting concepts & conventions, Preparation of Financial Statements/ Trial Balance, (Balance Sheets, Trading & Profit & loss A/c & Adjustments), Depreciation.

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

1. Bhattacharya, S.K. & Dearden John – Accounting for Management – PHI
2. Financial Management – Prasanna Chandra – TMH, New Delhi
3. Management Accounting – Sharma & Gupta – Kalyani Publications, New Delhi

REFERENCE BOOKS

1. Financial Accounting – S.M. Shukla – Sahitya Bhawan Publications, Agra
2. Cost & Management Accounting – Khan & Jain – TMH, Delhi
3. Cost & Management Accounting – M.N. Arora – Vikas Publications, New Delhi
4. Financial Management – I.M. Pandey – Vikas Publications, New Delhi
5. Modern Accountancy – Haneef & Mukherjee – TMH, Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Semester: **M. E. I**
Subject: **Advanced Metrology and Computer Aided Inspection**
Total Theory Periods: **40**
Total Marks in End Semester Exam. : **100**
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**
Code: **542134 (37)**
Total Tutorial Periods: **12**

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

1. Mikell P Groover : Automation Production Systems and Computer - Integrated Manufacturing - Pearson Education
2. John A Bosch : Co-ordinate Measuring Machines and Systems - Marcel Dekker, Inc. Vernon D : Machine Vision - Automated Visual Inspection and Robot Vision -Prentice Hall, International Ltd.

REFERENCE BOOKS

1. Fu K S Gonzalez, R C and Lee C S G Robotics : Control Sensing Vision and Intelligence McGraw Hill International
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

***Chhattisgarh Swami Vivekanand Technical University,
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Semester: **M. E. I**

Subject: **Advanced Manufacturing Engineering -Lab**

Total Practical Periods: **40**

Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**

Code: **542121 (37)**

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.

***Chhattisgarh Swami Vivekanand Technical University,
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Semester: **M. E. I**

Subject: **CAD/CAM Applications -Lab**

Total Practical Periods: **40**

Total Marks in End Semester Exam. : **75**

Branch: **Mechanical Engineering**

Code: **542122 (37)**

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