

**CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI
(C.G.)**

Scheme of Teaching & Examination

M. Tech. in CAD - CAM

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	558111 (37)	Product Design and Development Strategies	3	1	-	100	20	20	140	4
2	Mech. Engg	558112 (37)	Computer Aided Design	3	1	-	100	20	20	140	4
3	Mech. Engg	558113 (37)	Automation in Manufacturing	3	1	-	100	20	20	140	4
4	Mech. Engg	558114 (37)	Robotics	3	1	-	100	20	20	140	4
5	Refer Table - I		Elective – I	3	1	-	100	20	20	140	4
6	Mech. Engg	558121 (37)	CAD Lab	-	-	3	75	-	75	150	2
7	Mech. Engg	558122 (37)	Robotics Lab	-	-	3	75	-	75	150	2
Total				15	5	6	650	100	250	1000	24

L- Lecture

T- Tutorial

P- Practical ,

ESE- End Semester Exam

CT- Class Test

TA- Teacher's Assessment

Table-I

ELECTIVE I			
S.No.	Board of Study	Subject Code	Subject
1	Mech Engg	558131 (37)	Composite Materials
2	Mech Engg	558132 (37)	Computational Techniques
3	Mech Engg	558133 (37)	Stress Analysis and Vibration

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.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Product Design and Development Strategies**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558111 (37)**

Total Tutorial Periods: **12**

UNIT 1

Nature and Scope of Product Engineering: Creative thinking and organizing for product Innovation criteria for product success in life cycle of a product. Concurrent Engineering (CE) design Methodology Collaborative product development in CE.

UNIT 2

Design Process Product lifecycle: Technological Forecasting, Market identification Bench Marking Human factors in design Industrial Design. quality by Design Robust Design, FEMA for product development, reengineering.

UNIT 3

Materials Section: Motivation for selection, cost basis and service requirements- Selection for mechanical prosperities, strength, toughness, fatigue and creep- Selection for surface durability, corrosion and wear resistance- Relationship between materials selection and processing Case Studies in materials selection with relevance to aero, auto marine, machinery and nuclear applications. Cost versus performance relations-weighted property index, value analysis, Coating and their effect on wear characteristic of material.

UNIT 4

Functional and product design: Form design-influence of basic design, mechanical loading and material on form design- form design castings, and forgings, plastic moldings, welded fabrications, manufacture by machining methods. Influence of space, size, weight, etc., on form design aesthetic and ergonomic considerations.

UNIT 5

Dimensioning and Tolerancing a product: Functional production and inspection, datum-tolerance analysis. Tolerance work sheets and centrality analysis, examples. Design features to facilitate machining datum features- functions and manufacturing, CMM (Coordinate measuring machine) and its potential.

TEXT BOOKS

1. Engineering Design – G.E. Dieter, McGraw Hill Publication
2. Product Design and Development – Karl T. Ulrich and Steven D. Eppinger , McGraw Hill

REFERENCE BOOKS

1. Engineering Design – Robert Maouseek, Backie & Sons Ltd.
2. Product Design and Process Engineering – B. W. Biebel, A.B. Draper, McGraw Hill
3. Designing for Manufacture – Hary Peck, Sir Issac Pitman and Sons ltd

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Computer Aided Design**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558112 (37)**

Total Tutorial Periods: **12**

UNIT 1

CAD TOOLS: Definition of CAD Tools, Types of system, CAD/CAM system evaluation criteria, brief treatment of input and output devices. Graphics standard, functional areas of CAD, Modeling and viewing, software documentation, efficient use of CAD software.

GEOMETRIC MODELLING: Types of mathematical representation of curves, wire frame models wire frame entities parametric representation of synthetic curves hermite cubic splines Bezier curves B-splines rational curves.

UNIT 2

SURFACE MODELING: Mathematical representation surfaces, Surface model, Surface entities surface representation, Parametric representation of surfaces, plane surface, ruled surface, surface of revolutions.

UNIT 3

PARAMETRIC REPRESENTATION OF SYNTHETIC SURFACES: Hermite Bi-cubic surface, Bezier surface, B-Spline surface, COONs surface, Blending of surface, Sculptured surface, Surface manipulation – Displaying, Segmentation, Trimming, Intersection, Transformations (both 2D and 3D).

UNIT 4

GEOMETRICMODELLING-3D: Solid modeling, Solid Representation, Half - spaces Boundary Representation (B-rep), Constructive Solid Geometry (CSG), sweep representation, Analytic Solid Modeling.

UNIT 5

CAD/CAM Data Exchange: Evolution of data – exchange format, IGES data representations and structure, STEP Architecture, implementation, ACIS & DXF.
Introduction to Mass property calculations, Mechanical Assembly and Mechanical Tolerancing.

TEXT BOOKS

1. CAD / CAM Theory and Practice – Ibrahim Zeid, TMH Publication
2. Mathematical Elements for Computer Graphics – Rogers and Aadms, TMH Publication

REFERENCE BOOKS

1. Mastering CAD/CAM -- Ibrahim Zeid, TMH
2. CAD/CAM -- P.N.Rao, TMH.
3. Computer Aided Mechanical Desing and Analysis – V Ramamurti – TMH Publication
4. CAD / CAM – Groover, Zimmer, PHI Publication

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Automation in Manufacturing**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558113 (37)**

Total Tutorial Periods: **12**

UNIT 1

Fundamentals of Manufacturing Automation: Basic Principles of automation, types of automated systems, degrees of automation, Automation - reasons, Production operations and automation strategies- Plant Layout, production concepts and mathematical models - design the parts for automation. Automatic loading systems.

UNIT 2

Assembly Systems and Line Balance: Manual assembly lines - line balancing problem – methods of line balancing -ways to improve line balancing -flexible manual assembly lines- automated assembly systems, Analysis of multi station assembly.

UNIT 3

Automated Material Handling: Types of equipment and functions, design and analysis of material handling system, conveyor system. Automated guided vehicle system, components, operation, types, design of automated guided vehicles and applications. Automated storage / retrieval systems - types, basic components and applications.

UNIT 4

Group Technology: Part families, part classification and coding, machine Cell design, Benefits. Flexible automation and manufacturing system. Flexible manufacturing system. Components of FMS, Functions of FMS.

UNIT 5

Computer Aided Process Planning: Planning function. Retrieval type. Process Planning System. Generative process, benefits and limitations. **Automated Inspection And Testing:** Automated inspection principles and methods-sensors techniques for automated inspection-techniques for automated inspection-contact and non-contact inspection methods-in process gauging, CMM's, construction, types, inspection probes, types, and applications.

TEXT BOOKS

1. Automation Production System and CIM – M.P. Grower, PHI Publication
2. Robotic Technology and Flexible Automation – S. R. Deb, TMH Publication.

REFERENCE BOOK

1. CAD / CAM / CIM -- P. Radha Krishnan & S. Subrahmanyam, New Age International Publishers.
2. Automation and Advanced manufacturing systems – Dr. K. C. Jain, Sanjay Jain, Khanna Publisher.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Robotics**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558114 (37)**

Total Tutorial Periods: **12**

UNIT 1

INTRODUCTION: Historical perspective of robots, classification of robot, major components of robot, fixed versus flexible automation. Current robotic application in the field of welding, spray painting, grinding parts sorting and assembly operations. Robot application in the future.

SYSTEM OVERVIEW OF A ROBOT: Basic component of robot systems, robot system in an application, functions of robot systems, specification of robot systems.

UNIT 3

TRANSFORMATION AND KINEMATICS: Homogeneous coordinates, coordinate reference frames, properties of transformation matrices, establishing link coordinate frame, the denavit-hartenberg matrix, comments on forming forward solution, examples of forward solution applied to 2 DOF planer manipulator arm, cylindrical arm, articulated arm and 3 DOF polar arm. Inverse Kinematics

UNIT 4

ROBOTIC SENSORY DEVICES:- Non optical position sensors, optical position sensors, velocity sensors, accelerometers, proximity sensors , touch and slip sensors, force and torque sensors.

UNIT 5

COMPUTER VISION FOR ROBOTIC SYSTEMS: Imaging components, image representation, hardware consideration, picture coding, object recognition and categorization, software consideration, need for vision training and adaptation.

TEXT BOOKS

1. Robotic Engineering An integrated approach – Richard D. Klafter etl, PHI Publication
2. Robot Technology Fundamentals -- James G. Keramas, Vikas Publication

REFERENCE BOOKS

1. Mechanics of Robot Manipulation – M. T. Mason, PHI Publication
2. Remote Control Robotics -- Craig Sayers
3. Computational Principles of Mobile Robotics -- Michael Jenkin, Gregory Dudek

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Composite Materials**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558131 (37)**

Total Tutorial Periods: **12**

UNIT 1

Basic concepts and characteristics: Geometric and Physical definitions, natural and man-made composites, Aerospace and structural applications, types and classification of composites.

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and boron carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosets, Metal matrix and ceramic composites.

UNIT 2

Micromechanics: Unidirectional composites, constituent materials and properties, elastic properties of a lamina, properties of typical composite materials, laminate characteristics and configurations. Characterization of composite properties.

UNIT 3

Manufacturing methods: Autoclave, tape production, bag moulding process, filament winding, hand layup, sprayup techniques, pultrusion, RTM

UNIT 4

Coordinate transformations: Hooke's law for different types of materials, Hooke's law for two dimensional unidirectional lamina, Transformation of stress and strain, Numerical examples of stress strain transformation, Graphic interpretation of stress – strain relations. Off - axis, stiffness modulus, off - axis compliance.

UNIT 5

Elastic behavior of unidirectional composites: Elastic constants of lamina, relation ship between engineering constants and reduced stiffness and compliances, analysis of laminated composites, constitutive relations.

TEXT BOOKS

1. Mechanics of Composite Materials – R. M. Jones, McGraw Hill Company, New York
2. Analysis and performance of fibre Composites – B. D. Agrawal and L. J. Broutman, Wiley – Interscience, New York.

REFERENCE BOOKS

1. Analysis of Laminated Composite Structures – L. R. Calcote, Van Nostrand Reinhold, New York, 1969.
2. Engineering Mechanics of Composite Materials – Isaac, M. Daniel, Oxford University Press.

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Computational Techniques**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558132 (37)**

Total Tutorial Periods: **12**

UNIT 1

Getting Derivatives and Integrals Numerically, Derivatives from Difference Tables, Higher Order Derivatives, Extrapolation Techniques, Newton-Cotes Integration Formulas, Gaussian Quadrature, Adaptive Integration, Multiple Integrals, Multiple Integration with Variable Limits, Application of Cubic Splines, An application of Numerical Integration - Fourier Transforms.

UNIT 2

the Spring - Mass Problem-A variation, Multistep Methods, Milnes Methods, The Adams-Moulton Method, System of equations and higher Order Equation, Comparison of Methods, Stiff Equation.

UNIT 3

Temperature Distribution in a rod. The Shooting Methods, Solution Through a Set of Equations, derivative Boundary conditions, Characteristics Value Problems, Temperature distribution in slab. The alternating Direction Implicit Method.

UNIT 4

Types of partial differential Equations, The heat Equation and Wave Equation, Solution Technique for the Heat equation in one dimension, solving the vibrating string problems, Parabolic equations in two or three Dimensions, The wave equation in two dimensions.

UNIT 5

The Rayleigh - Ritz Method, The Collection and Galerkin methods, Finite Elements for ordinary Differential Equations, Finite elements for elliptic Partial Differential equations, Finite Elements for Parabolic and Hyperbolic Equations.

TEXT BOOKS

1. Applied Numerical analysis – Curtis F. Gerald, Patrick O Wheatley, Addison Wisley.
2. Numerical Methods for engineers – S.C. Chapra and R.P. Canale, TMH Publisher

REFERENCE BOOKS

1. Calculus of Finite Difference sand Numerical Analysis -- P.P. Gupta, G.S. Malik and S. Gupta, Krishna Prakashan Media (P) Ltd.
2. Numerical Methods for Scientific and Engineering Computation -- M.K. Jain, S.R.K. Iyengar and R.K. Jain, New age International Publishers.
3. Computational Methods for Partial differential Equation -- M.K. Jain, S.R.K. Iyengar and R.K. Jain, New age International Publishers.
4. Numerical Methods – E. Balaguruswamy, TMH Publications

CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)

Semester: **M. E. I**

Subject: **Stress Analysis and Vibration**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558133 (37)**

Total Tutorial Periods: **12**

UNIT 1

Two dimensional elasticity theory in Cartesian coordinates, plane stress problem in polar coordinates Thick cylinders, Rotating discs – stress concentration.

UNIT 2

Torsion of non circular prismatic sections, rectangular and axisymmetric. Circular plates, introduction to shell theory – contact stresses.

UNIT 3

Single degree freedom, two degree freedom system without and with damping – Free and forced vibrations. Transient vibrations.

UNIT 4

Transient vibrations of single and two degree systems, multi-degree systems – applications of matrix methods continuous systems.

UNIT 5

Free and forced vibrations of strings bars and beams. Principle of orthogonality – classical and energy methods.

TEXT BOOKS

1. Theory of Elasticity – Timoshenko and Goodier, McGraw Hill Book Company
2. Theory of Vibrations with applications – W.T. Thomson, CBS Publishing

REFERENCE BOOKS

1. Mechanical Vibrations—S.S. Rao, Addison Wesley Longman.
2. Advanced Strength of Material –J.P. Den Hartog,, Dover Publications
3. Mechanical Vibrations—J.P. Den Hartog, Dover Publications
4. Advanced Mechanism of Solid – L. S. Shivnath, Tata McGrawhill

**CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: **M. E. I**

Subject: **CAD LAB**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **558121(37)**

1. NX – 4.0, BY Unigraphics
2. Solid Edge
3. NASTRAN
4. Autocad
5. Visual Studio 6.0
6. MAT LAB- 6.0 with the following toolboxes
 - ?? Spline Toolbox
 - ?? Communication Toolbox
 - ?? Excel Link Toolbox.
7. ANSYS
8. CATIA (UG)

**CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,
BHILAI (C.G.)**

Semester: **M. E. I**

Subject: **Robotics Lab**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **558122(37)**

1. BOE – Bot robotics kit with gozbot infrared distance sensor
2. Hex – Crawler kit (six legged robot)
3. Toddler Kit
4. Robotics Arm Trainer