

CHHATTISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY, BHILAI (C.G.)**Scheme of Teaching & Examination****M. E. in CAD****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	563113 (37)	Computer programming and Data Structure	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	563122 (37)	Computer programming and Data Structure 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.	548132 (37)	Analysis and Design of pressure vessels & components
3	Mech. Engg.	558133 (37)	Stress analysis and vibration

Note (1) – 1/4th of total strength of students 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**

Branch: **Mechanical Engineering**

Subject: **Product Design and Development Strategies** Code: **558111 (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 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**

Branch: **Mechanical Engineering**

Subject: **Computer programming and Data Structure** Code: **563113 (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

Basics of programming in C & C++: Algorithms and flow charts, character set, Identifiers and keywords, Data types, Declarations, Expressions, statements and symbolic names,. Input-output functions.

UNIT – II

Programming in TC environment: Preparing and running a complete simple C++ program in TC environment. Loops and decisions, Functions, arrays, structures, classes and unions, operator overloading, pointers, Files and Streams.

UNIT - III

Introduction to graphics programming in TC environment. Object Oriented Programming (OOP).

UNIT - IV

Data Files: create, open, close, process, formatted and unformatted data files.

UNIT - V

Data Structures: Stacks, queues, lists, trees, and their applications.

TEXT BOOKS:

1. C And Data structures – P.Padmanabham, BS Publications
2. C & Data Structures- Ashok N.Kamthane, Pearson Education
3. Data Structure & Program Design – Robert L Kruse(PHI)

REFERENCES :

1. C & Data Structures – Prof. P.S.DeshPande, Prof O.G.Kakde, Wiley Dreamtech Pvt. Ltd., NewDelhi.
2. DataStructures Using C – A.S.Tanenbaum, PHI/Pearson education.
3. The C Programming Language, B.W. Kernighan, Dennis M.Ritchie, PHI/Pearson Education
4. Data structure Using C – ISRD Group (Tata Mc)

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.

UNIT 2

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 denavithartenberg 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.

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

Semester: **M. E. I**

Branch: **Mechanical Engineering**

Subject: **Analysis and design of pressure vessels and
Components**

Code: **548132 (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-1

Basic principles: Elastic analysis of shells of revolution, membrane solutions, spherical and cylindrical shells, Junctions of shells of different geometry, Limit analysis, Shakedown.

Unit-2

Pressure vessel branches: Radial nozzle in spherical shell, stress concentration factors due to combined loadings, design methods to reduce SCF

Unit-3

Non-radial nozzles in spherical shells, Junction analysis of radial and non-radial nozzles in cylindrical shells.

Unit-4

Pressure vessel ends: different design forms, Flanges: Stress analysis and design methods. **Local loading and local attachments:** Supports design, Creep and fatigue in thin pressure vessels and its components, Pressure vessel design codes.

Unit-5

Thick wall design: Mono block cylinders and spheres, multilayer constructions, Pre-stressing of thick shells, shrink fit construction, wire and ribbon wound cylinders, Plastic radial expansion – autofrettaging. Thermal stress, creep and stress rupture; Dynamic and fatigue behaviour. Case studies: Vessels for special purposes. Computer aided design of pressure vessels

Text Book

1. Theory & Design of Pressure Vessel By John F Harvey, CBS Distribution, 1987

Reference Book

1. Pressure Vessel Design Manual By Dennis R. Moss
2. Pressure vessel , Design Hand Book By Henry H. Bedner CBS Publishers & distributors, 1987
3. Chemical Process Equipment , Selection and design by Stanley , M. Wales , Butterworths series in chemical engineering, 1988
4. Approximate methods in the design and analysis of pressure vessels and piping by William J. Bees ASME Pressure vessel and piping conference 1997

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

**CHHATTISGARH 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)**

Exercises in Modeling and Analysis of Mechanical Components and assembly using Parametric and Feature based Softwares like **NX – 4.0, BY Unigraphics /Solid Edge/ NASTRAN/ Autocad/ Visual Studio 6.0/ MAT LAB/ ANSYS/ CATIA / Solid Works**

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

Semester: **M. E. I**

Branch: **Mechanical Engineering**

Subject: **Computer Programming and Data Structure Lab** Code: **563122 (37)**

Total Practical Periods: **40**

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

Practice in programming of

1. One dimensional array- Insertion, Deletion and Searching (Linear & Binary);
2. Implementation of stack and perform push pop operation; convert infix to postfix expression using stack;
3. Linear, circular, Double ended queue -addition, deletion, traversing;
4. Single and double link list.-creation, inversion, deletion;
5. Implementation of polynomial in link list and perform: Polynomial arithmetic, Evaluation of polynomial;
6. Implementation of linked stack and linked queue.