

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

## Scheme of Teaching &amp; Examination

## M. Tech. in CAD - CAM

## II Semester

S. No.	Board of Study	Subject Code	Subject	Periods per Week			Scheme of Examination			Total Marks	Credit L+(T+P)/2
							Theory / Practical				
				L	T	P	ESE	CT	TA		
1	Mech. Engg	558211 (37)	Computer control of M/c tools	3	1	-	100	20	20	140	4
2	Mech. Engg	558212 (37)	Optimization Technique	3	1	-	100	20	20	140	4
3	Mech. Engg	558213 (37)	Rapid Prototyping	3	1	-	100	20	20	140	4
4	Mech. Engg.	558214 (37)	Finite Element Analysis	3	1	-	100	20	20	140	4
5	Refer Table - II		Elective-II	3	1	-	100	20	20	140	4
6	Mech. Engg	558221 (37)	CAM LAB	-	-	3	75	-	75	150	2
7	Mech. Engg	558222 (37)	OT LAB	-	-	3	75	-	75	150	2
<b>Total</b>				<b>15</b>	<b>5</b>	<b>6</b>	<b>650</b>	<b>100</b>	<b>250</b>	<b>1000</b>	<b>24</b>

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

Note : Duration of all theory papers will be of Three Hours.

Table-II

ELECTIVE- I I			
S.No.	Board of Study	Subject Code	Subject
1	Mech Engg	558231 (37)	Mechatronics
2	Mech Engg	558232 (37)	Computer Aided Process Planing
3	Mech Engg	558233 (37)	Design for Manufacturing

**Note (1) –** 1/4<sup>th</sup> 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. II**

Subject: **Computer control of M/c tools**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558211 (37)**

Total Tutorial Periods: **12**

## **UNIT 1**

**Introduction to Numerical Control:** Need of NC machine tools, Elements of NC manufacturing, Axis of NC machines, NC machine tools, Steps in NC manufacturing.

## **UNIT 2**

**CNC DNC AND Adaptive control:** Principle of operation of CNC, Features of CNC, Adaptive Control, Direct Numerical Control, Standard Communication interfaces, Programmable logic controllers, Communication networks, Configuration of CNC systems.

## **UNIT 3**

**Control of NC Machines:** Open and closed loop controls, controlling task.

System Devices: Introduction, Stepper Motors, DC Motors, Feedback devices, Digital technology.

## **UNIT 4**

**Part programming:** Introduction, Manual Part Programming, Labeling of programs and subprograms, Fixed cycles, Subroutines or subprograms, Canned Cycle macros, verification documentation, computer assisted part programming languages, APT language structure, Post processor commands, Compilation control commands, repetitive programming.

## **UNIT 5**

**CAD TO CAM:** Introduction, Manufacturing process, Cam facilities desired, Automatic cut path generation, Surface machining.

## **TEXT BOOKS**

CAD / CAM Computer Aided Design and Manufacturing – M P Groover, Pearson Education.

CAD/CAM – Chris Mc Mohan, Jimmie Brown, Pearson Education.

## **REFERENCE BOOKS**

CAD/CAM – P.N.Rao, TMH Publication.

Computer Added Manufacturing – R.K. Srivastav, S.J.Pawar, Umesh Publication.

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

Semester: **M. E. II**

Subject: **Optimization Technique**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558212 (37)**

Total Tutorial Periods: **12**

## UNIT 1

Integer programming cutting plane method, Branch & Bound method, Sensitivity analysis – Changes in  $b_i$ , changes in  $c_j$ , changes in  $a_{ij}$ .

Parametric Programming – Parametric variation in  $c_j$ ,  $b_i$  &  $a_{ij}$ , simultaneous parametric variations. Goal Programming.

## UNIT 2

Non- linear Programming- langragian function, saddle point, Kuhn- tucker conditions, primal & dual problem, Quadratic programming, separable programming.

Geometric programming – Generalization high Kuhn- Tucker theory.

## UNIT 3

Dynamic Programming – Serial multistage model, backward & forward recursion, system with more than one constraints, Application of Dynamic Programming in continuous system.

Direct search & Gradient methods- one dimensional & n- dimensional search.

## UNIT 4

Taguchi Technique – Introduction to DOE, ANOVA, F-Test, Response surface Methodology. Markov chain.

## UNIT 5

Introduction to modern Oplimization Technique- ANN, Fuzzy logic, Genetic Algorithms. Memetic Algorithms, Antz colony Algorithm, Tabu Search.

## TEXT BOOKS

1. Optimization methods in Operation Research & System Analysis- K.V. Mithal & C. Mohan.- New Age International Publishers.
2. Neural Networks & Fuzzy System- Bart Kosko- PHI publications.
3. Quality Engineering using Robust Design- M.S. Phadke, PHI publication.

## RFERENCE BOOKS

1. Operation Research Principles and Practice- Ravindran, Phillips, solbers Wiley Publication.
2. Established Quality Control- Engene L.Grant, Richard. S. Leaven Worth- TMH
3. Neural Engineering – Computation, Representation and Dynamics in Neurobiological systems.- Chris Eliasmith and Charles H. Anderson.- EEE
4. Quantitative Technique in Management – N.D. Vohra, - TMH Publication.
5. Neural Network in Computer intelligence – Li Min Fu - TMH.

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

Semester: **M. E. II**  
Subject: **Rapid Prototyping**  
Total Theory Periods: **40**  
Total Marks in End Semester Exam. : **100**  
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**  
Code: **558213 (37)**  
Total Tutorial Periods: **12**

## **UNIT 1**

Introduction: Historical Development, Fundamentals of RP, Advantages of RP, Classification of RP.  
RP Process: Process chain, 3D modeling, data conversion and transmission, checking and preparing, building, post processing.

## **UNIT 2**

Liquid Based RP System: 3D systems' SLA, Cubital's SGC, Sony's SCS, Other similar commercial RP systems, micro fabrication.

## **UNIT 3**

Solid Based RP System: Helisys' LOM, Stratasys' FDM, 3D systems MJM, Other similar commercial RP systems.

## **UNIT 4**

Powder Based RP Systems: DTM's selective laser sintering (SLS), MIT's 3D printing (3DP), BPM Technology's ballistic particle manufacturing (BPM)

## **UNIT 5**

Rapid Prototyping Data formats: STL format, STL file problem, Consequences of building a valid and invalid tessellated model, STL file repair, newly proposed formats.

## **TEXT BOOKS**

1. Rapid Prototyping : Principles and Applications - Chua Chee Kai, Leong Kah Fai, Lim Chu-Sing, World Scientific Pub Co.
2. Rapid Manufacturing – D.T. Pham and S. S. Dimov, Springer Publication.

## **REFERENCE BOOKS**

1. Rapid Prototyping : Theory and Practice - Ali Kamrani, Emad Abouel Nasr (Editors), Springer Publication
2. Rapid Prototyping: Principles and Applications- Rafiq I. Noorani, Wiley.
3. Rapid Prototyping -- Andreas Gebhardt, Hanser Gardner Publications

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

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

Branch: **Mechanical Engineering**  
Code: **558214 (37)**  
Total Tutorial Periods: **12**

## **UNIT 1**

**Introduction to FEM:** basic concepts, historical back ground, application of FEM, general description, comparison of FEM with other methods.

## **UNIT 2**

Variational approach, Galerkin Methods. Co-ordinates, basic element shapes, interpolation function. Virtual energy principle, Rayleigh - Ritz method, properties of stiffness matrix, treatment of boundary conditions, solution of system of equations, shape functions and characteristics, Basic equations of elasticity, strain displacement relations

## **UNIT 3**

1-D structural problems – axial bar element – stiffness matrix, load vector, temperature effects, Quadratic shape function. Analysis of Trusses – Plane Truss and Space Truss elements.

## **UNIT 4**

Analysis of beams – Hermite shape functions – stiffness matrix – Load Vector – Problems 2-D problems –Constant Strain Triangles, force terms, Stiffness matrix and load vector, boundary conditions.

## **UNIT 5**

Application of FEM to elasticity, structural, fluid flow and lubrication problems  
Scalar field problems - 1-D Heat conduction – 1-D fin element – 2-D heat conduction problems – Introduction to Torsional problems.

Dynamic considerations, Dynamic equations – consistent mass matrix – Eigen Values, Eigen Vector, natural frequencies – mode shapes – modal analysis.

## **TEXT BOOKS**

The Finite Element Method -- O C Zienkiewicz, R L Taylor  
An Introduction to the Finite Element Method – J. N. Reddy, TMH Publication

## **REFERENCE BOOKS**

Finite Element Analysis – P. Seshu, PHI Publication  
Introduction to Finite Element Method – C.S. Desai and J. F. Abel  
Introduction to Finite Elements in Engineering – T. R. Chandrupatla & A. D Belegundu, PHI Publication.  
Applied Finite Element Analysis – L. J. Segerland , John Wiley Publications

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

Semester: **M. E. II**

Subject: **Mechatronics**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **558231 (37)**

Total Tutorial Periods: **12**

## **UNIT 1**

**Introduction:** Mechatronics, Measurement Systems, Basic Electrical Elements, Kerchoeff's Law, Voltage And Current Sources and Meters, Thevenin and Norton Equivalent Circuits, Alternating Current Circuit Analysis, Power in Electrical Circuits, Transformer, Impedence Matching, Grounding and Electrical Interference.

## **UNIT 2**

**Semiconductor Electronics:** Introduction, Semiconductor Physics as the Basis for Understanding Electronic Devices, Junction Diode, Bipolar Junction Transistor, and Field Effect Transistors

## **UNIT 3**

**Microcontroller Programming and Interfacing:** Microprocessor and Microcomputers, Microcontrollers, The PIC16F84 Microcontroller, Programming a PIC, Pic Basic Pro, Using Interrupts, Interfacing Common PIC Peripherals, Interfacing to the PIC,

**Data Acquisition:** Introduction, Quantizing Theory, Analog-to-Digital Conversion, Digital-to-Analog (D/A) Conversion,

## **UNIT 4**

**Sensors:** Introduction, Position and Speed Measurement, Stress and Strain Measurement, Temperature Measurement Vibration and Acceleration Measurement, Pressure and Flow Measurement, Semiconductor sensors and Microelectromechanical Devices.

## **UNIT 5**

**Actuators:** Introduction, Electromagnetic Principles, Solenoids and Relays, Electric Motors, DC Motors, Stepper Motors, Selecting a Motor, Hydraulics, Pneumatics,

## **TEXT BOOKS**

1. Introduction to Mechatronics and Measurement Systems – David G. Alciatore, Michael B. Histan, TMH Publication.
2. Mechatronics – Principles, Concepts and Applications – Dan Neculescu, Published by Pearson Education (Singapore)

## **REFERENCE BOOKS**

1. Mechanical Measurements– Thomas G. Beckwith, Roy D. Marangoni, John H. Lienhard V, Pearson Education.
2. Mechatronics -Principles, Concepts and Applications – Nitaigour Premchand Mahalik, Tata McGraw-Hill Publication.

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

Semester: **M. E. II**  
Subject: **Computer Aided Process Planning**  
Total Theory Periods: **40**  
Total Marks in End Semester Exam. : **100**  
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engineering**  
Code: **558232 (37)**  
Total Tutorial Periods: **12**

## **UNIT 1**

**Introduction to CAPP:** Information requirement for process planning system, Role of process planning, advantages of conventional process planning over CAPP, Structure of Automated process planning system, feature recognition, methods.

## **UNIT 2**

**Generative CAPP system:** Importance, principle of Generative CAPP system, automation of logical decisions, Knowledge based systems, Inference Engine, implementation, benefits.

**Retrieval CAPP system:** Significance, group technology, structure, relative advantages, implementation, and applications.

## **UNIT 3**

**Selection of manufacturing sequence:** Significance, alternative-manufacturing processes, reduction of total set-up cost for a particular sequence, quantitative methods for optimal selection, examples.

## **UNIT 4**

**Determination of machining parameters:** reasons for optimal selection of machining parameters, effect of parameters on production rate, cost and surface quality, different approaches, advantages of mathematical approach over conventional approach, solving optimization models of machining processes.

## **UNIT 5**

**Generation of tool path:** Simulation of machining processes, NC tool path generation, graphical implementation, determination of optimal index positions for executing fixed sequence, quantitative methods.

## **TEXT BOOKS**

1. Automation , Production systems and Computer Integrated Manufacturing System – Mikell P.Groover, PHI Publication.
2. Computer Aided Engineering – David Bedworth, TMH Publishers

## **REFERENCE BOOKS**

1. Computer Aided Design and Manufacturing – Dr.Sadhu Singh, Khanna Publisher

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

Semester: **M. E. II**  
Subject: **Design for 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: **558233 (37)**  
Total Tutorial Periods: **12**

## **UNIT 1**

**Introduction:** Design philosophy – steps in Design process – General Design rules for manufacturability – basic principles of designing for economical production – creativity in design.

## **UNIT 2**

**Materials:** Selection of Materials for design – Developments in Material technology – criteria for material selection – Material selection interrelationship with process selection – process selection charts.

## **UNIT 3**

**MACHINING PROCESS:** Overview of various machining processes – general design rules for machining -Dimensional tolerance and surface roughness – Design for machining – Ease – Redesigning of components for machining ease with suitable examples. General design recommendations for machined parts.

## **UNIT 4**

**METAL CASTING:** Appraisal of various casting processes, selection of casting process, - general design considerations for casting – casting tolerances – use of solidification simulation in casting design – product design rules for sand casting.

## **UNIT 5**

**METAL JOINING:** Appraisal of various welding processes, Factors in design of weldments – general design guidelines – pre and post treatment of welds – effects of thermal stresses in weld joints – design of brazed joints.

## **TEXT BOOKS**

1. Design for Manufacture – John,Cobert, Adisson – Wsely Publication
2. Engineering Design – A Material and Processing Approach – George E. Deiter, McGrawhill Publicatoin

## **RFERENCE BOOKS**

1. Product Design and Manufacturing – A.K. Chitale and R.C. Gupta, PHI Publication.
2. Design and Manufacturing – Surender Kumar and Goutham Sutradhar, IBH Publising Co. Pvt. Ltd.

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

Semester: **M. E. II**

Subject: **CAM LAB**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **558221(37)**

- ~~✍~~ Exercise in manual part programming of CNC lathe & Milling machines. Use of CAD/CAM software for simulation of turned and milled parts and simple surfaces.
- ~~✍~~ Automatic NC part program generation from CAD model and post processing for machining on CNC machines.
- ~~✍~~ RPT (optional)

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

Semester: **M. E. II**

Subject: **OT LAB**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **558222 (37)**

1. MAT LAB – 6.0 with the following toolboxes

☞☞ Spline Toolbox

☞☞ Communication Toolbox

☞☞ Excel link Toolbox

2. Visual Studio 6.0