

**CHHATISGARH SWAMI VIVEKANAND TECHNICAL UNIVERSITY,**

**SCHEME OF TEACHING AND EXAMINATION**

**M.E (Third Semester)**

**Mechanical Engineering (Production Engg.)**

S. No	CODE	Board of Studies	SUBJECT	Periods per week			Scheme of Exam Theory / Practical			GRAND TOTAL	Credits L+(T+P)/2
				L	T	P	ESE	CT	TA		
1	Mech. Engg.	542311(37)	Computer Integrated Manufacturing	3	1	-	100	20	20	140	4
2	Refer Below		Elective – III	3	1	-	100	20	20	140	4
3	Mech. Engg.	542321(37)	Preliminary work on Dissertation	-	-	28	100	-	100	200	14
4	Mech. Engg.	542322(37)	Seminar based on Dissertation	-	-	3	-	-	20	20	2
<b>TOTAL</b>				<b>6</b>	<b>2</b>	<b>31</b>	<b>300</b>	<b>40</b>	<b>160</b>	<b>500</b>	<b>24</b>

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

<b>Table - III</b>			
<b>Elective - III</b>			
S.No.	Board of Studies	Code	Subject
1	Mech. Engg.	542331(37)	Optimization Techniques
2	Mech. Engg.	542332(37)	Advanced Machine Tools
3	Mech. Engg.	542333(37)	Product Engineering
4	Mech. Engg.	542334(37)	Ergonomics

**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. III Sem.**  
Subject : **Computer Integrated manufacturing**  
Total Theory Periods: 40  
Total Marks in End Semester Exam. : **100**  
Minimum number of class test to be conducted: **02**

Branch: **Mechanical Engg. (Production Engg.)**  
Code : 542311 (37)  
Total Tutorial Periods: **10**

## **UNIT – I**

### **Introduction to CIM**

Integration and rationalization, sequence of functions, elements, CIM Wheel, activities, Database Management system, CIM development and related standards, hardware and software, implementation, benefits, product development through CIM.

## **UNIT – II**

### **Automated Process Planning**

Computer Aided Process Planning (CAPP) – Process planning, structure, operation of CAPP Software. Group Technology – Part families, parts classification and coding systems, part design attributes, part manufacturing attributes, coding structure – operating classification system, MI Class system, code system.

Methods of CAPP – Variant process planning, generative process planning, process planning systems – CAM, ICAPP, MIPLAN, MULTI CAPP, TIPPS.

## **UNIT – III**

### **Planning of Resources for Manufacturing**

Manufacturing Resources Planning (MRP-II) – Structure, Role of MRP – II in CIM System, major modules of software – Manufacturing applications – Business Plan, Production Plan, MPS, Engineering Applications – BOM, Standard Product Routing, job costing, standard product costing, capacity requirement planning (CRP)

Enterprise Resource Planning (ERP) - Modules in Software- Finance, Distribution, Manufacturing, service modules.

## **UNIT – IV**

### **Robotics**

Need, applications of industrial Robot and integration with CIM system.

### **Computer Aided Quality Control (CAQC)**

Tools and techniques for quality control, objectives, inspection systems, control methods.

## **UNIT – V**

### **Flexible Manufacturing Systems**

Elements, classification, operational aspects, planning and control, types, FMS, workstations, layout configuration, Material handling equipments, computer control systems, applications, benefits, evaluation criteria.

### **Material Handling and Storage**

Storage system performance, automated storage, retrieval system, carousal storage system, WIP system, interfacing handling of storage with manufacturing.

## **TEXT BOOKS**

1. Automation, Production System and CIM – M.P. Groover – PHI, Delhi
2. CAD/CAM/CIM – P. Radhakrishnan – New Age Publishers - Delhi

## **REFERENCE BOOKS**

1. Computer Aided Design and Manufacturing – Dr. Sadhu Singh – Khanna Publishers, Delhi
2. Performance Modelling of Automated Manufacturing System – N. Viswanathan, Y. Narhari – PHI
3. Modelling and Analysis of Manufacturing Systems – R.G. Askin & C.R. Standriage – John Wiley & Sons, New York

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

Semester: **M. E. III Sem.**  
Subject : **Optimization Techniques**

Total Theory Periods: 40  
Total Marks in End Semester Exam. : **100**

Branch: **Mechanical Engg. (Production Engg.)**

Code : 542331 (37)

Total Tutorial Periods: **10**

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

**UNIT - I**

**Introduction to Optimization and Classical Optimization Techniques:** Basic Concepts and introduction of engineering optimization, single-variable optimization, Multivariable optimization with no constraints, equality constraints and inequality constraints.

**UNIT - II**

**Linear Programming:** Basic concepts of Linear programming, Applications of Linear programming, standard forms of a Linear programming problems, solution of a system of linear simultaneous equations, Decomposition principle, Quadratic programming.

**UNIT - III**

**Non Linear Programming:** Basic concepts of Non-linear programming, Uni-modal function, Elimination methods, Interpolation methods, classification of unconstrained minimization methods-Direct search methods, Indirect search methods, characteristics of a constrained problem-Direct methods, Indirect methods.

**UNIT -IV**

**Geometric and Integer Programming:** Basic concepts of Geometric programming, Posynomial, unconstrained minimization problem, solution of an unconstrained geometric programming problem using differential calculus, Applications of geometric programming, Integer linear programming, Integer non linear programming.

**UNIT - V**

**Special Optimization Techniques:** Separable programming, multi objective optimization, calculus of variations, optimal control theory.

**TEXT BOOKS**

1. Engineering Optimization Theory and Practice – S.S. Rao – New Age Publishers, Delhi
2. Optimization for Engineering Design, Algorithms & examples – K. Deb – Prentice Hall of India, Delhi

**REFERENCE BOOKS**

1. Introduction to optimum Design – J.S. Arora – TMH, Delhi
2. Optimization methods for Engineering Design – R.L. Fox - Addison Wesley Pub.
3. Advances in optimization and Approximation – Ding Zhu Du - Kluwer Academic Publishers
4. An introduction to optimization – 2<sup>nd</sup> Edn. – Edwin K.P. Chong – Wiley publishers
5. Foundation of Mathematical optimization – Pallaschke – Kluwer Academic Publishers.

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

Semester: **M. E. III Sem.**

Branch: **Mechanical Engg. (Production Engg.)**

Subject : **Advanced Machine Tools**

Code : 542332 (37)

Total Theory Periods: **40**

Total Tutorial Periods: **10**

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

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

**UNIT – I**

**Accuracy of Machine Tools**

Accuracy, Element of accuracy, errors in form and relative locations, accuracy of machine Tool, spindle rotation accuracy and its significance, test methods for radial spindle rotation error, displacement accuracy, influence of geometric accuracy of machine tools on work piece accuracy.

**UNIT – II**

**Accuracy of Numerically Controlled System**

Errors due to Numerical interpolation, errors due to displacement measurement system, definition of accuracy of a numerical control system, periodic errors, errors due to velocity lags, transient response, slideway friction, feed drive stiffness, zero stability.

**UNIT – III**

**Static Stiffness and its influence on machining accuracy**

Static stiffness, nature of deformation of a machine tool, stiffness of lathe, compliance of work piece, errors due to variation of cutting force, errors due to variation of the total compliance.

**Inaccuracies due to Thermal effects**

Thermal effect, Heat sources, Heat dissipation, calculation of thermal field and deformations, Geometry of thermal deformations, method of decreasing thermal effects, Influence of forced vibration on accuracy, Influence of tool wear on accuracy.

**UNIT – IV**

**Dynamics of Machine Tool**

Machine Tool Elastic System, Dynamic characteristics of elements and system, Dynamic characteristics of equivalent elastic system, experimental determination.

Dynamic Characteristics of cutting process, stability analysis, forced vibration of machine tools, forced vibration due to perturbation of cutting process and perturbation of EES.

**UNIT – V**

**Automatic drives for Machine Tools**

Principle of automation, Automatic and semiautomatics, single spindle automatic screw machine, swiss type automatic machine, multiple spindle machine tool, automatic loading and feed of work piece.

Transfer Device in automatic machine tool system, classification, transfer bar mechanisms, rotary transfer devices, turn table for orientation.

Automatic in process gauging and gauging devices.

**TEXT BOOKS**

1. Precision Engineering in Manufacturing – R.L. Murty – New Age International, Delhi
2. Machine Tool Design and Numerical Control – N.K. Mehta – TMH, Delhi

**REFERENCE BOOKS**

1. Principle of Machine Tool – Gopal Chandra Sen, Amitabha Bhattacharya – New Central Book Agency – Calcutta
2. Machine Tool Practices – Richar R. Kibbe, John E. Neely – PHI, New Delhi

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

Semester: **M. E. III Sem.**  
Subject : **Production Engg.**  
Total Theory Periods: 40

Branch: **Mechanical Engg. (Production Engg.)**  
Code : 542333 (37)  
Total Tutorial Periods: **10**

Total Marks in End Semester Exam. : **100**  
**Minimum number of class test to be conducted: 02**

**UNIT – I**

**Product Development Process**

An introduction to product Design, Modern Product Development, Theories and Methodologies in Design, Product Development Teams, Product Development Planning, Customer Satisfaction, Gathering Customer Needs, Organizing and Prioritising customer needs.

**UNIT – II**

**Establishing Product Function**

Why Functional Decomposition, Modelling Process, A simple Approach-Function Trees, Establishing System Functionality-Creating a function structure, Augmentation-From Simple function trees to complete models, aggregation revisited-Simplicity of Shooting Darts, A functional common basis, critique of functional Modelling Methods.

**Product Tear Down and Experimentation**

Tear down process, teardown methods, post teardown reporting, applications of product teardown.

**Benchmarking and Establishing Engineering Specification**

Background-Know your enemy to know yourself, a bench marking approach, support tools for benchmarking process, setting product specifications.

**UNIT - III**

**Product Architecture**

Product Architecture, Product Modularity-Background, Modular Design, Modular Design, Architecture-Based Development Teams.

**Generating Concepts**

Concept Generation Process, Basic Methods-Information Gathering and Brainstorming, Advanced Methods-Direct Search, Morphological Analysis, Combination Solution Principles (Concept Variants)

**Concept Selection**

Estimating Technical Feasibility, A Concept Selection Process, A Basic Method-Pugh Concept Selection Charts, Advanced Discussion-Measurement Theory, Advanced Method-Numerical Concept Scoring, A Critique of Design Evaluation Schemes.

**UNIT – IV**

**Design for Manufacture and Assembly**

Overview and Motivation, Basic Method-Design Guidelines, Advanced Method-Manufacturing Cost Analysis, Critique of Design for Assembly Methods,.

**Design for the Environment**

Why DFE? Environmental Objectives, Basic DFE Methods-Design Guidelines, Life Cycle Assessment, Techniques to Reduce Environmental Impact.

**UNIT – V**

**Analytical and Numerical Model Solutions**

Overview and Strategy, Basic Method: Spreadsheet Search, Fundamental Concepts in Optimisation, Advanced Topic: A Discussion of Analytical Formulations, Practical Optimisation, Product Applications.

**Physical Properties**

Prototyping essentials, types of prototypes, uses of prototypes, rapid prototyping techniques, scale, dimensional analysis and similitude, basic method-physical prototype design and planning.

**Physical Models and Experimentation**

Design of Experiments, Design of Experiments-Reduced Tests and Fractional Experiments, Statistical Analysis of Experiments, Product Applications of Physical Modelling and DOE.

**TEXT BOOKS**

1. Product Development – Otto & Wood

**REFERENCE BOOKS**

1. Product Development – Chitale & Gupta
2. Product Development –

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

Semester: **M. E. III Sem.**

Subject : **Ergonomics**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engg. (Production Engg.)**

Code : **542334 (37)**

Total Tutorial Periods: **10**

**UNIT – I**

**Human factors in Production System**

Characteristics, features of man-machine system, Human performance and performance reliability, the human sensory motor system, stimulus dimensions, human information processing, noise and theory of signal detection.

**Displays**

Quantitative and Qualitative visual displays, auditory displays, factual and factory displays.

**UNIT – II**

**Method Study**

Objectives, steps, human factor considerations, recording techniques, critical evaluation of method, learning curves.

**UNIT – III**

**Control System**

Special movements and conceptual relationship of stimuli and response, continuous control system, control functions, tools and related devices, design of work place and works components, applied anthropometry, activity analysis, motion economy, design of individual work place.

**UNIT – IV**

**Human Performance**

Performance under heat, cold, illumination, vibration, noise, pollution, static and dynamic condition, organizational factors, energy expenditure in physical work activity, shift, work, age, sex.

**UNIT – V**

**Biomechanics**

Concepts and principles, Bio-Engineering aspects of human motor activity, performance analysis of body, members in making specific movements.

**TEXT BOOKS**

1. Ergonomics – Murrell
2. Human Factors Engineering – Mc Comick & Sanders

**REFERENCE BOOKS**

1. Work Study – ILO – Universal Publications, Bombay
2. Motion & Time Study – Barnes R.M. – John Wiley & Sons, New York