

Chhattisgarh Swami Vivekanand Technical University, Bhilai (CG)

Scheme of Teaching & Examination M.E. Mechanical Engg. (Production Engineering) II 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.	542211 (37)	Machine Tools Engineering	3	1	-	100	20	20	140	4
2	Mech. Engg	542212 (37)	Robotics	3	1	-	100	20	20	140	4
3	Mech. Engg	542213 (37)	Quality Control & Reliability Engineering	3	1	-	100	20	20	140	4
4	Mech. Engg	542214 (37)	Measurement system Analysis	3	1	-	100	20	20	140	4
5	Refer Table –I		Elective-II	3	1	-	100	20	20	140	4
6	Mech. Engg	542221 (37)	Machine Tools Engineering Lab	-	-	3	75	-	75	150	2
7	Mech. Engg	542222 (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.	542231 (37)	Mechatronics
2	Mech. Engg	542232 (37)	Productivity Management
3	Mech. Engg	542233 (37)	Advances in Material Processing
4	Mech. Engg	542234 (37)	Management of Organizational Behaviour

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. II**

Subject: **Machine Tools 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: **542211 (37)**

Total Tutorial Periods: **12**

UNIT – I

Cutting Tool Design

Design of Single Point Tool, Tool angle specification systems and their interrelationship, Design of form Tool, Design of indexable insert and its specification system, Design of Chip Braker.

Design of Twist drill, milling cutter, broach, reamer and taps.

Cutting Tool Material

Characteristics of tool material, advances in cutting tool material, role of coating.

UNIT –II

Mechanics of Machining Processes

Chip formation, Orthogonal cutting, Oblique cutting, mechanics of turning, milling and drilling process, machinery with controlled contact tools.

Machinability and Economics of Machining

Machinability, evaluation of Machinability, mechanism of tool failure, tool wear mechanism, tool life and tool life equation, factors affecting Machinability surface finish and surface integrity.

Economics of machining, cost of turning operation, optimum cutting speed for minimum cost and maximum rate of production.

UNIT – III

Design of Machine Tool Structure

Function and requirement, design criteria, material, static and dynamic stiffness, profile of machine tool structure, design procedure.

Design of – Beds, columns, housing, bases and tables, cross rails, arms, saddles, carriage and Rams.

Model Technique in design of Machine Tool structure.

Design of Guide ways

Function, Design criterion and calculations for slideways, guide way operating under liquid friction condition.

UNIT – IV

Design of spindle and spindle supports

Function of spindle unit and requirement, material, effect of machine tool compliance on machining accuracy, Design calculations of spindles, antifriction bearing and sliding bearing.

Kinematics of Machine Tool

Aim of speed and feed rate regulation, stepped regulation of speed, classification of speed and feed boxes, design of speed box & feed box, stepless regulation of speed and feed rates.

UNIT – V

Jig & Fixtures

Element of Jig & Fixtures, Principle of location, principle of clamping, locating and clamping devices. Design principle of drilling Jig and drill bushes. Design considerations and design of Milling fixtures, Lathe fixtures, grinding fixtures, broaching fixtures, indexing jig and fixture. Design problem on Jig & Fixture.

TEXT BOOKS

1. Tool Design – Cyril Donaldson, George H. Lecain, VC Goold – TMH, New Delhi
2. Machine Tool Design and Numerical Control – N.K. Mehta – TMH, New Delhi
3. Jig & Fixture – P.H. Joshi – TMH, New Delhi

REFERENCE BOOKS

1. Principle of Metal Cutting – G.C. Sen, A. Bhattacharya – New Central Book Agency – Calcutta
2. Principle of Machine Tool - G.C. Sen, A. Bhattacharya – New Central Book Agency – Calcutta
3. Production Engineering – P.C. Sharma – S. Chand & Company, New Delhi
4. Metal Cutting and Machine Tool – B.L. Juneja, G.S. Shekhar, Niting Seth – New Age, New Delhi
5. Production Engineering & Science – Dr. P.C. Pandey, Dr. C.K. Singh – Standard Publishers, Delhi
6. Production Technology – R.K. Jain – Khanna Publishers – New Delhi

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Semester: **M. E. II**

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: **542212 (37)**

Total Tutorial Periods: **12**

UNIT – I

Robotics

Concepts in Robotics - Advances and applications of robotics in Robots, Resolution, Accuracy and Repeatability, Point, Continuous part system control loops, types of manipulators, wrist & Grippers.

UNIT – II

Kinematics Analysis of Robotics

Geometry based direct kinematics, Co-ordinate and vector transformation using matrix, Denant – Hartenberg Convention, application of DH notation, Inverse Kinematics.

UNIT– III

Dynamics

Elementary treatment of Lagrange – Euler, Newton – Euler formulations, Generalized D' Alembert equations of motion.

UNIT- IV

Control & Trajectory Planning

Drives, Control of Trajectory: Hydraulic system stepper motor, Direct current servomotors, AC servomotors, adaptive control, interpolators, trajectory planning, resolved motion rate control method.

UNIT – V

Robotic Sensors

Vision system, Range, proximity, touch, force and torque sensors, Assembly-Aid devices, Robot programming, Artificial intelligence.

Applications of Robot

Handling, loading, unloading, welding, painting, assembly, Machining, Manufacturing, Work-cell, Installation of Robots.

TEXT BOOKS

1. Robotics & Control – R.K. Mittal, I.J. Nagrath – TMH – New Delhi
2. Fu K.S., Gonzalez R.C. and LeeC.S.G., Robotics : Control sensing vision and intelligence, Mc Graw Hill

REFERENCE BOOKS

1. M.P. Groover, M. Weiss, P.N. Nagal and N.G. Odrey, Industrial Robotics, McGraw Hill International Deduction
2. Shimon Y. Nof (Editor), hand book of industrial robotics, John Wiley and Sons
3. D.T. Pham, Expert – System in Engineering, Springer Verlag
4. Anthony C, Mc Donald, Robot Technology, theory , design and applications, Prentice Hall, New Jersey
5. Yoren Koren, Robot for Engineers.
6. K.S. Fu, R.C. Gonzaler C.S.G. Lee, Robothe (Control, sensing vision& intelligence)

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Semester: **M. E. II**
Subject: **Quality Control & Reliability 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: **542213 (37)**
Total Tutorial Periods: **12**

UNIT – I

Introduction to Quality Control and Total Quality System

Philosophy and fundamental of quality control, Some philosophies and their impact on quality, comparison of philosophies, Quality management practices, Tools and standards, Management commitment, Total quality management, performance standards, six sigma quality, Quality function deployment, QFD process, Innovative Adoption and performance evaluation – Bench marking, Quality auditing, Vendor rating, Tools for continuous improvement, International standards and quality awards.

UNIT – II

Fundamentals of Statistical concepts and Techniques in Quality Control and Improvement

Descriptive statistics describing product or process characteristics – Data collection, measurement scales, measure of central tendencies, measure of dispersion, measure of skewness and Kurtosis.

Probability distribution – discrete distributions (Hyper geometric, Binomial, Poisson), continuous distributions (Normal, exponential, Weibull). Approximate to some probability distribution.

Inferential statistics drawing conclusion on product and process quality – sampling distribution, Hypothesis testing, Analysis of Variance.

Graphical methods of data presentation and quality improvement – Frequency distributions and histogram, Run chart, Pareto diagram, Cause - Effect diagram, Box plot etc.

Tolerances of Assemblies and component – Tolerance limits on interacting components, tolerance limits on mating parts.

UNIT – III

Statistical Process Control using control charts

Causes of variation, Statistical basis for control charts, analysis of patterns in control charts, maintenance of control charts.

Control chart for variables – selection of characteristics for investigation, preliminary decisions, various control charts.

Control charts for Attributes – Advantages and Disadvantages, preliminary decisions, and various attribute charts.

Process Capability analysis – Benefits, process capability indices, process capability analysis procedure.

UNIT – IV

Acceptance Sampling

Sampling plans for attributes - Advantages and Disadvantages of sampling, evaluation of sampling plans, various sampling plans.

Sampling plan for variables- Advantages, disadvantages, variable sampling plans.

UNIT – V

Reliability Engineering

Reliability, life cycle curve, probability distribution in modelling reliability, system reliability, Redundancy, Reliability allocation, Reliability and life testing plans.

Experimental design, Taguchi method, quality control in service sector.

TEXT BOOKS:

1. Statistical Quality Control – M. Mahajan – Dhanpat Rai & Co. (P) Ltd.
2. Statistical Quality Control – R.C. Gupta – Khanna Publishers, Delhi

REFERENCE BOOKS

1. Fundamentals of Quality Control and Improvement – Amitava Mitra – Peterson Education Asia.
2. Quality Assurance Methods and Technologies – Kenneth L. Arnold, Michel Holler – McGrawHill Book Co.
3. Managing for total quality from Deming to Taguchi and SPC – N. Lugothetis Prentice – Hall of India.
4. Quality control and Industrial Statistics – Acheson J. Duncch – D.B. Taraporewala Sons & Co. Pvt. Ltd.

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Semester: **M. E. II**

Subject: **Measurement System 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: **542214 (37)**

Total Tutorial Periods: **12**

UNIT – I

Analysis of Measurement System

Classification of measurement, analysis of experimental data, types of measurement errors, uncertainty, uncertainty analysis, proposition of uncertainty, curve fitting.

UNIT – II

Static Characteristics

Static Performance Characteristics, linearity, static sensitivity, repeatability, hysteresis effect, resolution, readability, span, Thevenin Theorem, Theory of validation, multiple regression analysis, measurement with linear equality and inequality.

UNIT – III

Dynamic Characteristic

Zero order Instrument, first order instrument, ramp response, frequency response equation, second order Instrument with over damping, critical damping and under damping.

UNIT - IV

Data Analysis

Data acquisition and processing, types and configuration of DAS signal conditions, analog to digital conversion, digital to analog conversion, mechanical transmission, electric transmission, pneumatic transmission system.

UNIT – V

Theory of Calibration

Types of calibration, estimation of measuring instruments in verification, rejection and acceptance. Calculation of number of standards. Calibration standard, master calibration schedule.

TEXT BOOKS

1. Measurement System – Ernest 'O' Doebline- McGraw Hill, Delhi
2. Experimental Methods for Engineering – Holman. J.P. – TMH, Delhi

REFERENCE BOOKS

1. Mechanical Measurement – Backwith, Buck and Narangani – Narosa Publications, Delhi
2. Engineering Experimentation – Doebelin
3. Measurement Errors and Uncertainty – Semyan G, Rabinovich

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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: **542231 (37)**

Total Tutorial Periods: **12**

UNIT – I

Introduction

Introduction to Mechatronics, Systems, Mechatronics in Products, Measurement Systems, Control Systems, Traditional design and Mechatronics Design.

UNIT– II

Sensors and Transducers

Performance Technology, Displacement, Position and Proximity, Velocity and Motion, Fluid Pressure, Temperature Sensors, Light Sensors, Selection of Sensors, Signal processing, Servo systems.

UNIT – III

Microprocessors in Mechatronics

Architecture, Pin configuration, Instruction set, Programming of Microprocessors using 8085 instructions, Interfacing input and output devices, Interfacing D/A converters and A/D converters, Applications, Temperature control, Stepper motor control, Traffic light controller.

UNIT– IV

Programmable Logic Controllers

Basic structure, Input/Output processing, Programming, Mnemonics Timers, Internal relays and counters, Data handling, Analog input / output – Selection of PLC.

UNIT – V

Design and Mechatronics

Designing – Possible design solutions – Case studies of Mechatronic systems.

TEXT BOOKS

1. Mechatronics – HMT Ltd., Tata Mc. Graw Hill, New Delhi
2. Machine Design for mobile and Industrial applicators – G. W. Kurtz, J. K. Scheller, D. W. Claar, SAE

REFERENCE BOOKS

1. Computer Automation in Manufacturing – T. O. Boucher – An Introduction – Chappman & Hall
2. Mechatronics , Intl. J. Pergamon Press.

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Semester: **M. E. II**

Subject: **Productivity 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: **542232 (37)**

Total Tutorial Periods: **12**

UNIT – I

Productivity

Output, different inputs and productivity measures, partial and indirect measures, multi-factor productivity, efficiency and effectiveness, quantity orientation, productivity and quality, measures to increase productivity.

UNIT – II

Modern Tools and Techniques for Productivity Improvement

Job Redesign, human resource, Development Business Process Engineering, Bench Marking, Just-in-Time Production, Single Unit Production and Conveyance, Yo-I-Don and standardization, Kanban Production Information System.

UNIT – III

Operation Strategy

Operations Decision, priorities, components of production strategy, framework for manufacturing, types, developing and implementing, focussed operations, strategic management process, interfaces between operations and marketing function, Porter's five forces Models, Meaningful differentiation, flexibility, comparison, Traditional Vs New approach, cost leadership, operation strategies.

UNIT – IV

Performance Measurement

Principles, Indicators, key success factors, performance measurement system issues, Design and Implementation of performance measurement system.

UNIT – V

Technology Management

Technical issues and Implications, Technology Development and Acquisition, Technology Absorption and Diffusion, Technology Environment, Technology Support System.

TEXT BOOKS

1. Production & Operation Management – S.N. Chary – TMH, Delhi
2. Productivity Engineering & Management – Sumanth David J. – TMH, Delhi

REFERENCE BOOKS

1. Productivity Management- Concepts and Techniques – S.C. Sawhney – TMH, Delhi
2. Industrial Engineering & Production Management – Martand Telsang – S. Chand & Co., Delhi
3. Managing Productivity - Schaffen Robot – Jaico Publishing House, Bombay

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

Branch: **Mechanical Engineering**
Code: **542233 (37)**
Total Tutorial Periods: **12**

UNIT – I

Introduction to Advance Material

Composites, Ceramic, Polymer, Super alloy, Refractory metal and alloy, Low melting alloy, precious metal, shape memory alloy, amorphous alloy.

UNIT – II

Solidification Principle

Heat transfer in solidification, Nucleation and growth, Plane front solidification of alloy, Lateral segregation, cellular and dendritic growth, segregation, solidification process and cast structure, single crystal growth, grain refinement and eutectic modification.

UNIT – III

New Solidification Process

Rapid solidification process: conduction process and convection process, chill block melt spinning process, free flight melt spinning process, free jet melt spinning process, planer flow casting process, crucible melt extraction process, spray deposition process, plasm spray deposition process, ultrasonic gas atomization process.

Solidification of metal matrix Composite

Infiltration Casting process, dispersion process, spray casting process, reactive processing, Squeeze casting, semi mold metal forming process, Cosworth process, Improved low pressure casting process (LIP), Directional solidification processing.

UNIT – IV

Powder Metallurgy

Recent Advances in Powder Metallurgy: Hot Isostatic pressing, spark discharge sintering, gravity sintering, Induction sintering, sinter HIP process, ceracon process, Ospney process, Metal Inspction molding, Designing the powder Metallurgy parts for production.

UNIT – V

Special Processing Methods

Hot machining, Unit head, Plasting tooling, Electroforming, surface cleaning and surface treatment, surface coating, surface coating for tooling.

Modern techniques for Material Studies

Optical Microscope, Electron Microscope, Chemical Analysis using atomic absorption, spectroscope, photoelectron spectroscope, magnetic resonance.

TEXT BOOKS

1. Fundamentals of solidification – W. Kurz and D.J. Fisher – Tans Tech. Publication
2. Rapidly solidified metals – T. R. Anantbraman C. Suryaharyan – Trans Tech. Publication

REFERENCE BOOKS

1. Modern Ceramic Engineering – D. W. Richardson – Mareel Dekker Inc.
2. ASM Handbook Vol. 7 & 15 ASM Inst.

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Semester: **M. E. II**

Subject: **Management of Organizational Behaviour**

Total Theory Periods: **40**

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

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

Branch: **Mechanical Engineering**

Code: **542234 (37)**

Total Tutorial Periods: **12**

UNIT – I

Fundamentals of Organizational behavior

Dynamics of people & Organization – Goals, forces, characteristics of O.B. field, nature of people, nature of organization, supportive approach, contingency approach, system approach, causes of human behaviour.

Models of Organizational Behavior - Elements of the system – Autocratic model, custodian model, supportive model, collegial model.

Managing Communication – Importance of communication, process, problems, barriers & solutions to overcome barriers, types of communications.

Social System & Organization culture – Social equilibrium, effects of change, cultural diversity, role perception – conflict, ambiguity, characteristics of culture, measuring organization culture.

UNIT – II

Motivation & Reward System

Sources of motivation, Theories of motivation, Maslow's, Megregor's X & Y Theory, McClelland's theory, Herzberg's Theory, Models – Expectancy model, comparison model, Money as means of rewarding, performance appraisal, 360° feedback program, Economic incentive systems.

UNIT – III

Leadership & Empowerment

Nature of leadership, behavioral approaches to leadership styles, personality, perception, dimensions of personality, learning & behavior reinforcement, empowerment, participative process, impact on managerial power & prerequisites.

UNIT – IV

Individual & Group behaviour & Conflict Management

Individual & interpersonal behaviour, nature of employee attitude, effects of attitude, Job satisfaction, reasons for group formation, types of group, factors contributing to group conveniences, Differentiation of groups, conflicts – nature, types of situation, causes, negotiation, levels of conflict, team building – concept, ingredients of effective team, the process skills useful in T. Build.

UNIT – V

Emerging aspects of organizational behavior

Organizational behavior across culture, managing interpersonal behavior, barriers to cultural adoption, overcoming barriers, cultural contingencies.

TEXT BOOKS

1. Organizational Behaviour – Human Behavior at work – John W. Newstrom and K. Davis. – TMH, Delhi
2. Organizational Behaviour – Concept Controversies and Applications – S. P. Robbins – Prentice Hall of India

REFERENCE BOOKS

1. Organizational Behavior – Fred Luthans – Mc Graw Hill Irwin.
2. Organizational Designs for Excellence – Pradip N. Khandwalla – Tata Mc Graw Hill
3. Organizational Participation – Myth and Reality – Frank Herler , Eugen Pusic, George Strauss, Bernhard Wilpert.
4. Organizational Behaviour – M. N. Mishra – Vikas Publishing House Pvt. Ltd.

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Semester: **M. E. II**

Subject: **Machine Tools Engineering -Lab**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **542221 (37)**

List of Experiments

- 1) Design and Specification of Single point cutting Tool
- 2) Design and specification of indexable inserts and tool holders
- 3) Design of Chip breakers and tool shank
- 4) Practical application of turning operation
- 5) Form Tools
- 6) Design of Twist Drill and Practical application of drilling
- 7) Design of Milling cutter and practical application of milling
- 8) Practical application of grinders
- 9) Design for Limits, Fits and Tolerances
- 10) Design of Gear Hob

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Semester: **M. E. II**

Subject: **Robotics -Lab**

Total Practical Periods: **40**

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

Branch: **Mechanical Engineering**

Code: **542222 (37)**

List of Experiments (In Basic Stamp V2 Software)

- 1) Write a program for the forward movement of the hex crawler.
- 2) Write a program for the backward movement of the hex crawler.
- 3) Write a program for right rotation of the hex crawler.
- 4) Write a program for left rotation of the hex crawler.
- 5) Write a program for sensing an obstacle by the hex crawler.
- 6) Write a program for pick and place of an object.
- 7) Write a program for the tuning of the legs of hex crawler.
- 8) Write a program for setting the home position of the hex crawler.