

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII PRODUCTION ENGINEERING**  
**P- 701 COMPUTER AIDED DESIGN**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Practical /Oral Marks	Term work Marks	Total Marks
<b>04</b>	<b>02</b>	<b>100</b>	<b>03</b>	<b>50</b>	<b>25</b>	<b>175</b>

**A. THEORY**

**1. INTRODUCTION TO CAD**

Definition , scope & benefits of CAD, Conventional design Vs, CAD , Workstation and micro station , Major hardware items- Their construction , function and application, CAD peripherals, Specification of hardware items, Hardware capabilities and selection of CAD software available in market , Comparison of CAD software based on capabilities and areas of applications, computer languages used in CAD & CADD & its design application in it's basic machine components.

**2. INTERACTIVE COMPUTER GRAPHICS**

Role of computer Graphics in CAD/CAM. Configuration of graphic workstations, Fundamentals of 2D graphics Manu design and Graphical User interfaces (GUI), Customization and Parametric Programming. Vector representation of geometric entities, Homogeneous coordinate systems, Geometric transformations. Planar and space curve design Analytical and synthetic approaches, Parametric and implicit equations. Modeling of biparametric freedom surfaces., Coons, Bevier, Biplane and surface manipulation techniques . Geometric modeling techniques wire frames, and hybrid modelers, parametric and variation modeling.

**3. CAD SOFTWARES DATABASE AND PROGRAMMING**

Introduction to product data standards and data structures , database preparation for design analysis & drafting & its management, RDBMS, applications of 'C' programming in CAD, introduction to artificial intelligence & knowledge base expert system.

**4. INTRODCUTION TO FINITE ELEMENT METHOD**

Introduction , types of meshes, Various shapes of elements, Preprocessor and postprocessors, Programming for FEM, FEM software packages, simple problem for 2D analysis.

**5. INTRODUCTION TO CAD OPTIMIZATION**

Introduction , engineering design Vs optimum design , Objectives and functions for OPTIMIZATION , Classification of optimization problems, procedural steps for design optimization, Soft wares for optimizations.

**6. COMPUTER AIDED DRAFTINGS**

Introduction to computer aided drafting its commands, introduction to Auto lisp language and its use in CADD.

**B PRCATICAL /ORAL**

It shall be based on above syllabus and term work prepared.

**C. TERM WORK**

It shall be based on major topic areas of syllabus as above and problem solutions should accompany compute printouts.

**D. REFERENCE BOOKS**

- Computer aided design By C.S. Krishnamoorthy & S. Rajeev
- Mechanical & material for design By Methanm H Cook
- An Introduction to FEM By J.N. Reddy
- Introduction to optimum design By Arror
- Design of Mechanical elements By Mott (Mc Graw Hill Pub. Co.)
- Mechanical Engineering design By J.E. Shigley
- Computer graphic By Hern & Baker
- Computer graphic and design By Dr. P Radhakrishnan & Kothrdaman

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII PRODUCTION ENGINEERING**  
**P- 702 CONTROL ENGINEERING & MECHATRONICS**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Practical /Oral Marks	Term work Marks	Total Marks
<b>04</b>	<b>02</b>	<b>100</b>	<b>03</b>	<b>25</b>	<b>25</b>	<b>150</b>

**A**     **THEORY**  
**PART - I CONTROL ENGINEERING**

**1. BASIC CONTROL SYSTEM**

System differential equation of electrical, Mechanical, Thermal, Hydraulic and Electromechanical network Analogy.

**2. THEORY OF AUTOMATIC CONTROL**

Concept of feed back referred to linear control systems in general , e.g. displacement and speed control, process control , definition and terminology, Open loop and closed loop systems and its advantages.

Block diagrams and single flow graph representation of a physical system. Block diagram algebra, transfer function from a block diagram.

Basic control actions and controllers- on- off. Proportional, derivative and integral controllers, Steady- state analysis. Transient response of first order and second order systems to step, ramp and sinusoidal transform methods, Reuth’s stability criteria and root Locus methods Improving system performance.

**3. HYDRAULIC , PHEUMETIC & ELECTICAL SYSTEM**

Their Control Characteristics, Control actions, Control system analysis and design & compensation techniques for control mechanisms, such as liquid level control, Feed control pressure & temperature control & industrial process regulation , Concept of low cost automation.

**PART – II MECHATRONICS**

**1. INTRODUCTION TO MECHATRONICS**

Definition & importance of Mechatronics, scope & applications for CAM, Basic of microprocessors, Concept of microprocessor; System & software engg., fundamental Digital & Electronics devices , drives , feedback devices & counting devices such as flip flop, counters, Decoders, multiplexes , encoder, sample hold circuit etc. with architecture of general purpose CPU, instruction sets, timing diagrams, Input/ output techniques, programmable interfacing devices, analogue interfacing; sampling , ADC, DAC.

**2. INTERPOLATORS FOR MANUFACTURING SYSTEMS**

DDA integrator, DDA Hardware Interpolator, CNC Software Interpolators, Software DDA Interpolator, Reference word CNC Interpolators.

**B PRACTICAL/ ORAL**

It shall be based on above syllabus and teamwork prepared.

**C TERM WORK**

It shall be based on term work prepared and knowledge on above syllabus.

**D REFERENCE BOOKS**

1. Modern Control Engineering           By Ogata-Prentice Hall of India.
2. Control System Engineering           By Negrath- Wiely Easiern
3. Control Engineering                    By Kuo.
4. Computer control of                    By Yoram Koren. Mc Graw – Hill  
Manufacturing systems.

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII (PRODUCTION)**  
**P-703 PRODUCTIVITY IMPROVEMENT TECHNIQUES**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	TheoryHrs.	Practical/Oral Marks	Term work Marks	Total Marks
<b>04</b>	<b>02</b>	<b>100</b>	<b>03</b>	<b>50</b>	<b>25</b>	<b>175</b>

**A. THEORY**

**1. PRODUCTIVITY MANAGEMENT**

Introduction and Meaning, Concern and Significance, Different inputs and productivity measures, Partial, Indirect and multifactor productivity, Reasons for Low productivity, Impact of external Environment, Efficiency and Effectiveness, Measures/ Techniques for improvement

**2. PRODUCTIVITY AND WORKSTUDY**

Concept of work study, factors affecting productivity, Productivity and work study, basic work content , scope of work study applications, human factors and work conditions in work study applications.

**3. METHOD STUDY**

Introduction to method study, selection of jobs for study, recording techniques, Questioning techniques for critical examinations, developing improved method.

Principle of motion economy, Therbligs- basic movements, workstation layout, Micro motion study and Memo motion analysis and method improvement.

**4. WORK MEASUREMENT:**

Purpose, uses and basic procedures of work measurement , Techniques of work measurement – work sampling and time study, No of cycles/ observations to be timed, Basic time study equipments and forms, Selection of job for time study, Approach with the worker during time study , Steps in making time study, Breaking down job into basic elements, timing each element, Concept of rating, factors affecting rating and methods of rating Basic time, Allowances, Calculations of standard time, Use of time standard data, Standard unit of work, Synthesis of standard data, Production studies, Activity sampling , Number of observation required, Rated activity sampling , analytical estimating, P.M.T.S., M.T.M., W.F.S, B.M.T.S and M.T.A.- application of work measurement techniques.

**5. ERGONOMICS**

Introduction, Principles, Work-System-Design, Man-Machine System, Human Behaviour and Equipment Design, Tools, Techniques and Applications

**6. BUSINESS PROCESS REENGINEERING**

Concepts and Purpose, Procedures and preparations, Methodologies/ Phases of Reengineering,Tools, Cases

**7. CONTEMPORARY ISSUES IN PRODUCTIVITY**

Activities of National Productivity Council and other organizations, Productivity Scenario and changes.

**B PRACTICAL / ORAL**

It shall be based on term work and syllabus as above.

**C TERM WORK**

It shall be based on areas of Method study and work measurement in the form of exercise/ experiment / problem. Student will prepare in group work system design write up for a given cases study.

**D REFERENCE BOOKS**

1. Work Study By. I.L.O
2. Work Study By. R.M. Currie
3. Work Study By. Patel & Gupta
4. Methods Engineering By Kriek
5. Work System Design Ideals Concept By Naddler
6. Industrial Engineering and O.R. By Miller/ Schemidt.
7. Operations/ Production Management By S.N. Cahry
8. Operations/ Production Management By Adams & Ebert
9. Productivity By Prem Vrat, Bishwas, Sahay
10. Productivity Management By Sawhney
11. Industrial Management & Engg. Economics By K.C.Arora
12. Reengineering the Corporation By Michel Hammer and Champy

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII PRODUCTION ENGINEERING**  
**P- 704 MACHINE TOOL DESIGN**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Practical/Oral Marks	Term work Marks	Total Marks
<b>04</b>	<b>02</b>	<b>100</b>	<b>04</b>	<b>50</b>	<b>25</b>	<b>175</b>

**A THEORY**

**1. INTRODUCTION**

Machine tool types and basic Machine elements, Integration of Machine elements in to machine for functional and design requirements , Mechanism for periodic intermittent and rectilinear motions, Concept of rigidity , Concepts and principles of machine tool design, preferred numbers, Developing machine tools based on functional requirements , Force and power calculation in turning, milling, drilling , grinding , etc. Modular concepts in machine tool.

**2. DRIVES AND CONTROLS IN MACHINE TOOLS**

Need for speed variations, Stepped and step less speed and step less speed variations and it's mechanisms, Rupert drive and Meander's drive speed variations through gear boxes speed and feed gear box & their designs, Design of feed gear box & their designs, Design of feed mechanism and power screw, Infinitely variable mechanical electric and hydraulics drives and logic circuits for automation, Development of typical hydraulic & hydroelectric circuits in machine tool control for design of specific requirements Introduction and use of servo System.

**3. SPINDLES AND BEARINGS**

Rotational accuracy, rigidity , types of bearings, Criteria for selection of bearing, Design and selection of bearings based on application, load and life of bearing, radial and axial clearance adjustments of bearings and it's effects of performance.

**4. BEDS, COLUMNS AND SLIDES**

Functions , Types and uses of stiffeners, cast Vs Fabricated constructions, wear compensations of sideways and other machine elements, Devices for wear adjustments, bed Column and slides- It's materials , Typical constructions and design features in general, Stick- slip Phenomena, Antifriction slides and hydrostatics sideways, Design of lathe guide ways.

**5. DESIGN OF MACHINE ELEMENTS USING COMPUTER**

Use of read made computer programs for machine elements such as belt, chain, keys. Gears, shafts bearings and columns, Stresses for force fit un machine elements using computer program.

**6. HUMAN FACTORS IN MACHINE TOOLS**

Application of ergonomics in determination of the light of m/c tool, Placement of controls, illumination, vibration ( Noise) , safety devices, etc. Anthropometrics data and charts, etc.

**7. VIBRATIONS IN MACHINE TOOLS**

Concept of chatter, role of chatters in machine tool, Sources and effect of vibration, Methods for controlling Vibrations in machine tools, Analysis of machine tool Vibrations- Nature and it's causes.

**B PRACTICAL/ ORAL**

It shall be based on syllabus above and term work prepared.

**C. TERM WORK**

It shall be based on above syllabus and report should consist of Suitable drawing and computer print out.

**D. REFERENCE BOOK :**

1. Machine Tool Design VOL- II & IV By Acherkan
2. Machine Tool Design By N.K. Mehta
3. Design of Machine Tools By S.K. Basu
4. Principles of Machine Tools By Sen & Bhattacharya
5. Hand Book of Machine Tool Design By CMTI, Bangalore
6. Machine Elements in M/c. Design By Mott.
7. Design Elements in M/c. Design By F. Koenigsherger  
Cutting Machine Tools Mir. Publishers (10/01/03)

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII PRODUCTION ENGINEERING**  
**P- 705 MANUFACTURING PLANNING & CONTROL**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Practical/Or al Marks	Term work Marks	Total Marks
04	02	100	03	50	25	175

**A THEORY**

**1. PRODUCTION PLANNING AND CONTROL**

Objectives of PPC, Types of Production , Characteristics of continuous and intermittent production, Functions of PPC , Preplanning activities, Regular & Planning activities such as order control , Flow control , Load control , and project control. Project, planning v/s production planning, Critical path analysis technique, advantages and its application.

**2. PRODUCTION FORECASTING**

Forecasting and prediction, Forecasting , Forecasting requirement in Production/ operations, short run and long run planning decisions for Forecasting, Demand Forecasting and Demand patterns, Noise in demands , different methods of forecasting , Measures of forecast error, costs of errors, Useful forecasting models for operations- such as simple average, simple moving average, weighted moving average and exponential smoothing- selection of smoothing coif, Kin ear regression model, Criteria for selection of forecasting models.

**3. SCHEDULING**

**Scheduling:** Inputs to scheduling. Work schedules and load chart, types of Gantt charts, Techniques of schedules and load charts, types of Gantt carats. Techniques of schedules and load Johnson’s two m/cs and three m/cs algorithms, N jobs & two machines, n jobs & 3 machines and n jobs and m machines, graphical method of two jobs and n machines types of sequencing problems, index method of scheduling, Critical ratio scheduling , Line of balance.

**4. BREAK EVEN ANALYSIS**

Product mix, M/c. & Process selection, make –buy decision, Costs Benefit analysis and selection of M/c. or Process.

**5. AGGREGATE PLANNING**

Strategies of development aggregate plan, and Kin ear decision rules, Aggregate planning case study for production control.

**6. ASSEMBLY LINE BALANCING**

Assembly line balancing for operation sequencing and calculations for minimum No. of theoretical work stations and efficiency of line.

**7. INVENTORY MANAGEMENT:**

Need of inventory, types of inventory models deterministic & probabilistic, selective inventory controls. MRP, Different components of MRP, MRP-II

**B. PRACTICAL / ORAL**

It will be based on Term work prepared by students and on the theory topics for decision making.

**C. TERM WORK**

It will be consisting of about at least six exercise- problems and of two case studies based on subject topics as above.

**D. REFERENCE BOOKS**

1. Production Planning & Control By L.C. Jhamb.
2. Production Planning & Control By Bulbridge.
3. Elements of System Planning & Control By Sanuel Eilon.
4. Production System Planning analysis & Control By J.M. Riggs.
5. Principles & Design of Production Planning & Control By Sheele Westerman
6. Modern Production Management By Buffa.
7. Production & Operations Management By Exerett E Adamj

**BHAVNAGAR UNIVERSITY**  
**B.E.SEMESTER –VII PRODUCTION ENGINEERING**  
**P- 706 INDUSTRIAL PROJECT – I**

Teaching Scheme		Examination Scheme				
Theory Hrs.	Practical Hrs.	Marks	Theory Hrs.	Practical/Oral Marks	Term work Marks	Total Marks
**	02	**	**	100	50	150

**GENERAL GUIDELINES**

Students shall undertake 06 weeks of Industrial Training in any Industry of reputation. During Training he will observe / critically analyses his own live experiences about the product , the plant, the process, the programming and the procedures, and people at work. Student shall understand basic interrelationship between and marketing function, finance function, Production functions and different service functions for integration of an Engineering Production of an organization. He shall apply Questioning Techniques, SWOT analysis and cost benefit analysis for his observation during training.

**OR**

Students shall take up a topic relevant to Production Engineering in consultation with the faculty member, which should be approved by the Head of the Department. The student will work extensively on the subject to understand, analyze, interpret, synthesize and design the principles, process, and cases if taken up. The work should be started only after defining the problem clearly, deciding the methodology for the approach to work and expected results to be achieved.

**TERM WORK**

Students shall prepare and submit a work report based on own exposures and experiences during said training / project work. The report should be prepared to the satisfaction of concerned faculty member and should be approved by faculty and Head of the Department before submission.

**PRACTICAL / ORAL**

Practical oral exam shall be based on above industrial training / project work report submitted.

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