DEPARTMENT OF TECHNOLOGY
SHIVAJI UNIVERSITY, KOLHAPUR

STRUCTURE AND SYLLABUS
OF
FINAL YEAR B. TECH
(MECHANICAL ENGINEERING)

TO BE EFFECTIVE FROM
ACADEMIC YEAR 2016-17

DEPARTMENT OF TECHNOLOGY
FINAL YEAR B.TECH
Scheme of Teaching and Examination
Semester – VII (Mechanical Engineering)

Sr. No	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credit	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
1.	Refrigeration and Air-conditioning	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
2.	Hydraulics and Pneumatics	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
3.	Machine Design – III	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
4.	Manufacturing Engineering III	03	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
5.	Elective – I	03	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	--------	---------
6.	Refrigeration and Air-conditioning	- -	- -	02	01	--------	-------	-------	IPE	50	20
						--------	-------	-------	EOE	50	20
7.	Manufacturing Engineering – III	- -	- -	02	01	--------	-------	-------	IOE	--------	--------
						--------	-------	-------	EOE	50	20
8.	Hydraulics and Pneumatics	- -	- -	02	01	--------	--------	--------	EPE	50	20
9.	Major Project(Phase I)*	-	-	02	03*	--------	-------	-------	IOE (Project Based Seminar)	50	20
10.	Report of Industrial Training	-	-	-	-	--------	-------	-------	IOE	50	20
	Total	**18**	**--**	**08**	**24**	--------	**500**	-------	--------	**300**	--------
11.	Constitution of India (Audit Course)	02	-	-	-	--------	--------	--------	--------	--------	--------

Total Credits: 24
Total Contact Hours/Week: 28 Hrs
Note:
#: Minimum 40% marks must be secured in SEE to pass that head.
* Students are expected to do self study for two hours as per the guidance given by the project guide hence contact hours to be taken as two for the calculation of contact hours.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.
CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

Elective – I:

1. Finite Element Analysis
2. Cryogenics
3. Operations Research
4. Tribology
5. Production Management
6. Open Elective

Note on Electives:
A particular elective will be offered when at least 20 students opt for it.

Note on Open Elective:
In order to promote interdisciplinary study department can offer open electives to students. This elective will be offered from the electives of other branches, particularly available in Sem. VII only. Students shall attend the theory lectures as per schedule of respective branch.

DEPARTMENT OF TECHNOLOGY
FINAL YEAR B.TECH
Scheme of Teaching and Examination
Semester – VIII (Mechanical Engineering)

Sr. No	Subject	Teaching Scheme (Hours / Week)				Examination Scheme (Marks)					
						Theory			Practical		
		L	T	P	Credits	Scheme	Max. marks	Min. Passing	Scheme	Max. marks	Min. Passing
1.	Automobile Engineering	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
2.	Total Quality Management	03	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
3.	Mechatronics and Robotics	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
4.	Power Plant Engineering	03	-	-	03	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
5.	Elective – II	04	-	-	04	CIE	50	20	--------	-------	--------
						SEE	50	20	--------	-------	--------
6.	Automobile Engineering	-	-	02	01	--------	-------	--------	IPE	-------	-------
						--------	-------	--------	EOE	50	20
7.	Mechatronics and Robotics	-	-	02	01	--------	-------	--------	IPE	--	--
						--------	-------	--------	EOE	50	20
8.	Power Plant Engineering	- -	- -	02	01	--------	--------	--------	EOE	50	20
9.	Major Project(Phase II)*	-	-	02	03*	--------	-------	--------	IPE	50	20
						--------	-------	--------	EPE	100	40
	Total	**18**	**-**	**08**	**24**	--------	**500**	--------	--------	**300**	--------
10.	Human Values and Professional Ethics (Audit Course)	02	-	-	-	--------	--------	--------	--------	--------	--------

Total Credits: 24
Total Contact Hours/Week: 28 hrs
Note:
#: Minimum 40% marks must be secured in SEE to pass that head.

* Students are expected to do self study for two hours as per the guidance given by the project guide hence contact hours to be taken as two for the calculation of contact hours.

• Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.
CIE – Continuous Internal Evaluation, SEE – Semester End Examination,
IPE – Internal Practical Evaluation, EPE–External Practical Examination,
IOE– Internal Oral Evaluation, EOE–External Oral Examination

Elective – II:

1. Computational Fluid Dynamics
2. Vibration and Noise
3. Nano- Technology
4. Machine Tool Design
5. Flexible Manufacturing Systems
6. Open Elective

Note on Electives:
A particular elective will be offered when at least 20 students opt for it.

Note on Open Elective:
In order to promote interdisciplinary study department can offer open electives to students. This elective will be offered from the electives of other branches, particularly available in Sem. VIII only. Students shall attend the theory lectures as per schedule of respective branch.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

REFRIGERATION AND AIR CONDITIONING

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

BASIC REFRIGERATION CYCLES

Carnot cycle, Reversed Carnot cycle, Simple Vapour compression cycle, sub-cooling, superheating, Liquid to suction vapour heat exchanger, Calculations and performance of above cycles, Actual vapor compression cycle, Bell Coleman - Reversed Bryton cycle, Air cycles for air craft's (Descriptive Treatment).

UNIT 2

A) REFRIGERATION EQUIPMENTS

Compressor, Condenser, Evaporator, Expansion devices, Types, selection, use of insulation, methods of charging and testing, Non conventional methods of refrigeration like vortex tube, Pulse Tube, Safety controls.

B) REFRIGERANTS

Classification, Desirable Properties like Thermodynamic, physical, & chemical. Comparison among commonly used refrigerants, Selection of Refrigerants, Effect on Ozone depletion and global warming, Alternative Refrigerants.

UNIT 3

A) MULTI PRESSURE SYSTEM

Removal of flash gas, Flash inter-cooling, Water-cooling, Multistage, Multi-evaporator &

Cascade System, Introduction to cryogenic engg. & application, Claude cycle, Linde Cycle.

B) VAPOR ABSORPTION SYSTEM

Aqua Ammonia system, Lithium Bromide water vapour system, Crystallization, Coefficient of Performance, Comparison with Vapour Compression cycle (Descriptive treatment only)

UNIT 4

PSYCHROMETRY

Moist air as a working substance, Psychometric properties of air, Use of Psychometric tables and charts, Processes, Combinations and Calculations, ADP, Coil Condition lime, Sensible heat factor, Bypass factor, Air washer and it's applications.

Comfort: Thermal exchange between human body and environment, factors affecting comfort, effective temperature comfort chart, ventilation requirements.

UNIT 5

HEATING AND COOLING LOAD CALCULATION

Representation of actual air conditioning process by layouts & on psychometric charts, Load analysis RSHF, GSHF, ESHF, Enumeration & brief explanation of the factors forming the load on refrigeration and air conditioning systems, Energy requirements of different types of air conditioning systems, Energy conservation in air conditioning.

UNIT 6

A) Air Distribution System

Re-circulated air, Ventilation air, Duct work, , duct system, principle of duct sizing, and air distribution it's norms, layout, Applications of duct systems .

B) Introduction to cryogenics

History and development , its importance, cryogenic temperature scale, cryogenic materials and its properties.

Reference and Text Books:

1. Arora C P, Refrigeration and Air Conditioning, Tata McGraw Hill
2. Refrigeration and Air Conditioning - Arora Domkundwar
3. Dossat Ray J., Principal of Refrigeration, S.I. Version, Wiley Eastern Limited, 2000
4. Manohar Prasad, Refrigeration and Air-conditioning, Wiley Eastern Limited, 1983
5. Stocker W.F. and Jones J.W., Refrigeration and Air-conditioning, McGraw Hill International editions 1982
6. Threlkeld J.L., "Thermal Environmental Engineering, Prentice Hall Inc. New Delhi
7. Anantnarayan, Basic of Refrigeration and Air Conditioning, Tata McGraw Hill Publications
8. Shan Wang, Handbook of Refrigeration and Air Conditioning, McGraw Hill Publications
9. Wilbert Stocker, Industrial Refrigeration, McGraw Hill Publications
10. Cryogenics systems – Randall Barron – Mc Graw Hill Book Co
11. Roger Legg, Air conditioning systems: Design, Commissioning and maintenance

12. Keith Harold, Absorption chillers and Heat Pumps, McGraw Hill Publications
13. ASHRAE and ISHRAE Handbook
14. ASHRAE, Air Conditioning System Design Manual, 2nd edition, ASHRAE

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

HYDRAULICS AND PNEUMATICS

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

INTRODUCTION TO FLUID POWER

a) Classification, general features, applications in various fields of engineering, various hydraulic and pneumatic ISO/JIC Symbols, transmission of power at static and dynamic states, advantages and disadvantages. b) Principle of hydraulic system, Types of hydraulic fluids and their properties, selection of fluid, effect of temperature on fluids. c) Introduction and Application of pneumatics, Physical properties, Principles, basic requirement of pneumatic system, comparison with hydraulic system.

UNIT 2

HYDRAULIC SYSTEM ELEMENTS

a) Classification, types of seals, sealing material, pipes, hoses, compatibility of seal with fluid, sources of contamination and its control, strainer, filter, heat-exchanger, reservoir. b) Pumps-types, selection of pumps from Gear, vane, piston, screw, ball pump etc. for various applications. c) Actuators-linear and rotary, hydraulic motors, types of hydraulic cylinders and their mountings. d) Accumulators, intensifier and their applications.

UNIT 3

CONTROL OF FLUID POWER ELEMENTS

a) Requirements of Pressure control, direction control and flow control valves. b) Principle of pressure control valves, directly operated and pilot operated pressure relief valve, pressure reducing valve, sequence valves, counter balance valve. c) Principles and Types of direction Control valves-2/2, 3/2, 4/2, 4/3, 5/2. Open center, close center, tandem center, manual operated, mechanical operated solenoid, pilot operated direction control valves, check valves. d) Principles of flow control valves, temperature compensated, pressure compensated, temperature and pressure compensated flow control valve.

UNIT 4

ELEMENTS OF PNEUMATIC SYSTEM

a) Air compressor- Types, selection criteria, capacity control, piping layout, fitting and connectors, Pneumatic controls, Direction control valves (two way, three way,

four way), check valves, flow control valves, pressure control valves, speed regulators, quick exhaust valves, time delay valve, shuttle valve and twin pressure valve. Solenoid operated, pilot operated valves, , Pneumatic actuators, Rotary and reciprocating cylinders–types and their mountings, Air motor – types, Comparison with hydraulic and electric motor. b) Serving of compressed air – types of filters, regulators, lubricators (FRL unit), mufflers, dryers.

UNIT 5

A) HYDRAULIC CIRCUITS AND ITS APPLICATION

i. Speed control circuits – Meter-in, Meter-out, Bleed off, Regenerative, Fast approach and slow traverse. ii. Sequence circuits – Travel dependent and Pressure dependent iii. Synchronizing circuit. iv. Regenerative circuit.

B) PNEUMATIC CIRCUITS AND ITS APPLICATION

i. Speed control circuits
ii. Impulse operation circuit.
iii. Sequence circuits.
iv. Time delay circuit.

UNIT 6

a) Hydraulic and Pneumatic servo system for linear and rotary motion.
b) Maintenance, troubleshooting and safety of hydraulic and pneumatic systems. c) Introduction to fluidics – study of simple logic gates, turbulence, amplifiers. Pneumatic sensors, applications.

Reference and Text Books:

1. "Oil hydraulics Systems", S. R. Mujumdar, Tata McGraw Hill Publication.
2. "Pneumatic Systems", S. R. Mujumdar- Tata McGraw Hill Publication.
3. "Industrial Fluid Power",D. S. Pawaskar, Nishant Prakashan.
4. "Hydraulics and Pneumatics", Shaikh and Khan, R.K. Publication.
5. "Fluid Power with Application", Esposito, Pearson Education , 7th Edition.
6. "Basic Hydraulic – Festo Manual"
7. "Basic Pneumatic – Festo Manual"
1. "Industrial Fluid Power", S.S. Kuber, Nirali Prakashan, 3rd Edition.
2. "Hydraulic and Pneumatic",H.L.Stewart,Industrial Press.
3. "Industrial Hydraulic", J. J. Pipenger ,Tata McGraw Hill.
4. "Power Hydraulics", Goodwin 1st Edition.
5. "Introduction to Hydraulic and Pneumatics",S. Ilango and V Soundararajan, Prentice Hall of India, 2nd Edition.
6. "Pneumatic Control",Joji P.,Wiley. ,1st Edition.
7. "Fluid Power",Jagadeesha T. , Wiley Publications.
8. "Eaton (Vickers) Manual."

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

MACHINE DESIGN – III

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Aesthetic and Ergonomic consideration in Design : Basic types of product forms, Designing for appearance, shape, Design features, Materials, Finishes, proportions, Symmetry, Contrast etc. Morgon's color code. Ergonomic considerations- Relation between man, machine and environmental factors. Design of displays and controls. Practical examples of products or equipments using ergonomics and aesthetic design principles.

UNIT 2

System Approach to Design: System Approach to Design; Mathematical model; Lumped system; Dynamic response of lumped & distributed system; Modeling of masses, Elasticity, Inertia, Damping and friction.

UNIT 3

Pressure Vessel Design: Thin and thick cylinders; failure criteria of vessels; Lame's equation; Clavarino's and Birnie's equation; Autofrettage and compound cylinders; Types of pressure vessels-Horizontal and vertical; Classification of pressure vessel as per IS2825, 1969.Introdduction to design of pressure vessels as per IS Codes. Shell and end closures. Effect of opening & nozzles in shell & covers. Types of pressure vessel support.

UNIT 4

A) Brakes:- Design consideration in brakes, Band, Internal expanding shoe, External contracting shoe. Thermal consideration and rating of brakes.

B) Clutches:- Design requirement of friction clutches, Selection criteria. Torque transmitting capacity of single plate, Multidisc clutch, Cone clutch and Centrifugal clutch.

UNIT 5

Statistical considerations in Design: Frequency distribution- Histogram and frequency polygon- Normal distribution- Units of measurement of central tendency and dispersion- Standard variable- Population combination-

Design and natural tolerances- Design for assembly- Statistical analysis of tolerances- Mechanical reliability and factor of safety. Design of Gear boxes for machine tool applications: Determination of variable speed range- Graphical representation of speeds- Structure diagram- Deviation diagram- Ray diagram- Selection of optimum ray diagram- Difference between number of teeth of successive gears in a change gear box- Analysis of twelve speed gear box- Compound ray diagram.

UNIT 6

Design of Material handling system: Design of belt and chain conveyors – Power requirement, Selection of belt and chain, Design of tension take up unit, Idler pulley Optimum Design: Objectives of optimum design- Johnsons Method of Optimum Design (MOD),Adequate and optimum design. Primary, Subsidiary and Limit equations- Optimum design with normal specifications of simple machine elements like tension bar, transmission shaft, helical spring.Introduction to optimum design with Langrange Multiplier.

Reference and Text Books:

1 Design of machine element by V.B.Bhandari, Tata Mc- Graw Hill Publication
2 Mechanical Engineering Design by Shigley and C.R.Miscke, Tata Mc- Graw Hill Publication
3 Mechanical design analysis by M.F.Spotts, Prentice Hall publication
4 Machine Design by Black P.H.and O.Eugene Adams, Tata Mc- Graw Hill Publication
5 Mechanical Design Synthesis with Optimisation Applications by Johnson R.C.,Von- Nostrand-Reynold Publicaion
6 Engineering Design by Dieter G.E. Tata Mc- Graw Hill Publication.
7 Design of Machine Tools by S.K.Basu and D.K.Pal, Oxford and IBH Publication
8 Machine Tool Design by N.K.Mehta, Tata Mc- Graw Hill Publication
9 Mechanical System Design by S.P.Patil, Jaico Publication House,New Delhi
10 Product design and process engineering –Benjamin W. Niebel , Alan B. Draper, Tata Mc- Graw Hill Publication
11 Design data PSG College of Technology Coimbatore
12 I.S.:2825 Code for unfired Pressure Vessels
13 Design of Pressure vessel by Harve, CBS publishers and distributors
14 Engineering Optimization Theories and Practice by S.S.Rao, New Age Publication
15 Principles of machine tool by Sen. Bhattacharya, New central book agency
16 Process Equipment Design by M.V.Joshi , Macmillal Publication
17 Machine Design by Robert L.Norton, Tata Mc- Graw Hill Publication
18 Material Handling Equipment by Rudenko, M.I.R.publishers, Moscow
19 Reliability in Engineering Design by Kapur Wiley India
20 Fundamentals of Machine Component Design by Junvinall Wiley India
21 Mechanical System Design by Anurag Dixit SCITECH publication
22 Design of Machine Element/Machine Design by Kannaiah SCITECH publication

23 Design of Machine Element by Spotts/Shoup/Hornberger/Jayram/Venketesh Pierson Education
24 Machine Design by T H Wentzell Cengage Learning

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

MANUFACTURING ENGINEERING – III

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Manufacturing Systems Designs: Definition, Systems, Subsystems, Systems Approach Fundamentals, Systems Approach for designing, Manufacturing Systems, Systematic Layout Planning (SLP), Computerized Plant Layout-CRAFT, ALDEP, CORELAP.

UNIT 2

Manufacturing Systems Economics: Concept of time value of money, Preparation of time profile of project, Single payment, Equal Series payment, various machine and project selection & evaluation techniques: Payback period, Present worth, Equivalent annual cost, Cost- benefit ratio, Evaluation for both equal & unequal life.

UNIT 3

New Product Development (NPD): Product Development, Customer Need, Strategies for New Product Development, Product life cycle, Product status. Corporate Design Strategies, Japanese Approach to NPD. PUGH total Design approach, PAHL & BEITZ Approach, Project Approach, Cross functional

UNIT 4

Manufacturing Planning & Control Systems: Overview of Aggregate Planning Models, Linear Decision Rules, Management Coefficient, Direct Search Methods, Master Production Schedule, Modular Bill and Materials, Capacity planning & control, language, medium range, short range capacity planning, Toyota Production System, Just- in Time (JIT), Manufacturing –Philosophy, Elements, KANBAN, effects on layout, workers & vendors, Optimized Production Technology (OPT).

UNIT 5

Forecasting Methods: Forecasting Framework, Forecasting cost and accuracy, Forecasting Uses and Methods – Delphi, Exponential Smoothing, Forecasting Errors – MAD, Regression Methods-Linear Model for single & multiple variables, Brief idea of computerized forecasting systems. Material Requirements Planning (MRP): Definition of MRP systems. MRP versus Order point, MRP Elements, Types of MRP – MRP I & II.

UNIT 6

Maintenance & Reliability: Concept of preventive & breakdown maintenance, maintenance cost, optimal preventive maintenance simple replacement models-individual and group replacement, MAPI - methods, reliability definitions, failure analysis and curve, systems reliability- series parallel, redundancy, methods of improving reliability, MTBF, MTTR, Maintainability, availability.

Text books:

1. Operations management – Schoroeder, Mc Graw Hill International
2. Production operations management – chary, TMH, New Delhi.

Reference books:

1. Production Operations Management – Adam & Ebert, PHI, New Delhi
2. Operational Management –Monks, Mcgraw Hill, Int.
3. Production & Operations Management – I. Hill, Prentice Hall Int.11
4. Production Planning & Inventory Control – Narasimham etal, PHI, New Delhi
5. Production & Operation Management- Panneerselvam, PHI, New Delhi
6. Managing for Total Quality-Logothetis, PHI, New Delhi
7. Concept of Reliability Engineering –L.S. Srinath, Affiliated East West.
8. Revolutionizing Product Development – Wheelwright & Clark, Free press.
9. Management In Engineering – Freeman-Ball & Balkwill, PHI, New Delhi.
10. Production & operations management – Martinich, John Wiely , New Delhi.
11. The goal by Eliyahu M. Goldratt & Jeff Cox, Productivity Press India Ltd, Bangalore.
12. Toyota Production System by Taichi Ohno, Productivity Press India Ltd, Bangalore.

Elective – I

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

1) FINITE ELEMENT ANALYSIS

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
INTRODUCTION
Brief history, Introduction to Matrix Notation, General steps of FEM using a simple 1-d element for stress analysis of a stepped bar, Thermal rod, Heat conduction through wall. Applications of FEM
Functional, Extremization of a functional, obtaining the variation form from a Differential equation, Principle of virtual work, Principle of Minimum potential energy.

UNIT2
A) Discritization of the problem
Introduction, Geometrical approximations, Simplification through symmetry, Basic element shapes and behavior, Choice of element type, Size and number of elements, Element shape and distortion, Location of nodes, Node and element numbering
B) Approximation methods for solving differential equations:
Introduction, Rayleigh-Ritz method, Galerkin method, Least square method,
Interpolation Functions and Simplex Elements: Introduction, simplex, complex and multiplex elements, Linear interpolation polynomials for simplex elements, Natural co-ordinates, vector quantities, an axisymmetric element

UNIT 3
FORMULATION OF THE ELEMENTS CHARACTERISTIC MATRICES AND VECTORS FOR ELASTICITY, FIELD , THERMAL PROBLEMS:

A) Formulation of the Elements Characteristic Matrices and Vectors for Elasticity Problems: Introduction, one dimensional elasticity, two dimensional elasticity, axi-symmetric elasticity
B) Formulation of the Elements Characteristic Matrices and Vectors for Field Problems

C) Introduction, Thermal problems, One dimensional heat transfer, two dimensional heat transfer, axi-symmetric heat transfer. Torsional problems, Fluid flow problems.

UNIT 4

ASSEMBLY AND SOLUTION OF THE FINITE ELEMENT EQUATIONS

Introduction, co- ordinate transformations, assembly of element equations, Incorporation of the boundary conditions, solution of the equations, elimination method

UNIT 5

HIGHER ORDER ELEMENT FORMULATIONS

Introduction, Natural co – ordinates systems and numerical integration, higher order one dimensional elements – quadratic and cubic elements, evaluation of the element equations, an alternative formulation

Higher order two and three dimensional elements – iso-parametric triangular elements, iso-parametric quadrilateral elements, isoparametric solid elements, stress and heat flow calculations. Convergence requirements of interpolation functions

UNIT 6

MODELING PROCEDURES RESULTS PROCESSING AND FEM

Introduction, model validity and accuracy, mesh design and refinement, element distortions, result processing, model checking

Solving FEM Problems on a computer, Introduction, Developing on FEM code, Finite element packages

Text Books:

1. Bhavikatti S. S. Finite element analysis, New Age International Publishers
2. Chandrupatla T. R. and Belegunda A. D., Introduction to Finite Elements in Engineering, Prentice Hall India.
3. Liu G. R. and Quek S. S. The Finite Element Method – A Practical Course, Butterworth-Heinemann, 2003.
4. Lakshiminarayana H. V. Finite Element Analysis (Procedures in Engineering), University Press, 2004.
5. Chandrupatla T. R., Finite Element Analysis for Engineering and Technology, University Press, 2009.
6. Seshu P. Text book of Finite Element Analysis, PHI Learning Private Ltd. New Delhi, 2010.
7. Y. M. Desai, T. L. Eldho and A. H. Shah; „Finite Element Method applications in Engineering", Pearson Education 32 of 41

Reference Books:

1 Bathe K. J., Finite Element Procedures, Prentice-Hall of India (P) Ltd., New Delhi.
2 Fagan M. J., Finite Element Analysis, Theory and Practice, Pearson Education Limited
3 Cook R. D., Finite Element Modeling for Stress Analysis, John Wiley and Sons Inc, 1995
4 Kwon Y. W., Bang H., Finite Element Method using MATLAB, CRC Press, 1997
5 S. Moaveni Finite element analysis, theory and application with Ansys –
6 Asghar Bhatti, Fundamental Finite Element Analysis and Applications, John Wiley and Sons Inc, 2005
7 David V. Hutton, Fundamental of Finite Element Analysis, Tata McGraw-Hill Education Pvt. Ltd.
8 Daryl Logan, First Course in the Finite Element Method, Cengage Learning India Pvt. Ltd.
9 Zienkiewicz O. C., Taylor R. I., The Finite Element Method, Butterworth-Heinemann
10 Carlos A. Introduction to Finite Element Methods, Felippa
11 G. Lakshmi Narasaiah, Finite Element Application, BS Publications
12 Gokhale N. S., Deshpande S. S., Bedekar S. V. and Thite A. N., Practical Finite Element Analysis, Finite to Infinite, Pune

Elective – I

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

2) CRYOGENICS

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

INTRODUCTION TO CRYOGENIC:

History and development it's importance, cryogenic temperature scale. Behavior of materials at low temperature : Low temperature properties of materials, Mechanical properties Thermal properties, electric and magnetic properties, Properties of cryogenics& fluids.

UNIT 2

GAS LIQUIFICATION SYSTEMS:

Introduction- production of low temperature , Liquefaction systems for N2, Neon, Hydrogen, He etc.(Numerical Treatment)

UNIT 3

CRYO COOLERS:

Sterling, G-M and pulse tube cry coolers.

UNIT 4

GAS SEPARATION AND PURIFICATION SYSTEMS:

Thermodynamically ideal separation systems- properties ofmmixtures , principles of gas separation Rectification column- Linde single and double column system of air separation. Measurement Systems For Low Temperatures Measurement of different parameters at low temperature like temperature, pressure level mass flow rate etc.

UNIT 5

CRYOGENIC FLUID STORAGE AND TRANSFER SYSTEMS:

Dewar vessel, insulation types and importance. Components of transfer system with importance. Importance of vacuum and it's measurement.

UNIT 6

APPLICATION OF CRYOGENIC SYSTEMS:

Applications in mechanical, electrical, food preservation, biological and medical, space technology etc.

Reference and Text Books:

1 .Cryogenics systems – Randall Barron – Mc Graw Hill Book Co
2 .Cryogenic Engineering – R.B.Scott – Van Nosfrand Co.
3 .Cryogenic Engineering –J.H.Bell – Prentice Hall
4 Cryogenic Engineering – R.W.Vance – John Welley.
5 Cryocoolers - Walkers – Prentice Hill Publication

Elective – I

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

3) OPERATIONS RESEARCH

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

INTRODUCTION TO OPERATION RESEARCH

Development of operations Research, characteristics and scope of operations Research, Models in operations Research, Model Formulation, Types of mathematical models, Limitations of operations Research. L.P. models, simplex method, the algebra of simplex method. (Minimization and Minimization problems), The big M method, post optimality analysis, essence of duality theory, Application of sensitivity analysis.

UNIT 2

TRANSPORTATION AND ASSIGNMENT MODELS

Structure, industrial and business applications.

a) Transportation problems: Use of various methods for solving transportation problems, degeneracy and its solution.

b) Assignment problems: Solution of various types of problems, Traveling Salesman problem.

UNIT 3

FUNDAMENTALS OF CPM / PERT NETWORKS

CPM – construction of networks, critical path, forward and backward pass, floats & their significance, crashing for minimum cost and optimum and minimum duration, resource allocation and leveling.

PERT – Time Estimates, Construction of Networks, Probability of completing projects by given date.

UNIT 4

a)Sequencing: Sequencing of n jobs and 2 and 3 machines, 2 jobs and m machines.

b)Replacement Analysis: With and without time value of money, single item and group replacement.

UNIT 5

Inventory Models: Various costs involved, classification of models, EOQ model with and without shortage, EOQ with uniform demand and production lot size model, EOQ model with single price break.

UNIT 6

a) Decision Theory: Pay off and regret tables, decision rules, decisions under uncertainty and risk, decision tree.

b) Network Techniques: Shortest Path Model- Systematic Method, Dijkstra's Algorithm, Floyd's Algorithm

Reference and Text Books:

1) Introduction to O.R., 7/e (with CD) – Hamdy A. Taha, (PHI)
2) Quantitative Techniques in Management, 4/e - N.D. Vora. (TMH)
3) Introduction to O.R., 7/e (with CD) – Hillier & Lieberman (TMH)
4) Operations Research, 2/e – R. Panneerselvam (PHI)
5) Operations Research – Natarajan, A.M.; Balasubramani, P. & Tamilrasi, A. (Pearson Education)
6) Operations Research – J.K. Sharma. (Mac Millan)
7) Operations Research – P. Sankara Iyer (TMH- Sigma Series, 2008)
8) Operations Research – Principles & Practice - Ravindran, Phillips & Solberg (John Wily & Sons, Wiley India, 2006)
9) Introduction to Operations Research-Theory & Applications, - H.S. Kasana & K.D. Kumar, (Springer International Edition, 2005, Springer India)
10) Operations Research- Applications & Algorithms, 4/e, - Wayne L. Winston (CENGAGE Learning 2003)
11) Introduction to operation research By Hillier and Lieberman, McGraw-Hill
12) Operations Research By P.K. Gupta and D.S. Hira
13) Linear Programming -By N.P. Loomba

Elective – I

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

4) TRIBOLOGY

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

INTRODUCTION TO TRIBOLOGY

Introduction to Tribology, Tribology in design, Tribology in industry, economic aspects of Tribology, lubrication, basic modes of lubrication, lubricants, properties of lubricants - physical and chemical, types of additives, extreme pressure lubricants, recycling of used oils and oil conservation, disposal of scrap oil, oil emulsion. Types of sliding contact bearings, comparison of sliding and rolling contact bearings.

UNIT 2

FRICTION AND WEAR

Friction: Introduction, laws of friction, kinds of friction, causes of friction, friction measurement, theories of friction, effect of surface preparation.

Wear: Types of wear, various factors affecting wear, measurement of wear, wear between solids and liquids, theories of wear.

UNIT 3

HYDRODYNAMIC LUBRICATION

Hydrodynamic lubrication: Theory of hydrodynamic lubrication, mechanism of pressure development in oil film, two-dimensional Reynold„s equation, infinitely long journal bearing, infinitely short journal bearing, finite bearing.

Hydrodynamic thrust bearing: Introduction, flat plate thrust bearing, pressure equation, load, center of pressure, friction in tilting pad thrust bearing.

UNIT 4

HYDROSTATIC LUBRICATION

Hydrostatic lubrication: Basic concept, advantages and limitations, viscous flow through rectangular slot, load carrying capacity and flow requirement of hydrostatic step bearing, energy losses, optimum design of step bearing. Compensators and their actions.

Squeeze film lubrication: Introduction, circular and rectangular plates approaching a plane.

UNIT 5

ELASTO-HYDRODYNAMIC LUBRICATION AND GAS LUBRICATION

Elastohydrodynamic Lubrication: Principle and application, pressure - viscosity term in Reynold,,s equation, Hertz theory. Ertel-Grubin Equation.

Gas lubrication: Introduction, merits and demerits, applications.

Lubrication in metal working: Rolling, forging, drawing and extrusion. Bearing materials, bearing constructions, oil seals, shields and gaskets.

UNIT 6

SURFACE ENGINEERING

Introduction to surface engineering, concept and scope of surface engineering, manufacturing of surface layers, solid surface-geometrical, mechanical and physico chemical concepts, superficial-layer, development of concept, structure of superficial layer, general characteristics of superficial layer, obtained by machining, strengthening and weakening of superficial layer. Surface Engineering for Wear and Corrosion resistance: Diffusion, coating, electro and electro-less plating, hot deep coating, metal spraying, cladded coating, crystallizing coating, selection of coating for wear and corrosion resistance, potential properties and parameters of coating.

Reference and Text Books:

1. Cameron A., "Basic Lubrication Theory", Wiley Eastern Ltd.
2. B. C. Majumdar, "Introduction to Tribology and Bearings", S.Chand and Company Ltd. New Delhi
3. Fuller D. D., "Theory and Practice of Lubrication for Engineers", John Wiley and Sons
4. Halling J., "Principles of Tribology", McMillan Press Ltd.
5. B. Bhushan, B.K. Gupta, "Handbook of tribology: materials, coatings and surface treatments", McGraw-Hill
6. Davis J., "Surface Engineering for corrosion and Wear Resistance", Woodhead Publishing, 2001
7. V.B. Bhandari., "Design of Machine Elements" Tata McGraw Hill Pvt Ltd.
8. Tadausz Burakowski, "Surface Engineering of Metals: Principles, Equipments, Technologies", Taylor and Francis

Elective – I

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

5) PRODUCTION MANAGEMENT

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
PRODUCTION FUNCTION
Production types, objectives and scope of Production Management, Production Planning and Control (PPC)- Definition, elements, Activities of production planning and production control Interrelationship of Production with other functional areas.

UNIT 2
PRODUCTION/ OPERATION STRATEGY
Relevance, strategy formulation process, order qualifiers and order winners, attributes, strategic options for Operations- Product portfolio, process technology, capacity, Supply chain issues, Measures to ensure Optional Excellence, WCM practices.

UNIT 3
PRODUCT DESIGN AND DEVELOPMENT
Role of Product Development in competitiveness, Product Life Cycle (PLC), Product Development Process. Tools for efficient product development- FMECA, concurrent engineering, Design for Manufacturing Mass Customization Process Design Determinants of process characteristics- volume, variety, flow. Types of processes, choice of Process, equipment selection, use of BEP in selection process- product matrix. Estimation of Demand- Time series Analysis and causal forecasting techniques, Least square method, moving average and exponential smoothing forecasting method.

UNIT 4
CAPACITY AND AGGREGATE PLANNING
Capacity- Definition, Measure of Capacity, capacity strategies Estimation of number of machines, Overcapacity and under capacity factors, Aggregate Planning, Aggregate Planning Strategies, Pure and mixed strategies, Use of transportation model approach to aggregate planning , Scheduling of Operations Loading, scheduling and sequencing, Priority sequencing rules. Sequencing problems, n job 2 machines, n Job

'3' machines. Forward and backward scheduling, critical ratio scheduling, Production Control Activities

UNIT 5.

Supply chain Management :

Concept of supply chain and supply chain management, Manufacturing supply chain, SCM activities Supply chain strategies, Managing supply chain, Measuring supply chain performance

Just in Time and Lean Manufacturing:

JIT Philosophy, origin and core logic of JIT, Elements of JIT, Kanban System-Design of Kanban containers, JIT. Implementation issues and performance, Lean Manufacturing- Pillars, features and process comparison with Traditional Manufacturing. .

Total Productive Maintenance and Replacement Introduction, Definition, six big losses, stages of maintenance, pillars stages of TPM Development,

UNIT 6.

a) Inventory management: Aims, buffer stocks, lead time, ROL, fixed order quantity system, periodic review system, Selective Inventory Control Techniques - ABC and VED analysis, JIT manufacturing / purchasing, Stores management: objectives, functions, procedure, documentation, stock taking and reconciliation

b) **Human Consideration in production management:** Industrial Psychology – Introduction, motivational factors, behavioral aspects, grievances, working conditions, safety; shop supervisor's role in above functions.

Reference and Text Books:

1) Production Planning & Control – Samuel.Eilon (Universal)
2) Production Systems – James L. Riggs (Wiley)
3) Production Management – Lockyer (ELBS)
4) Production Handbook – Carson, Boltz & Young (Ronald Press)
5) Production Management – R. Mayer (McGraw Hill)
6) Operations Management: Strategy & Analysis, 6/e – Krajewsky, Ritzman (Pearson Education)
7) Modern Production Management – E.S. Buffa (John Wiley)
8) Production Management – Burbridge (ELBS)
9) Operation Management – Schroeder (McGraw Hill)
10) Stores Management – K.S. Menon (Mac Millan)
11) Just In Time Manufacturing – Korgaonkar (Mac Millan)
12) Supply Chain Management; Strategy, Planning & Operation – Sunil Chopra, Peter Meindl (Pearson Education Asia)

13) Logistics Engineering & Management – Bejamin S. Blanchard (Pearson Education Asia)
14) Total Quality Management - R S Naagarazan, A A Arivalagar (Publisher-New Age International)
15) Stein, R. E., (1996) Re-engineering the manufacturing system: applying the theory of
constraints (TOC). Marcel Dekker.
16)Operations Management – B. Mahadevan, (Pearson Education)
17) Operations Management- Haizer & Render, (Pearson Education)
18) Martand Telsang – Industrial Engineering & Production Management, S Chand & Company New Delhi (2009)

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

Laboratory

REFRIGERATION AND AIR CONDITIONING

Teaching Scheme: P: 2 hrs/week	**Credits: 1**
Evaluation Scheme: IPE : 50	**Minimum Passing Marks: 20**
EOE: 50	**Minimum Passing Marks: 20**

The term work shall consist of a record based on following experiments;

1. Trial on vapour compression refrigeration system.
2. Trial on vapour absorption refrigeration system.
3. Trial on Ice plant.
4. Study and trial on cascade system
5. Trial on Air conditioning system.
6. Study / Trial on heat pump.
7. Study and demonstration of controls in refrigeration
8. Industrial Visit related to refrigeration & air conditioning system.

Shivaji University, Kolhapur

Department of Technology
Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

Laboratory
Manufacturing Engineering – III

Teaching Scheme: P: 2 hrs/week **Credits: 1**
Evaluation Scheme: EOE: 50 **Minimum Passing Marks: 20**

Term work comprises of assignments on each unit.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

Laboratory
HYDRAULICS AND PNEUMATICS

Teaching Scheme: P: 2 hrs/week **Credits: 1**
Evaluation Scheme: EPE: 50 **Minimum Passing Marks: 20**

Term Work:

1. Study and Demonstration of basic hydraulic and pneumatic system.
2. Study and Demonstration of ISO/JIC Symbols for hydraulic and pneumatic systems.
3. Study and Demonstration of different types of valves used in hydraulic and pneumatic system.
4. Study and Demonstration of accumulators/actuators/intensifiers/hydraulic and pneumatic power brakes.
5. At least five circuit preparations on hydraulic trainer kit.
6. At least five circuit preparations on pneumatic trainer kit.
7. At least two Circuit preparations using Fluid Simulation Software.
8. Design of hydraulic / pneumatic system and related components for any one of the following:
    1) Shaping machine
    2) Broaching machine
    3) Slotting machine
    4) Hydraulic clamps
    5) Pneumatic clamp
    6) Any one industrial application.
9. Industrial visits are recommended for applications of pneumatic and hydraulic system and their reports.

Shivaji University, Kolhapur

Department of Technology
Second Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

Laboratory
MAJOR PROJECT (PHASE I)

Teaching Scheme: P: 2 hrs/week **Credits: 3**
Evaluation Scheme: IOE: 50 **Minimum Passing Marks: 20**

Objectives:

1. To provide an opportunity to students do work independently on a topic/ problem/ experimentation selected by them and encourage them to think independently on their own to bring out the conclusion under the given circumstances of the curriculum period in the budget provided with the guidance of the teachers.

2. To encourage creative thinking process to help them to get confidence by planning and carrying out the work plan of the project and to successfully complete the same, through observations, discussions and decision making process.

Project Load:
Maximum 9-10 students in one batch, involving 03 groups. Maximum 9-10students shall work under one Faculty Member. Group of one student is not allowed under any circumstances.

Project Definition:
Project work shall be based on any of the following:
1. Fabrication of product/ testing setup of an experimentation unit/ apparatus/ small equipment, in a group.
2. Experimental verification of principles used in Mechanical Engineering Applications.
3. Projects having valid database, data flow, algorithm, and output reports, preferably software based.

Project Term Work:
The internal oral evaluation of students' work carried out under project first phase submitted by students shall include and assessment of work done by the students in the light of
1. Searching suitable project work
2. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring out the project.
3. Brief report of feasibility studies carried to implement the conclusion.
4. Rough Sketches/ Design Calculations, etc.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VII)

Laboratory

REPORT OF INDUSTRIAL TRAINING

Teaching Scheme: P: -- hrs/week **Credits: No Credit**
Evaluation Scheme: IOE: 50 **Minimum Passing Marks: 20**

Training Report:

Maximum fifteen students in one batch, involving three groups of maximum five students, shall work under one teacher. The same group shall work for project under the same guide. However, each student should have different industrial training report and its presentation. The report should be of 20 to 30 pages. For standardization of the report the following format should be followed as per instructions given.

1 Page size : Trimmed A4
2. Top Margin : 1.00 Inches
3. Bottom Margin : 1.32 Inches
4. Left Margin : 1.5 Inches
5. Right Margin : 1.0 Inches
6. Para Text : Font - Times New Roman; 12 point
7. Line Spacing : 1.5 Lines
8. Page Numbers : Right aligned and in footer.
9. Headings : Font Times New Roman; 12 point
   New Times Roman, 14 point, Boldface
10. Certificate : All students should attach standard format of the entire report should be in given format

1. "Name of Industry with address along with completed training certificate"
2. Area in which Industrial training is completed

Marking Scheme:

Training Report: 10 marks
Presentation: 15 marks
All students have to present their reports individually before the faculty members.

Shivaji University, Kolhapur

Department of Technology
Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

AUDIT COURSE V
CONSTITUTION OF INDIA

Teaching Scheme: L: 2hrs/week **Credits: No Credits**

UNIT 1
Preamble to the constitution of India. Fundamental rights under Part – III – details of Exercise of rights, Limitations & Important cases.

UNIT 2
Relevance of Directive principles of State Policy under Part – IV. Fundamental duties & their significance.

UNIT 3
Union Executive – President, Prime Minister, Parliament & the Supreme Court of India.

UNIT 4
State executive – Governors, Chief Minister, State Legislator and High Courts.

UNIT 5
Constitutional Provisions for Scheduled Castes & Tribes, Women & Children & Backward classes. Emergency Provisions.

UNIT 6
Electoral process, Amendment procedure, 42nd, 44th, 74th, 76th, 86th and 91st Constitutional amendments.

Text Book:

1. Durga Das Basu: "Introduction to the Constitution of India"(Students Edn.) Prentice – Hall EEE, 19th/20th Edn., 2001.
2. R.C.Agarwal, "Indian Political System", (1997) S.Chand and Company, New Delhi.
3. Maciver and Page, "Society: An Introduction Analysis", Mac Milan India Ltd., New Delhi.
4. K.L.Sharma, "Social Stratification in India: Issues and Themes",(1997), Jawaharlal Nehru University, New Delhi.
5. M Laxmikanth, "" Indian Polity" Tata McGraw Hill Education Private Limited, Third Edition.

Reference Book:

1. An Introduction to Constitution of India" by M.V.Pylee, Vikas Publishing, 2002.
2. Sharma, Brij Kishore, "Introduction to the Constitution of India:, Prentice Hall of India, New Delhi.
3. U.R.Gahai, "(1998) Indian Political System ", New Academic Publishing House, Jalaendhar.
4. R.N. Sharma, "Indian Social Problems ", Media Promoters and Publishers Pvt. Ltd.
5. Yogendra Singh, "(1997) Social Stratification and Charge in India ", Manohar, New Delhi.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

AUTOMOBILE ENGINEERING

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
INTRODUCTION
Vehicle specifications, classifications, chassis layout, frame main components of automobile and articulated vehicles. Engine cylinder arrangements, Design considerations, materials and their properties. Power requirements, motion resistance and power loss; tractive efforts and vehicle performance curves.

UNIT 2
STEERING AND SUSPENSION SYSTEMS
Steering system, principle of steering, centre point steering, steering linkages, steering geometry and wheel alignment, power steering. Suspension system, need, types, independent suspension, coil and leaf springs, suspension systems for multi, axle vehicles, trouble shooting and remedies.

UNIT 3
TRANSMISSION SYSTEM
Clutches: need, types. Need of gearbox, types of gear transmission, shift mechanisms, over running clutch, fluid coupling, and torque converters. Transmission universal joint, constant velocity joint, propeller shaft, Hotchkiss drive , torque tube drive, front and rear axles types , stub axles , need of differential and types , four wheel drive.

UNIT 4
BRAKES, WHEELS AND TYRES:
Brakes, need, types, Mechanical, hydraulic and pneumatic brakes, disc and drum types, their relative merits, details of components, brake adjustments and defects, power brakes. Wheels and Tyres: Types, tyre construction, specification, tyre wear and cause, wheel balancing.

UNIT 5
ELECTRICAL SYSTEMS
Electrical systems – construction, operation and maintenance of lead acid batteries – battery charging system – principle and operation of cutout and regulators –starter motor– Bendix drive – solenoid drive – magneto coil and solid stage ignition systems

– ignition-timing – lighting and electrical accessories – automobile air conditioning – panel board instruments.

UNIT 6

VEHICLE TESTING AND MAINTENANCE

Need of vehicle testing, vehicle tests standards, different vehicle tests. Maintenance – trouble shooting and service procedure – over hauling –engine tune up, tools and equipment for repair and overhaul – organization and management of service station – testing equipments. Pollution due to vehicle emissions and exhaust emissions control systems and regulations. Selection of power unit and engine performance characteristics troubleshooting and rectification, engine tuning and servicing**.**

Text Books:

1. Automobile Engineering by Dr. Kirpal Singh (Vol. I & II) Standard Publishers
2. Automobile Engineering by G.B.S. Narang.
3. Automotive Technology by H.M. Sethi.
4. Automobile Engineering by Banga & Singh
5. Joseph Heitner'Automotive Mechanics', 2nd Ed., Affiliated Eastern Law house, 1967.
6. Dolan. J.A., 'Motor Vehicle Technology and Practical Work', ELBS, 1978

Refrence Books:

1. Motor Vehicles, Newton & Steed
2. Motor Manuals (Vol I to VII), A.W. Judge.
3.Automobile Mechanics, W.H. Crouse. McGraw Hill Publishing Co.
4. Automobile Mechanics; N. K. Giri

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

TOTAL QUALITY MANAGEMENT

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Quality basic concepts – various definitions and their implications. ISO definition of quality. Quality cost estimation and reduction. Q.A. system: Concept of total quality, role and objectives of Q.A. Q.A. cycle, process approach to Q.A. (input-process-output), significance of feedback, internal customer Approach.

UNIT 2

Planning for quality – specifications of quality, planning for specification of processes, planning through trial lots, information feedback, field complaints analysis, defect prevention programs, quality planning with vendors, vendor control procedures, vendor rating. Controlling techniques for quality – significance of N-D curve, SPC, problem solving QC tools, process capability analysis, six sigma-concept, need, implementation, DPMO, gradation.

UNIT 3

Product and system reliability : Basic concepts, prediction and evaluation of parallel, series and combined system reliability, reliability tests (life testing , burn-in test, accelerated life testing) Taguchi's quality engineering : Taguchi's quality philosophy, system design, parameter design, tolerance design, orthogonal arrays, S/N ration, loss functions.

UNIT 4

Principles of TQM : Concept and definition of TQM, principles, Models, characteristics, and benefits of TQM. Approaches to TQM : Deming's approach, Juran's triology, Crosby and quality improvement, Ishikawa's CWQC, Feigenbaum's theory of TQC.

UNIT 5

The essential's of TQM : Customer focus,- customer perception of quality, customer satisfaction, Kano's model of satisfaction, customer retention,. TQM leadership,- role and commitment and accountability of leadership, quality policy and objectives, organizational structure for TQM, role of HR in TQM, training for TQM, developing

quality culture. Tools and techniques for TQM: 5-S campaign, TEI, quality circles, QFD, FMEA; and FTA, Poka-Yoke, KAIZEN

UNIT 6

TQM in service sector : Definition and meaning and service, problems in defining service quality, attributes of service quality, SERVQUAL model, Implementing TQM in service industries, measurement system for service quality.

ISO 9001:2008 series of standards : Structure of ISO 9001:2008 series standards, clauses, contents, interpretation and implementation, audit

Reference and Text Books:

1. Grant E.L. Statistical Quality Control- McGraw Hill Book Company, New York.
2. Juran J.M & Gryna Quality Planning and analysis
3. Total Quality Control Feigenban - McGraw Hill Book Company, New York
4. ISO-9000- Preparing for registration Lamprecht
5. Implementing Total Quality-Joe Culle
6. ISO9000 Quality System – Dalela
7. SQC-R.C.Gupta.
8. Dale H. Besterfilee, "Total Quality Management", Pearson Education
9. Tapan Bagchi, " Taguchi Methods Explained".
10. Amitava Mitra, " Fundamentals of Quality Control and Improvement", Pearson Education
11. Introduction to Statistical Quality Control Montgomery Willey India
12. Quality Control by Kulkarni Bewoor Willey India
13. Total Quality Management by Senthil Arasu/Paul SCITECH publication

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

MECHATRONICS AND ROBOTICS

Teaching Scheme: L : 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

MECHATRONICS

UNIT 1

Introduction to Mechatronics: What is mechatronics, Mechatronic systems, Measurement systems, Control systems, micrpoprocessor based controllers, multi discipline scenario

Signal conditioning process, Operational amplifier (inverting amplifier, non-inverting amplifier, summing, integrating amplifier), protection, filtering, data acquisition, multiplexer, analog to digital converter (ADC), digital to analog converter (DAC).

UNIT 2

Position Sensors: Limit switch, photoelectric switches, proximity sensors, pneumatic limit valves and backpressure sensors, pressure switches, resolvers, incremental & absolute encoders, decoders & relays. Displacement: Potentiometer sensors, LVDT, capacitive displacement sensors. Velocity sensors: Tachogenerator, use of encoders,

Digital logic, number systems, logic gates, Boolean algebra, application of logic gates, sequential logic, flip flop, D flip flop, JK flip flop, Master slave flip flop.

UNIT 3

Programmable Logic Controllers(PLC):Introduction, definition and history of PLC, PLC system and components of PLC input output module, PLC advantages and disadvantages.

Ladder diagram & PLC programming fundamentals: Basic components and other symbols, fundamentals of ladder diagram, machine control terminology, update – sole ladder – update, physical components Vs. program components, light control example, internal relays, disagreement circuit, majority circuit, oscillator, holding (sealed or latches) contacts, always ON always OFF contacts, Nesting of ladders.

PLC programming: PLC input instructions, outputs, coils, indicators, operational procedures, contact and coil input output, programming example, fail safe circuits, simple industrial applications.

ROBOTICS

UNIT 4

Fundamentals of Industrial Robots: Specifications and Characteristics, Criteria for selection. Robotic Control Systems: Drives, Robot Motions, Actuators, Power transmission systems; Robot controllers, Dynamic properties of robots-stability, control resolution, spatial resolution, accuracy, repeatability, compliance, work cell control, Interlocks

UNIT 5

Robotic End Effectors and Sensors: Transducers and sensors- sensors in robotics & their classification, Touch (Tactile) sensors, proximity and range sensors, force and torque sensing, End Effectors- Types, grippers, Various process tools as end effectors; Robot- End effector interface, Active and passive compliance, Gripper selection and design.

UNIT 6

Robot Programming: Lead through method, Robot program as a path in space, Methods of defining positions in space, Motion interpolation, branching; Textual robot programming languages-VAL II.

Robot Applications: Material transfer, machine loading unloading and processing applications.

Reference and Text Books:

1. Mechatronics – W. Bolton, Pearson education
2. Mechatronics – Mahalik, TATA McGraw Hill
3. Microprocessor 8085 – Gaokar
4. Mechatronics – Appu Kuttam, Oxford publications
5. Automated Manufacturing systems, S. Brain Morris, McGRaw Hill
6. Introduction to PLC programming, NIIT, P
7. Programmable logical controller, Hackworth & Hackworth, Pearson Education
8. Programmable logical controller, Reis Webb, Prentice Hall
9. Groover, M.P., (2004), "Automation, Production Systems & Computer Integrated Manufacturing" 2/e, (Pearson Edu.) ISBN: 81-7808-511-9
10. Groover, M.P.; Weiss, M.; Nagel, R.N. & Odrey, N.G. "Industrial Robotics, Technology, Programming & Applications", (McGraw Hill Intl. Ed.) ISBN:0-07-024989-X
11. Fu, K.S.; Gonzalez, R.C. & Lee, C.S.G. "Robotics-Control, Sensing, Vision and Intelligence", (McGraw Hill Intl. Ed.) ISBN:0-07-100421-1
12. Keramas, James G. (1998), " Robot Technology Fundamentals",(Thomson Learning-Delmar) ISBN: 981-240-621-2
13. Noff, Shimon Y. "Handbook of Robotics", (John Wiley & Sons)

14. Niku, Saeed B. (2002), "Introduction to Robotics, Analysis, Systems & Applications", (Prentice Hall of India)
15. Koren, Yoram "Robotics for Engineers", (McGraw Hill)
16. Schilling, Robert J.(2004), "Fundamentals of Robotics, Analysis & Control", (Prentice Hall of India), ISBN: 81-203-1047-0
17. Introduction To Robotics Mechanics & Control 3e by J J Craig Pierson Education
18. Applied Robotics Volume I & II by Edwin Wise Cengage Learning.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

POWER PLANT ENGINEERING

Teaching Scheme: L: 3 hrs/week			**Credits: 3**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Introduction: Resources and development of power in India, NTPC, NHPC and their role in Power development in India, Power generation in Private sector, Power distribution, National Grid, Indian Electricity Grid Code, Structure of IEGC, Operating Policies and Procedures, Present Power position in India and Maharashtra.

Power Plants Introduction, Factors affecting Selection of Site, Schematic Diagrams and relative merits of steam, Gas, Diesel, Hydro Power Plants, carbon credits.

UNIT 2

Steam turbine power plant

Introduction, general layout of modern thermal power plant, construction and working of steam power plant, condenser efficiency , vacuum efficiency (with numerical treatment), necessity of feed water treatment, high pressure boilers and importance of water purity, effect of operating variable on thermal efficiency, regeneration, reheating, Cogeneration power Plant

Gas turbine power plant

Introduction, general layout of gas turbine power plant, construction and working of gas power plant, effect of operating variable on thermal efficiency, regeneration, reheating, performance of closed and semi closed cycle gas turbine plant.

UNIT 3

Nuclear power plant

Elements of nuclear power plant, nuclear reactor and its types, fuels moderators, coolants, control rod, classification of nuclear power plants, waste disposal.

Diesel Power Plant: Diesel engine performance and operation, plant layout, log sheet, application, selection of engine size.

UNIT 4

HYDROELECTRIC POWER PLANT

Hydroelectric Power Plant: site selection, classification of HPP, and their field of use, capacity calculation for hydro power, dam, head water control, penstock, water

turbines, specific speeds, governors, hydro electric plant auxiliaries, plant layout, automatic and pumped storage, project cost of hydroelectric plant. Advantages of hydro power plant

UNIT 5

ENVIRONMENTAL ASPECTS IN POWER STATION

Environmental aspects: Introduction, Constitutes of the atmosphere, Different pollutants due to thermal power plant and their effect on human health, environmental control of different pollutants such as particulate matter, oxides of sulphur (Pre and Post Treatments) oxides of Nitrogen ,Global warming and green house effect, Thermal Pollution of Water and its control.

UNIT 6

ECONOMIC ANALYSIS AND ENERGY AUDIT AND ENERGY MARKETING

Introduction Cost of electric Energy, Fixed and operating cost, Selection and Type of Generation, Selection of generation equipment, Performance and Operation Characteristics of power plants and Tariff methods.

Energy Audit and Energy Marketing: Selling and marketing in India, Creating supply chain in India, Successfully working with business and virtual teams in India, Navigating the financial, legal and accounting environment, Human Resources issues, India's business culture in transition.

Reference and Text Books:

1. Domkundwar and Arora "Power Plant Engineering", Dhanpat Rai and Sons, New Delhi
2. E.I. Wakil, "Power Plant Engineering", Publications, New Delhi
3. P. K. Nag, "Power Plant Engineering", Tata McGraw Hill, New Delhi
4. R. K. Rajput," Power Plant Engineering", Laxmi Publications, New Delhi.
5. R. Yadav - Steam and Gas turbines, central publishing house, Allahabad
6. G. D. Rai Non conventional energy sources,

Elective – II

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

1) COMPUTATIONAL FLUID DYNAMICS

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
BASIC CONCEPTS
Thermodynamics laws and relation, Energy equation, Continuity equation, Momentum equation, Mach number, Mach angle, various regions of flow.

UNIT 2
One Dimensional Isentropic Flow: Adiabatic flow and reference speed, Relation between M and M, Fllegnerl's formula, Impulse function, Gas tables and charts, Performance of convergent- divergent nozzle.

UNIT 3
NORMAL SHOCK
Fanno process, Rayleigh process, Formation of shock wave, Prandtimeyer relation, pressure and temperature ratios across the shock, Stagnation pressure loss and increase in entropy, Supersonic diffusers. Introduction, Governing equations, Prandtl relation, oblique shock relation, Mach angle and Mach waves, the shock polar.

UNIT 4
FLOW WITH FRICTION
Governing equation, Fanno equation, Change in entropy, isothermal flow. Governing equation, Rayliegh equation, Maximum enthalpy point, Maximum entropy point, Valuation of fluid properties, Maximum heat.

UNIT 5
Equation of motion in cartesion co-ordinates, continuity equation, momentrim equation, Vortices components, radial and tangential accelerations, Velocity potential, Stream function and its equation

UNIT 6
MEASUREMENT TECHNIQUES
Wind tunnel, Suction tunnel, Supersonic tunnel, Shock tube, Flow visualization, Smoke techniques, Liquid film method, Measurement of Velocity, Measurement of Flow.

Reference and Text Books:

1) Suhas V Patankar, "Numerical Heat Transfer and Fluid Flow", Taylor and Francis
2) J. D. Anderson, "Computational Fluid Dynamics - The Basics With Appications", McGraw Hill
3) C T Shaw, "Using Computational Fluid Dynamics"
4) H K Versteeg, W Malalasekera ,"An introduction to Computational Fluid Dynamics"
5) P S Ghoshdastidar, "Computer simulation of flow and heat transfer"
6) Jiyuan Tu, Guan Heng Yeah, C Liu, "Computational Fluid dynamics", Elsevier
7) T. J. Chung, "Computational Fluid dynamics", Cambridge University Pres.
8) Charles Hirsch, "Numerical Computation of Internal and External Flows", Vols I and II, Wiley
9) Sengupta Tapan K., Fundamentals of Computational Fluid Mechanics, University Press, 2005.
10) Pradeep Niyogi, S. K. Chakravarti and M. K. Laha; „Introduction to Fluid dynamics", Person Education, 2005

Elective – II

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

2) VIBRATIONS AND NOISE

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Importance & scope, Concepts & terms used, SHM, Vector and Complex method of representing vibration, Fourier series & harmonic analysis.

Single DOF system: (a) Damped free vibrations, Types of damping, Logarithmic decrement, Coulomb damping, and damping materials.(b) Forced Vibrations: Types of excitation, Forced excitation, Support excitation, Excitation due to unbalance in machines, Response due to above types of excitations, transmissibility, Force transmissibility & motion transmissibility, Vibration isolators, commercial isolation materials & shock mounts. (c) Forced vibrations of un-damped systems due to non-harmonic excitations.

UNIT 2

TWO DOF SYSTEM:

(a) Free un-damped vibrations – Principal modes and natural frequencies, Co-ordinate coupling and principal co-ordinates. (b) Forced vibrations (Undamped) – Harmonic excitation, Vibration, Dampers & absorbers, Dynamic vibration absorber – Tuned & Untuned type.

UNIT 3

Introduction to Numerical Methods in Vibration Holzer method, Raleigh's method, Matrix iteration method.

UNIT 4

VIBRATION MEASURING INSTRUMENTS

Instruments for measurement of displacement, velocity, acceleration & frequency of vibration, Sensors and Actuators, Introduction of X – Y plotter, Spectral analyzers, FFT analyzer.

UNIT 5

Sound level & subjective response to sound, Frequency dependent human response to sound , Sound pressure dependent human response ,Decibel scale, Relation among sound power, Sound intensity & sound pressure level, Octave band analysis.

UNIT 6

NOISE- EFFECTS, RATING and REGULATION

Non auditory effects of noise on people, Auditory effects of noise, Noise standards & limits, Ambient emission noise standards in INDIA, Hazardous noise explosion, Day night noise level, Noise sources &control.

Reference and Text Books:

1 Mechanical Vibration by G. K. Grover, Published by Nemchand & Brothers, Roorkee
2 Mechanical Vibration – Austin Church, Wiely Eastern.
3 Schaumm's Outline series in Mechanical Vibration by S. Graham Kelly
4 Mechanical Vibration by Dr. V. P. Singh, Published by S. Chand & Sons New Delhi.
5 Noise and vibration control by Leo L. Bernack, Tata Mc- Graw Hill Publication
6 Machanical vibration & noise engineering by A.G.Ambekar prentice hall of INDIA
7 Kinematics,Dynamics and Design of Machinery

Elective – II

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3) NANO TECHNOLOGY

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1

Introduction to Nanotechnology: What is Nanotechnology, Nanoscale, consequences of the nanoscale for technology and society, Beyond Moore's Law.

UNIT 2

Technologies for the Nanoscale: Top-down versus bottom –up assembly, Visualisation.

UNIT 3

Manipulation and characterization at the nanoscale, proximal probe technologies, Selfassembly, Biomimetic systems. Assemblers.

UNIT 4

Nanoscale Manufacturing : Nano manipulation, Nanolithography.

UNIT 5

Nanoscale Material and Structures: Nano composite, Safety issues with nanoscale powders, Quantum wells, wires dotes and nanoparticles.

UNIT 6

Applications : Applications in Energy, Tribology, Informatics, medicine, etc…

Reference and Text Books:

1. David ferry, transports in nanostructures, Cambridge University Press, 2000.
2. Engine of Creation, K E Drexler, Oxford Paperbackes, New York (1996).
3. Y.Imry, Introduction to Mesoscopic Systems, Cambridge University Press, 1997
4. S.Datta, Electron Transport in mesoscope Systems, Cambridge University Press, 1995
5. H.Grabert and M. Devoret, Single Charge Tunneling, Plenum Press, 1992.
6. Beenaker and Van Houten, Quantum Transportun Semiconductor Nanostructures, in solid state physics v. 44, eds. Ehernreich and Turnball, Academic Press, 1991.

7. P.Rai- Choudhury, Handbook of Microlithography, Micromachining & Microfabrication, SPIE,1997.
8. Nanosystems: Molecular Machinery, Manufacturing & Computation, K E Drexler, (Wiley),1992, ISBN 0471575186
9. Our Molecular Furure: How Nanotechnology, Robotics, Genetics and Artificial Intelligence will transform the World, Prometheus (2002) ISBN 1573929921
10. Web Resources: www.nanotechweb.

Elective – II

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

4) MACHINE TOOL DESIGN

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
DRIVES
Design considerations for drives based on continuous and intermittent requirement of power, Types and selection of motor for the drive, Regulation and range of speed based on preferred number series, geometric progression. Design of speed gear box for spindle drive and feed gear box.

UNIT 2
DESIGN OF MACHINE TOOL STRUCTURE
Analysis of forces on machine tool structure, static and dynamic stiffness.
Design of beds, columns, housings, bases and tables.

UNIT 3
DESIGN OF GUIDE-WAYS
Functions and types of guide-ways, design criteria and calculation for slide-ways, design of hydrodynamic, hydrostatic and aerostatic slide-ways, Stick-Slip motion in slide-ways.

UNIT 4
DESIGN OF SPINDLES, SPINDLE SUPPORTS AND POWER SCREWS
Design of spindle and spindle support using deflection and rigidity analysis, analysis of anti-friction bearings, preloading of antifriction bearing.
Design of power screws: Distribution of load and rigidity analysis.

UNIT 5
DYNAMICS OF MACHINE TOOLS
Dynamic characteristic of the cutting process, Stability analysis, vibrations of machine tools. Control Systems, Mechanical and Electrical, Adaptive Control System, relays, push button control, electrical brakes, drum control.

UNIT 6

SPECIAL FEATURES IN MACHINE TOOL DESIGN

Design considerations for SPM, NC/CNC, and micro machining, Retrofitting, Recent trends in machine tools, Design Layout of machine tool using matrices.

Step-less drives Design considerations of Step-less drives, electromechanical system of regulation, friction, and ball variators, PIV drive, Epicyclic drive, principle of self locking,

Reference and Text Books:

1. N.K. Mehta, "Machine Tool Design", Tata McGraw Hill, ISBN 0-07-451775-9.
2. Bhattacharya and S. G. Sen., "Principles of Machine Tool", New central book agency Calcutta, ISBN 81-7381-1555.
3. D. K Pal, S. K. Basu, "Design of Machine Tool", 4th Edition. Oxford IBH 2005, ISBN 81-204-0968
4. N. S. Acherkan, "Machine Tool", Vol. I, II, III and IV, MIR publications.
5. F. Koenigsberger, "Design Principles of Metal Cutting Machine Tools", The Macmillan Company New York 1964

Elective – II

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

5) FLEXIBLE MANUFACTURING SYSTEMS

Teaching Scheme: L: 4 hrs/week			**Credits: 4**
Evaluation Scheme:	**CIE**	**SEE**	**Minimum Passing Marks**
	(25 + 25)	**50**	**40**

UNIT 1
INTRODUCTION
Flexible and rigid manufacturing, Concept of F.M. Cell and F.M. System, Functions of a manufacturing cell, Types and components of FMS, Tests of flexibility, Group Technology and FMS, Optimization of FMS, Tasks in selection of FMS.

UNIT 2
CONTROL STRUCTURE OF FMS
Architecture of typical FMS, Automated work piece flow in FMS, Hierarchical control system architecture of FMS – Factory level, Cell level and Equipment level; Factory networks, Distributed Numerical Control (DNC), unmanned operation, FMS Diagnostics.

UNIT 3
TOOLING AND FIXTURING IN FMS
A. Tooling in FMS: Tool holders for CNC machines, modular tooling, tool monitoring; preset, offset and wear compensation values, robotized tool assembly, tool database, tool management system, tool flow control in FMS

B. Fixturing in FMS: Palletizing of parts, pallet pool, flexible fixturing – principles and methodologies, standard fixtures, modular fixturing system – T-slot based and dowel pin based and their components; Computer aided fixture design – approaches, use of GT in fixture design – fixture design process, fixturing structure and fixturing information tree, fixture database

UNIT 4
DATABASE MANAGEMENT SYSTEMS IN FMS
Conceptual DBMS, types of data structures and their applications in FMS, Integrated DBMS in FMS and its implementation

UNIT 5

MATERIAL HANDLING IN FMS

Functions of an integrated material handling system in FMS, Flexibilities in material handling, Layouts in FMS, Industrial robots for load / unload applications, Robotic cell layouts; Automatically Guided Vehicles (AGVs) – types, Control of AGVs- Wire guided, optically guided, dead reckoning, free ranging AGVs, Scheduling of AGV, Storage and retrieval machines in AS/RS.

UNIT 6

DESIGNING AND SIMULATING FMS

Need, techniques, inputs, procedure, performance analysis, Simulation of FMS shop, using Simulation software package (like ARENA or FLEXSIM) including various modules like Arrive, Server, Depart, Simulate modules, Creating models of FMS shops and simulating the performance to obtain output results

Reference and Text Books:

1. Ranky, Dr. Paul, (1984), "The Design & Operation of FMS",
2. Groover, Mikell P., 3/e, "Automation, Production Systems & Computer Integrated Manufacturing", Pearson Education or PHI
3. Viswanadhan, N. & Narahari, Y., "Performance Modelling of Automated Manufacturing Systems" 2/e, PHI
4. Pinedo, Michael & Chao, Xiuly (1999), "Operations Scheduling with Applications in Manufacturing & Services", McGraw Hill International Editions (with LEKIN Scheduling Software, also available on INTERNET)
5. Kelton, Sadowsky & Sadowsky, "Simulation with ARENA",2/e, McGraw Hill International Editions (with CD of ARENA Simulation Software)
6. CAD/CAM/CIM, 3/e – Radhakrishnan, Subramanayam & Raju (New Age International)
7. Rao, PN, Tewari NK, Kundra TK, "Computer Aided Manufacturing", TMH
8. Rong, Yeming; "Computer Aided Fixture Design", Marcel Dekker, ISBN 0-8247-9961-5
9. Sewik, "Production Planning & Scheduling in Flexible Assembly Systems", Springer Verlag, ISBN 3-540-64998-0
10 Koren, Y.: Computer Control of Manufacturing Systems. McGraw-Hill Book Co., New York,
11. Computer Aided Manufacturing - Chang, Wysk & Wong (Prentice Hall of India)
12. Changeable and Reconfigurable Manufacturing Systems (Springer Series in Advanced Manufacturing) (Ed. Hoda A. Elmaraghy)
13. Computer Integrated Manufacturing- A. Alavudeen & N.Venkateshwaran, (2008), (PHI), ISBN-978-81-203-3345-1
14. Planning and Scheduling in Manufacturing and Services- Pinedo, Michael, (2005), Springer, ISBN 0-387-22198-0 (with CD)

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Department of Technology
Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

Laboratory
AUTOMOBILE ENGINEERING

Teaching Scheme: P: 2 hrs/week **Credits: 1**
Evaluation Scheme: EOE: 50 **Minimum Passing Marks: 20**

Term work:

1. Study and demonstration of four wheeler chassis layout. Two-wheel & four-wheel drive layouts.
2. Study and Demonstration of working of single plate automobile clutch.
3. Study and demonstration of synchromesh gearbox.
4. Study and demonstration of final drive and differential.
5. Study and demonstration of working Hydraulic braking system.
6. Study and demonstration of front wheel steering geometry and steering mechanism.
7. Study and demonstration of suspension system of a four-wheeler.
8. Study and demonstration of battery, electrical starting, charging system.
9. Study of Fuel Injection Systems
10. Study of Car AC
11. Visit to servicing station for study of vehicle maintenance, wheel balancing & front wheel alignment, repairs with relevant visit report.

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Department of Technology
Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

Laboratory
MECHATRONICS AND ROBOTICS

Teaching Scheme: P: 2 hrs/week **Credits: 1**
Evaluation Scheme: EOE: 50 **Minimum Passing Marks: 20**

The term work comprises of experiments and assignments selected from the following topics

1. One assignment on "Introduction to PLC"
2. One experiment on PLC programming examples for simple sequence control.
3. One experiment based on Timers and Counters
4. One assignment on Microprocessor and Microcontroller.
5. Design and testing of circuits for Trainer Robots by modifying the basic model with the use of sensors.
6. Programming of Industrial Robot for understanding Manipulator Mechanism Design, Programming, Controls, etc
7. Simulation of robotic system using suitable simulation software.
8. Industrial Visit for observing recent updates in the fields of Robotics.

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Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

Laboratory

POWER PLANT ENGINEERING

Teaching Scheme: P: 2 hrs/week **Credits: 1**
Evaluation Scheme: EOE: 50 **Minimum Passing Marks: 20**

Assignments on each unit / Industrial visit to study principles underlying in subject.

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Department of Technology

Second Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

Laboratory

MAJOR PROJECT (PHASE II)

Teaching Scheme: P: 2 hrs/week	**Credits: 3**
Evaluation Scheme: IPE: 50	**Minimum Passing Marks: 20**
EPE: 100	**Minimum Passing Marks: 40**

Objectives:

1. To provide an opportunity to students do work independently on a topic/ problem/ experimentation selected by them and encourage them to think independently on their own to bring out the conclusion under the given circumstances of the curriculum period in the budget provided with the guidance of the teachers.

2. To encourage creative thinking process to help them to get confidence by planning and carrying out the work plan of the project and to successfully complete the same, through observations, discussions and decision making process.

In this phase students will continue working on the project selected and finalized and at the end of phase II, they will submit report according to the guidelines given.

Project Term Work:
The term work under project submitted by students shall include and assessment of Term work should be as below
1 Work Diary: 25 Marks
Work Diary maintained by group and countersigned by the guide weekly.

The contents of work diary shall reflect the efforts taken by project group for
1. Searching suitable project work
2. Brief report preferably on journals/ research or conference papers/ books or literature surveyed to select and bring out the project.
3. Brief report of feasibility studies carried to implement the conclusion.
4. Rough Sketches/ Design Calculations, etc.

PROJECT REPORT FORMAT

Project Report:

Project report should be of 60 to 70 pages. For standardization of the project reports the following format should be strictly followed.

1 Page size : Trimmed A4

2. Top Margin : 1.00 Inches

3. Bottom Margin : 1.32 Inches

4. Left Margin : 1.5 Inches

5. Right Margin : 1.0 Inches

6. Para Text : Times New Roman 12 point font

7. Line Spacing : 1.5 Lines

8. Page Numbers : Right aligned at footer. Font 12 point Times New Roman

9. Headings : New Times Roman, 14 point, Boldface

10. Certificate :All students should attach standard format of Certificate as described by the Department. Certificate should be awarded to batch and not individual student Certificate should have signatures of Guide, Coordinator, Director and External Examiner.

11 Index of Report :

i) Title Sheet
ii) Certificate
iii) Acknowledgement
iv)Table of Contents
v) Synopsis
vi) List of Figures
vii) List of Photographs/ Plates
viii) List of Tables
1. Introduction
2. Literature Survey/ Theory
3. Design/ Experimentation/ Fabrication/ Production/ Actual work carried out for the same.
4. Observation Results
5. Discussion on Results and Conclusion

12 References : References should have the following format

For Books: “Title of Book”; Authors; Publisher; Edition;
For Papers: “Title of Paper”; Authors; Conference Details; Year.

13 Presentation / Demonstration / Question Answer: 25 Marks on the Basis of Continuous assessment

The group has to make a presentation before the faculties of department for external examination and assessment of project followed by presentation / demonstration / question answer.

Shivaji University, Kolhapur

Department of Technology

Final Year B. Tech (MECHANICAL ENGINEERING) (Semester VIII)

AUDIT COURSE VI
HUMAN VALUES AND PROFESSIONAL ETHICS

Teaching Scheme: L: 2hrs/week **No Credits**

UNIT1
HUMAN VALUES
The value-crisis in the contemporary Indian Society-The Indian system of values-Values in the Indian constitution -Aesthetic values: perception and enjoyment of beauty-Relative and absolute values-Morals- Values and Ethics – Integrity-Service – Work Ethic – Service Learning – Civic Virtue – Respect for Others –Respect for the Environment-Quest for Living Peacefully and happily–Attitude of Nonviolence-Innate dignity for human life – Bring out the best in oneself -caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT2.
ENGINEERING ETHICS
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT3.
ENGINEERING AS SOCIAL EXPERIMENTATION
Engineering as experimentation - engineers as responsible experimenters - Research Ethics - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT4
SAFETY, RESPONSIBILITIES AND RIGHTS
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk – The Government Regulator’s Approach to Risk- the three mile island, chernobyl and Bhopal case studies.

UNIT5
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights – Intellectual Property Rights (IPR) - discrimination.

UNIT6

GLOBAL ISSUES

Multinational corporations - Business Ethics -Environmental ethics –Role in Technological Development- computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -Honesty-moral leadership-sample codes of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers (IETE), India, etc.

Text Books

1. Professional Ethics and Human Values by M.P. Raghavan,Scitech Publications (India) Pvt Ltd
2. Human Values and Professional Ethics by Jayashri and Suresh B S ,S Chand
Mike Martin and Roland Schinzinger,
3. “Ethics in Engineering”, McGraw-Hill, New York 1996. Govindarajan M, Natarajan S, Senthil Kumar V. S,
4. “Engineering Ethics(Including Human Values)”, Prentice Hall of India, New Delhi,
5. A Textbook on Professional Ethics and Human Values by Naagarazan, R.S. ,New Age Publishers
6. Professional Ethics and Human Values by A Alavudeen,R Kalil Rahman M
Jayakumaran ,Laxmi Publisher
7. Understanding Human Values :Individual and Societal by Milton Rokeach ,Fres Press Publication
8. Human Values by A N Tripathy, New Age International
9. A Foundation Course in Value Education by R R Gaur, R Sangal,2009
10. Science and humanism by P L Dhar and R R Gaur, Commonwealth Publishers
11. “Wisdom for The New Millennium” by H.H .Sri Sri Ravishankarji, founder Art Of Living ,Vyakti Vikas Kendra Bangalore.
12. “The Monk Who Sold his Ferrari” by Robin Sharma, Jaico Publishing House
13. “Mega Living” by Robin Sharma, Jaico Publishing House
14. The Story of Phillosophy by W,Durant

References

1. Charles D. Fleddermann, “Engineering Ethics”, Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available).
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford,
5. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, “Business Ethics – An Indian Perspective” Biztantra, New Delhi, (2004)

6. Science and the Human Prospect, by Ronald C. Pine
7. Brave New World, Aldous Huxley
8. Society ,Environment and Engineering by H R Mukhi , Birla Publications ,New Delhi
9. Society, Environment and Engineering by R Agor, Satya Prakashan,New Delhi

Relevant CDs ,Movies ,Documentaries and Websites

www.onlineethics.org, www.storystuff.com, www.iahv.org, www.5h.org, www.artofliving.org

Al Gore ,An Inconvenient Truth, Paramount classics USA

Charlie Chaplin, Modern Times ,United Artits ,USA

IIT Delhi, Modern Technology-The Untold Story