

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037711(037)
Subject: Design of Transmission System	Total Tutorial Periods: 01
Total Theory Periods: 03	Maximum Marks: 100
Class Tests: Two(Minimum)	Minimum Marks: 35
Assignments: Two(Minimum)	ESE Duration: Four Hours

Course Objectives:

The objective of this course is to impart skills required to model, analyze and design different components of transmission system e.g. gears, spring, brakes, bearings, chain drive, belt drive etc.

UNIT-I	<p>Gears: Gear Drives, Classification of Gears, Selection of type of Gears</p> <p>Spur Gears: Law of Gearing, Force Analysis, Gear Tooth Failures, Selection of Material, Number of Teeth, Face Width, Beam Strength of Gear Tooth, Effective Load on Gear Tooth, Estimation of Module Based on Wear Strength, Lewis equation, Gear Design for Maximum Power Transmitting Capacity, Gear Lubrication.</p>
UNIT-II	<p>Helical Gears: Helical Gears, Terminology of Helical Gears, Virtual Number of Teeth, Tooth Proportions, Force Analysis, Beam Strength of Helical Gears, Effective Load on Gear Tooth, Wear Strength of Helical Gears.</p> <p>Bevel Gears: Bevel Gears, Terminology of Bevel Gears, Force analysis, Beam strength of Bevel Gears, Wear Strength of Bevel Gears, Effective Load on Gear Tooth.</p>
UNIT-III	<p>Spring: Spring materials and their mechanical properties, Equation for stress and deflection, Helical coil Springs of circular section for tension, Compression and torsion, Dynamic loading, Fatigue loading, Wahl line, Leaf spring and laminated spring.</p> <p>Brakes: Energy equation, Types of brakes, Block brake, Band brake, Disk brake, Thermal consideration.</p>
UNIT-IV	<p>Bearings - Rolling Contact Bearings: Types of ball and roller bearings, selection of bearing for radial and axial load, bearing life, methods for selection of bearings for cyclic load, Reliability of bearings, Bearing failure causes and remedies.</p> <p>Sliding Contact Bearings: Modes of lubrication, viscosity, Petroff's equation and McKee's curve, Hydrodynamic theory of lubrication, Journal Bearing design – Selection of parameters, Sommerfeld number, heat balance, self-contained bearings, bearing materials.</p>
UNIT-V	<p>Chain Drives: Chain drives, roller chains, geometric relationships, designation, dimensions of chain components, polygonal effect, selection of roller chain, power rating of roller chains.</p> <p>Belt Drives: Flat and V-belts, belt constructions, geometrical relationships for length of the belt, analysis of belt tensions, condition for maximum power, selection of flat & V-belts, adjustment of belt tensions.</p>

TextBooks:

1.	Design of Machine Elements, V.B.Bhandari, TMH, New Delhi
2.	Mechanical Engineering Design, Shigley, McGraw Hill, Delhi

ReferenceBooks:	
1.	Design Data Book, PSG, Coimbtore
2.	Machine Design, Movnin, MIR Publishers, Moscow
3.	Machine Design - Fundamental & Application, Gope, PHI, New Delhi
4.	Machine Design, Sharma &Agrawal, Katson, New Delhi
5.	Principles of Mechanical Design, R. Phelan, McGraw Hill, New Delhi

CourseOutcomes:	
On successful completion of the course, the student will be able to:	
1.	Model, analyze and design spur gears.
2.	Model, analyze and design helical and bevel gears.
3.	Model, analyze and design springs and brakes.
4.	Model, analyze and design bearings.
5.	Model, analyze and design chain and belt drives.

Chhattisgarh Swami Vivekanand Technical University, Bilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037712(037)
Subject: Refrigeration and Air Conditioning	Total Tutorial Periods: 01
Total Theory Periods: 02	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The main objective of the course is to familiarize with the terminology associated with refrigeration and air conditioning systems and to acquire the skills required to model, analyze and design different refrigeration as well as air conditioning processes and components.

UNIT-I	Introduction: Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle. Vapour Compression Refrigeration System, Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle, Introduction to Multiple Evaporator and compound compression systems.
UNIT-II	Gas Cycle Refrigeration: Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E. Air Cycle for Aircraft: Necessity of cooling of aircraft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.
UNIT-III	Vapour Absorption System: Simple vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System. Refrigerants: Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants. Refrigeration Equipments: Compressor, condenser, evaporator, expansion devices – types & working.
UNIT-IV	Psychrometry: Psychrometric properties, psychrometric relations, psychrometric charts, psychrometric processes, cooling coils, By-pass factor and air washers. Human Comfort Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.
UNIT-V	Cooling Load Calculations: Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychrometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air Conditioning System: Central, split and window air conditioning system.

TextBooks:

1.	Refrigeration and Air Conditioning –C. P. Arora – TMH,Delhi
2.	Refrigeration and Air Conditioning – Manohar Prasad – New Age - Delhi

ReferenceBooks:	
1.	Refrigeration and Air Conditioning – Arora&Domkundwar – DhanpatRai,Delhi
2.	Refrigeration & Air Conditioning-R.K.Rajput-S.K. Kataria, Delhi
3.	Refrigeration and Air Conditioning – P.L. Ballaney – KhannaPub.,Delhi
4.	Refrigeration & Air Conditioning – AhmadulAmeen - PHI, Delhi
5.	Refrigeration and Air Conditioning- Stocker & Jones, McGraw Hill, Delhi
6.	Basic Refrigeration and Air-Conditioning- P.N.Ananthanarayanan, TMH,Delhi
7.	Principles of Refrigeration-Roy J.Dossat , -Pearson,Delhi
8.	Refrigeration and Air Conditioning –R.C.Arora -PHI, Delhi
CourseOutcomes:	
On successful completion of the course, the student will be able to:	
1.	Analyze vapour compression refrigeration system.
2.	Analyze gas and air cycle refrigeration system.
3.	Analyze vapour absorption system, describe refrigerant and refrigeration equipment.
4.	Explain terminologies ofpsychrometry and human comfort and apply to analyze related problems.
5.	Carry out cooling load calculations and describe air-conditioning systems.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program : Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037713(037)
Subject: Automation in Manufacturing	Total Tutorial Periods: 01
Total Theory Periods: 02	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives:

The objective of this course is to impart an understanding of the importance of automation in the of field machine tool based manufacturing, the knowledge of various elements of manufacturing automation – CAD/CAM, sensors, pneumatics, hydraulics and CNC and the basics of product design.

UNIT-I	Introduction: Why automation, Current trends, CAD, CAM, CIM; Rigid automation: Part handling, Machine tools. Flexible automation: Computer control of Machine Tools and Machining Centers, NC and NC part programming, CNC-Adaptive Control, Automated Material handling. Assembly, Flexible fixturing.
UNIT-II	Computer Aided Design: Fundamentals of CAD - Hardware in CAD-Computer Graphics Software and Data Base, Geometric modeling for downstream applications and analysis methods.
UNIT-III	Computer Aided Manufacturing: CNC technology, PLC, Micro-controllers, CNC-Adaptive Control
UNIT-IV	Low cost automation: Mechanical & Electro mechanical Systems, Pneumatics and Hydraulics, Illustrative Examples and case studies.
UNIT-V	Introduction to Modeling and Simulation: Product design, process route modeling, Optimization techniques, Case studies & industrial applications.

TextBooks:

1.	Automation, Production Systems, and Computer-integrated Manufacturing, Mikell P. Groover, Prentice Hall
2.	Manufacturing – Engineering and Technology, Serope Kalpakjian & Steven R. Schmid, 7th edition, Pearson

ReferenceBooks:

1.	Computer control of manufacturing system, Yoram Koren, 1st edition
2.	CAD/CAM: Theory & Practice, Ibrahim Zeid, 2nd edition.

Course Outcomes:

On successful completion of the course, the student will be able to:

1.	Illustrate the basic concepts of automation in machine.
2.	Explain the fundamentals of CAD.
3.	Explain the basics of computer aided manufacturing.
4.	Discuss the low cost automation systems.
5.	Explain the basic concepts of modeling and simulation.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	
Branch: Mechanical Engineering	Semester: VII
Subject: Refrigeration & Air-Conditioning Lab	Code: D037721(037)
Total Lab Periods: 24	BatchSize- 30
MaximumMarks: 40	MinimumMarks: 20

Course Objectives:

The main objective of the course is to further reinforce the students understanding of the refrigeration and air conditioning through suitably designed experiments in refrigeration & air-conditioning lab.

List of Experiments: (At least Seven experiments are to be performed by each student)

1.	To study domestic refrigerator.
2.	To study the hermetically sealed compressor.
3.	To study Refrigeration Tutor and to determine the following:- <ol style="list-style-type: none"> a. Theoretical coefficient of performance b. Actual coefficient of performance. c. Theoretical capacity of the plant d. Actual capacity of the plant
4.	To study the mechanical heat pump and to determine the following:- <ol style="list-style-type: none"> a. Theoretical coefficient of performance b. Actual coefficient of performance. c. Theoretical capacity of the plant d. Actual capacity of the plant
5.	To study the air and water heat pump and to determine the following:- <ol style="list-style-type: none"> a. Theoretical coefficient of performance of the system as a refrigerator and as a heat pump. b. Actual coefficient of performance of the system as a refrigerator and as a heat pump. c. Capacity of the system in tons as a refrigerator. d. Capacity of the system in kW as a heat pump under the following conditions of operation:- <ol style="list-style-type: none"> i. Water cooled condenser and water-cooled evaporator. ii. Water-cooled condenser and air-cooled evaporator. iii. Air-cooled condenser and air-cooled evaporator. iv. Air-cooled condenser and water-cooled evaporator.
6.	To study the following processes onthe air conditioning test rig: <ol style="list-style-type: none"> a. Sensible heating b. Sensible cooling c. Sensible cooling/cooling dehumidification d. Humidification and cooling
7.	To find the efficiency of cooling tower test rig.
8.	To study the simple vapor absorption system.
9.	To study the AC Simulator and to determine the following: <ol style="list-style-type: none"> a. Sensible heating b. Sensible cooling c. COP of R-22 d. Air washer efficiency e. Sensible heat load applied f. Latent heat load applied g. RSHF h. ESHF i. Creation of different climatic conditions in AC simulator

Course Outcomes:**On successful completion of the course, the student will be able to:**

1.	Describe the construction and working of different refrigeration and air conditioning equipments.
2.	Analyze performance parameters of refrigeration system.
3.	Analyze performance parameters of mechanical heat pump.
4.	Analyze performance parameters of air conditioning system.
5.	Simulate and analyze various air conditioning processes.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	
Branch: Mechanical Engineering	Semester: VII
Subject: CIM & Automation Lab	Code: D037722(037)
TotalLabPeriods: 24	BatchSize –30
MaximumMarks: 40	MinimumMarks: 20

Course Objectives: The main objective of the course are:to demonstrate the concepts discussed in Computer Integrated Manufacturing course, to introduce CNC part programming for simulation of various machining operations, to educate the students on Flexible Manufacturing System and Robot Programming and also on the hydraulics, pneumatics and electro–pneumatic systems.

List of Experiments:

1.	PART – A CNC part programming using CAM packages. Simulation of Turning, Drilling, Milling operations. 3 typical simulations to be carried out using simulation packages like Master- CAM, or any equivalent software.
2.	PART – B (Only for Demo/Viva voce) a. FMS (Flexible Manufacturing System): Programming of Automatic storage and Retrieval system (ASRS) and linear shuttle conveyor Interfacing CNC lathe, milling with loading unloading arm and ASRS to be carried out on simple components. b. Robot programming: Using Teach Pendant & Offline programming to perform pick and place, stacking of objects, 2 programs.
3.	PART – C (Only for Demo/Viva voce) Pneumatics and Hydraulics, Electro-Pneumatics: 3 typical experiments on Basics of these topics to be conducted.

CourseOutcomes:

Onsuccessfulcompletionof thecourse,thestudentwillbeableto:

1.	Demonstrate an understanding of concepts discussed in Computer Integrated Manufacturing courseandits implementation in manufacturing
2.	Write CNC part programs using CADEM simulation package for simulation of machining operations such as Turning, Drilling & Milling.
3.	Write programs for Flexible Manufacturing Systems.
4.	Write programs for Robotics.
5.	Demonstrate an understanding of the operating principles of hydraulics, pneumatics and electro–pneumatic systems.

Chhattisgarh Swami Vivekanand Technical University, Bilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037731(037)
Subject: Machine Tools Technology	Total Tutorial Periods: 01
Total Theory Periods: 01	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The main objective of this course is to impart understanding cutting tool geometry, tool material, mechanics of metal cutting, machinability, cutting fluid, the kinematics of speed and feed gearbox and procedure of acceptance test of machine tool.

Unit- I	<p>Cutting Tool–Types, requirements, specification & application</p> <p>Geometry of Single Point Cutting Tool- tool angle, Tool angle specification system, ASA, ORS and NRS and inter-relationship.</p> <p>Mechanics of Metal Cutting Theories of metal cutting, chip formation, types of chips, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.</p>
Unit- II	<p>Machinability: Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Tool life equation, Machinability index, factors affecting machinability.</p> <p>Thermal Aspects in Machining and Cutting Fluid Source of heat in metal cutting and its distributions, temp measurement in metal cutting, function of cutting fluid, types of cutting fluid.</p>
Unit- III	<p>Design of Machine Tool Elements: Design of Lathe bed-Material and construction feature, various bed section, analysis of force under head stock, tail stock and saddle, torque analysis of lathe bed, bending of lathe bed, designing for torsional rigidity, use of reinforcing stiffener in lathe bed.</p> <p>Design of Guide ways, Material and construction features, overturning diagram, Antifriction guide ways.</p>
Unit- IV	<p>Design of Speed Gear Box: Drives in Machine Tool, classification, selecting maximum and minimum cutting speeds, speed loss, kinematic advantage of Geometric progression, kinematic diagrams, design of Gear Box of 6, 9, 12 and 18 speeds.</p>
Unit- V	<p>Design of Feed Gear Box: Elements of feed gear box, classification-Norton drive, draw key drive, Meander's drive, Design of feed gear box for longitudinal and cross feed and for thread cutting.</p> <p>Acceptance Test of Machine tool: Testing, Geometrical checks, measuring equipment for testing, acceptance test for Lathe and Radial drilling machines</p>
Text Books:	
1	Machine Tool Engineering–G.R. Nagpal– Khanna Publishers, New Delhi
2	Fundamentals of Metal Cutting & Machine Tool–B.L. Juneja, G.S. Sekhan, Nitin Sethi–New Age Publishers–New Delhi

Reference Books:

1	Manufacturing Engineering & Technology–Serope Kalpakjian–Pearson, Delhi
2	Production Technology–R.K. Jain–Khanna Publisher–New Delhi
3	Manufacturing Technology Vol.-II–P.N. Rao –TMH Delhi
4	Production Engineering – P.C. Sharma–S. Chand & Company–New Delhi
5	Principle of Metal Cutting–Sen, Bhattacharya–New Central Book Agency, Calcutta

Course Outcomes:**On successful completion of the course, the student will be able to:**

1	Demonstrate an understanding of cutting tool materials and tool geometries and apply mechanics of metal cutting for analysis of related problems.
2	Demonstrate an understanding of concepts of machinability, mechanism of tool failure, thermal aspects in machining and cutting fluid.
3	Describe the construction features of machine tool elements and analyze the forces and torque acting on it.
4	Design speed gear box.
5	Design feed gear box and describe acceptance tests of machine tools.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037732(037)
Subject: Quality Control & Total Quality Management	Total Tutorial Periods: 01
Total Theory Periods: 01	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The objectives of the course are: to define and understand various terms associated with quality control, enhance the students understanding of the complexity of statistical analysis and interpretation, provide an introduction to the fundamental concept of SPC, total quality management, six sigma, quality function deployment and applications of these concepts, understanding the philosophies of TQM in order to better evaluate the TQM implementation proposals and assess exactly where an organization stands on quality management with respect to ISO 9000 quality management.

Unit- I	<p>Basic Concept of Quality: Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of conformance, History of quality control, Quality policy and objectives, Economics of quality.</p> <p>Statistical Concept of Variation: Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and Weibull distribution, pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.</p>
Unit- II	<p>Quality Assurance: Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planning for quality, Quality function deployment (QFD).</p> <p>Statistical Quality Control: Objectives, Growth and applications of S.Q.C., S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts for variables and attributes and their analysis, process capability, concept of six sigma.</p>
Unit-III	<p>Acceptance Sampling: Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans.</p>
Unit-IV	<p>Total Quality Management: Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM.</p>
Unit- V	<p>Quality system: Quality system, need for quality system, ISO 9000 Quality Management Standards, ISO 9000:2000 requirement, Quality Auditing, ISO 14000, Benefits of ISO 14000</p>

Text Books:

1	Quality Planning and Analysis –Juran&Gryana – McGraw Hill, New York
2	Statistical Quality Control – R.C. Gupta – Khanna Publishers, Delhi

Reference Books:

1	Statistical quality control – Grant and Leavenworth – McGraw Hill, New York
2	Engineering Statistics and Quality Control – I. W. Burr- McGraw Hill, New York
3	Managing for Total Quality - Logothetis – PHI Delhi
4	Statistical Quality Control – M. Mahajan – DhanpatRai – New Delhi
5	Total Quality Management – Suganthi& Samuel - PHI, Delhi
6	Total Quality Management - Charantimath, Poornima – Pearson, Delhi
7	Total Quality Management – K.C. Arora - S.K. Kataria- New Delhi

Course Outcomes:**On successful completion of the course, the student will be able to:**

1	Explain the basic concept of quality & statistical concept of variation.
2	Demonstrate the understanding of basic concepts of quality assurance & use of the control charts.
3	Apply the principles of acceptance sampling to solve practical problems.
4	Demonstrate an understanding on quality management philosophies and frameworks
5	Demonstrate an in-depth understanding of Quality System.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037733(037)
Subject: Thermal System Design	Total Tutorial Periods: 01
Total Theory Periods: 01	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The main objective of this course is to impart understanding of the concepts of thermal system design and to familiarize with modeling, simulation and optimization techniques of thermal systems

Unit- I	<p>Introduction to Thermal System Design: Thermal system design, concept and major applications, categories of thermalsystem design.</p> <p>Designing A Workable Thermal System: Introduction, Workable vs. Optimum system, various design basis, design of a food freezing plant and several other examples</p>
Unit- II	<p>Economics of Thermal Systems: Introduction, Major and minor costs, Interest, present and future worth, economic evaluation of thermal system design, Life cycle costing (LCC) method of economic evaluation, Effect of inflation, Presentworth of yearly installment taking inflation into account, Preliminary cost estimation, equipment cost estimating parameter, effect of time factor on costs, energy costs, Taxes, Depreciation.</p>
Unit- III	<p>Modeling of Thermal Systems: Introduction, curve fitting or equation fitting for one, two and polynomial independentvariable, Example of curve fitting for thermal systems, Best fit equation, least square method with example, Some example of mathematical modeling of thermal systems.</p>
Unit- IV	<p>Thermal System Simulation: Introduction, classes of systems, information flow diagrams, Sequential and simultaneous calculations, Formulation of information flow diagram of thermal systems some example like water pumping systems, wasteheat utilization systems.</p> <p>Methods of Simultaneous Calculations: Successive substitution method and Newton-Raphson method, Newton-Raphson method for multiple functions, Simulation of Gas turbine system.</p>
Unit- V	<p>Optimization of Thermal Systems: Introduction, Mathematical representation of optimization problem with example of water chilling system, Lagrange multipliers, Heat exchanger optimization with Lagrange multipliers</p>

Text Books:

1	Design of Thermal Systems - Stoecker W.F. - McGraw Hill
2	Advanced Thermodynamic for Engineers - Wark K. - John Wiley

Reference Books:

1	Advanced Engineering Thermodynamics - Bejan A. - John Wiley
2	Advanced Engineering Thermodynamics - Annamalai K. & Puri - CRC Press
3	Thermal Design & Optimization - Bejan A., Tsatsarones G. & Moran M - John Wiley
4	Fundamentals of Engineering Thermodynamics - Moran M.J. & Shapiro H.N - John Wiley

Course Outcomes:

On successful completion of the course, the student will be able to:	
1	Demonstrate a basic understanding of concepts of thermal system design.
2	Discuss about economics of thermal system
3	Model and analyze of thermal systems.
4	Demonstrate a basic understanding of concepts of thermal system simulation and methods of simultaneous calculations.
5	Demonstrate a basic understanding of optimization of thermal systems.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037734(037)
Subject: Industrial Hydraulics	Total Tutorial Periods: 01
Total Theory Periods: 01	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The main objective of the course is impart an understanding of basic concepts, terminologies, construction and working principle of various hydraulic power system, pumps, actuators, valves, hydraulic circuits, accumulators and intensifiers.

Unit- I	Fluidics: Technology, Terminology, types of fluid logic elements, amplifiers, logic states, methods of obtaining input signals and power outputs, application of fluidics, third generation fluidics.
Unit- II	Hydraulic Fluid: Types of hydraulic fluids, properties of fluid, selection of fluids, JIC/ISO symbols for hydraulic circuits. Fluid Power System: Components, advantages, applications in the field of Machine Tools, material handling, presses, mobile and stationary machines, clamping & indexing devices etc., transmission of power at static and dynamic states.
Unit-III	Pumps: Types, classification, principle and working of vane, gear, radial and axial plunger pumps, power and efficiency calculations, selection of pumps for hydraulic transmission. Actuators: Linear and rotary actuators, hydraulic motor types & construction methods of control of acceleration, types of cylinder and mountings, calculation of piston velocity, thrust under static and dynamic application.
Unit-IV	Control of Fluid Power: Principle, working types of the following valves, pressure control, direction control, flow control, relief valves, sequence valves etc.
Unit- V	Hydraulic Circuits: Meter in, meter out circuits, Pressure control for cylinders, Flow divider circuits, Circuit illustrating use of pressure reducer valves, sequence valve, counter balance valves, unloading valves with the use of electrical control, accumulators etc. Accumulators and Intensifiers: Types, function, application, selection and design procedure.

Text Books:

1	Hydraulic Machines including fluidics – Dr. Jagdish Lal, Metropolitan Book Company, New Delhi
2	Introduction to Fluid Power – Sahastrabadhe, NiraliPrakashan, Pune

Reference Books:

1	Industrial Hydraulics manual by Vickers
2	Industrial Hydraulics – Pipenger & Hicks, McGraw Hill Company, New York
3	Hydraulics Vol. 1 & 2 by Rexroth
4	Fluid Power – Goodwin

Course Outcomes:	
On successful completion of the course, the student will be able to:	
1	Explain basic concepts and terminologies of fluidics.
2	Describe various fluid power systems.
3	Describe construction and working principle of various pumps & actuators.
4	Describe construction and working principle of various type of valve.
5	Demonstrate understanding of hydraulic circuits, accumulators and intensifiers.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of program: Bachelor of Technology	Semester: VII
Branch: Mechanical Engineering	Code: D037735(037)
Subject: Applied Elasticity and Plasticity	Total Tutorial Periods: 01
Total Theory Periods: 02	Maximum Marks: 100
Class Tests: Two (Minimum)	Minimum Marks: 35
Assignments: Two (Minimum)	ESE Duration: Three Hours

Course Objectives: The main objective of the course is to study the classical theory of linear elasticity for two and three dimensional state of stress and obtain solutions for selected problems and to understand the plastic stress strain relations, criteria of yielding and elasto-plastic problems.

Unit- I	Theory of Elasticity: Introduction, Definition of stress and strain at a point, components of stress and strain at a point in cartesian and polar co-ordinates, constitutive relations, equilibrium equations, compatibility equations and boundary conditions in 2-D and 3-D cases. Transformation of stress and strain at a point, principal Stresses and principal strains, invariants of stress and strain, hydrostatic and deviatoric stress, spherical and deviatoric strains, maximum shear stress, maximum shear strain.
Unit- II	Plain Stress and Plain Strain: Airy's stress function approach to 2-D problems of elasticity, simple problems of bending of beams, solution of axis-symmetric problems, stress concentration due to the presence of a circular hole in planes.
Unit-III	Elementary Problems of Elasticity in Three Dimensions: Stretching of a prismatic bar by its own weight, twist of circular shafts, torsion of non-circular sections, membrane analogy, Propagation of waves in solid media. Applications of finite difference equations in elasticity
Unit-IV	Theory of Plasticity: Stress-strain diagram in simple tension, perfectly elastic, Rigid - Perfectly plastic, Linear work - hardening, Elastic Perfectly plastic, Elastic Linear work hardening materials, Failure theories, yield conditions, stress - space representation of yield criteria through Westergard stress space, Tresca and Von-Mises criteria of yielding
Unit- V	Plastic Stress-Strain Relations: Saint Venant's Theory of Plastic flow, Elastic plastic Deformations, Prandtl's stress equations, Levy - Mises equation, Reuss theory of elastic - plastic deformation, Hencky's theory of small plastic deformations, Plastic potential, Flow Rule.

Text Books:

1	Theory of Elasticity – Sadhu Singh – Khanna Publisher, New Delhi
2	Theory of Plasticity – Sadhu Singh - Khanna Publisher, New Delhi

Reference Books:

1	Theory of elasticity -Timoshenko and Goodier - McGraw Hill
2	Theory of Plasticity - J. Chakrabarthy - McGraw Hill
3	Plastic Analysis of Structures-P. S. Hodge-John Wiley and Sons.
4	Plastic Methods of Structural Analysis-Neal B. G.-Chapmen and Hall, 1977, III Edition.
5	Plasticity for Mechanical Engineers-W. Johnson and P. B. Mellor-D.VanNostrand
6	Introduction to the Theory of Plasticity for Engineers-Haffman& Sachs-Mc,Graw Hill.
7	Theory of Inelastic structures-T. H. Lin-John Wiley and sons.
8	Plastic Analysis and Design of Plates, Shells and Discs- Massonnet-North Holland.
9	Plastic Design of Steel Frames-Beedle L. S.-John wiley.
10	Foundations of Solid Mechanics- Y. C. Fung- Prentice-Hall.

11	Continuum Mechanics fundamentals- S. Vallappan-Oxford and IBH.
12	Theory of Plasticity-M. Kachanov-Mir publishers, Moscow.

Course Outcomes:

On successful completion of the course, the student will be able to:

1	Discuss the basics of theory of elasticity and principle stresses and strains.
2	Apply plain stress and strain to solverelated problems.
3	Solve the elementary problems of elasticity in three dimensions
4	Explain the basics of theory of plasticity.
5	Discuss the theories related to plastic stress-strain relations.

Chhattisgarh Swami Vivekananda Technical University, Newai

Name of the Program: Bachelor of Technology

Semester: B. Tech – 7th

Subject: Universal Human values 2

Total Marks in End Semester Exam:

Branch: Mechanical Engg.

Course Code: D000701(046)

L: T: P: 2 Credits: 0

Course Objective(s):

- Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
- Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
- Strengthening of self-reflection.
- Development of commitment and courage to act.

UNIT-I Introduction- Need, Basic Guidelines, Content and Process for Value Education

- Purpose and motivation for the course, recapitulation from Universal Human Values-I.
- Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration.
- Continuous Happiness and Prosperity- A look at basic Human Aspirations
- Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority.
- Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
- Method to fulfill the above human aspirations: understanding and living in harmony at various levels.
- Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

UNIT-II Understanding Harmony in the Human Being - Harmony in Myself!

- Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility.
- Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer).
- Understanding the characteristics and activities of ‘I’ and harmony in ‘I’.
- Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail.
- Programs to ensure Sanyam and Health.
- Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life.
- Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease

UNIT-III Understanding Harmony in the Family and Society- Harmony in Human-Human Relationship

- Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect as the foundational values of relationship
- Understanding the meaning of Trust; Difference between intention and competence
- Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship
- Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals
- Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.
- Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives.

UNIT-IV Understanding Harmony in the Nature and Existence - Whole existence as Coexistence

- Understanding the harmony in the Nature
- Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature.
- Understanding Existence as Co-existence of mutually interacting units in all-pervasive space.
- Holistic perception of harmony at all levels of existence.
- Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

UNIT-V Implications of the above Holistic Understanding of Harmony on Professional Ethics

- Natural acceptance of human values
- Definitiveness of Ethical Human Conduct
- Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
- Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and eco-friendly production systems, c. Ability to identify and develop appropriate technologies and management patterns for above production systems.
- Case studies of typical holistic technologies, management models and production systems
- Strategy for transition from the present state to Universal Human Order:
 - At the level of individual: as socially and ecologically responsible engineers, technologists and managers
 - At the level of society: as mutually enriching institutions and organizations
- Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. to discuss the conduct as an engineer or scientist etc.

Text Books:

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
2. Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3. Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

Reference Books:

1. The Story of Stuff (Book).
2. The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
3. Small is Beautiful - E. F Schumacher.

Course Outcome:

After completion of course, student should be able to

- To become more aware of themselves, and their surroundings (family, society, nature); they would become more responsible in life, and in handling problems with sustainable solutions, while keeping human relationships and human nature in mind.
- They would have better critical ability. They would also become sensitive to their commitment towards what they have understood (human values, human relationship and human society). It is hoped that they would be able to apply what they have learnt to their own self in different day-to-day settings in real life, at least a beginning would be made in this direction.