

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Dynamics of Machines**

Total Theory Periods: **03**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067511(067)**

Total Tutorial Periods: **01**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To study types of mechanical governors and to analyze its performance parameters
- To Apply the theory of balancing to rotating and reciprocating masses.
- To analyze gyro-effect on moving bodies
- To understand the concepts of mechanical vibration
- To perform inertia force analysis of machine elements•
- To draw turning moment diagram of reciprocating engines
- To analyze performance parameters flywheel

UNIT I Governors: Characteristics of centrifugal governors, Gravity controlled governors, Porter and proell. Spring controlled centrifugal governor: Hartung, &Hartnell governor. Performance parameter: Sensitivity, stability, Isochronisms, Governor Effort and power.

UNIT II Balancing: Balancing of rotating masses, Static and dynamic balancing, Determination of balancing masses in two plane balancing, Balancing of internal combustion engines, Balancing of in-line engines, Firing order, Balancing of V-twin and radial engines, Forward and reverse crank method, Balancing of rotors.

UNIT III Gyroscope: Gyroscopic forces and couple, gyroscopic effect in Airplanes, Ship motion and Vehicles moving on curved path.

UNIT IV Mechanical Vibrations: One-dimensional, longitudinal, Transverse, and torsional vibrations, Natural frequency, Effect of damping on vibrations, Different types of damping. Forced vibration, Forces and displacement, Transmissibility, Vibration Isolation, Vibration sensors: seismometer and Accelerometers, Whirling of shafts with single rotor.

UNIT V (a) Inertia force analysis: Effective force and inertia force on link, Inertia force on reciprocating engine. Inertia force in four bar chain mechanism.

(b)Turning moment diagram and flywheel: Turning moment diagram for single and multi cylinder internal combustion engine, Coefficient of fluctuation of speed, Coefficient of fluctuation of energy, Flywheel.

TEXT BOOKS

1. Theory of Machine- S.S.Rattan - Tata McGraw Hill, New Delhi
2. Theory of Machines - Thomas Bevan, - CBS/ Cengage Publishers

REFERENCE BOOKS

1. Theory of Machines and Mechanism– Uicker, Pennock, &Shigley – Oxford Univ. Press
2. Theory of Mechanisms and Machines- A. Ghosh, A. K. Mallik – EWP Press.
3. Mechanism and Machine theory-Ambekar-PHI, Delhi
4. Theory of Machine – P.L. Ballaney – Khanna Publishers, New Delhi
5. Theory of Machine -JagdishLal- Metro Politan Books, New Delhi

Course Outcomes:

- Apply knowledge of Dynamics of machine for understanding, formulating and solving engineering problems.
- Acquire knowledge and hands-on competence in applying the concepts Dynamics of machine in the design and development of mechanical systems.
- Demonstrate creativeness in designing new systems components and processes in the field of engineering
- Identify, analyze and solve mechanical engineering problems useful to the society.
- Work effectively with engineering and science teams as well as with multidisciplinary designs.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Fluid Machines and Fluidics**

Total Theory Periods: **03**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067512(067)**

Total Tutorial Periods: **01**

Assignments: **Two (Minimum)**

Marks: 100 Minimum Marks: 35

Course Objectives:

- To understand the principles of jets
- To understand the different types of fluid machineries
- To study the different types of pumps and machineries
- To study the fluid systems

UNIT I Impact of Free Jets: Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes, jet propulsion of ship.

Impulse Turbine: Classification of turbine, impulse turbine, Pelton wheel, Construction working, work done, head efficiency and Design aspects, Governing of impulse turbine.

UNIT II Reaction Turbine: Radial flow reaction turbine, Francis turbine: construction, working, workdone, efficiency, design aspect, advantages & disadvantages over pelton wheel.

Axial flow reaction turbine: Propeller and Kaplan turbine, bulb or tubular turbine, draft tube, specific speed, unit quantities, cavitation, degree of reaction, performance characteristics, surge tanks, governing of reaction turbine.

UNIT III Centrifugal Pumps: Classification of Pumps, Centrifugal pump, Construction, working, work done, heads, efficiencies, multistage centrifugal pump, pump in series and parallel, specific speed, characteristic, net positive suction head, cavitation.

UNIT IV Reciprocating Pumps: Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, air vessels.

UNIT V Fluid system: Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

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.

TEXT BOOKS:

1. A Textbook of Hydraulic Machines – R. K. Rajput – S. Chand & Company Ltd.
2. Hydraulic Machines including Fluidics by Dr. Jagdish Lal, Metropolitan Book Company Private Limited, New Delhi

REFERENCE BOOKS:

- Fluid Mechanics and Fluid Power Engineering – D.S. Kumar– Kataria& Sons
- Hydraulics and Fluid Mechanics – Modi P.N, Seth S.M. – Standard Book House
- Introduction to Fluid Mechanics and Fluid Machines – S.K. Som& G. Biswas– TMH

Course outcomes:

- The Students will get the knowledge of turbines and pumps
- The students will know about the fluid systems.
- The students will become familiar to the hydraulic machines.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Advance Microcontroller and System Design**

Total Theory Periods: **03**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067513(067)**

Total Tutorial Periods: **01**

Assignments: **Two (Minimum)**

Marks: 100 Minimum Marks: 35

Course Objectives:

- To introduce AVR Microcontroller.
- Understand Counter and timer programming using AVR 16/32.
- Understanding Basic of Serial Communication,Atmega16/32
- Understand the basic concepts of embedded systems.

UNIT I Introduction to AVR Microcontroller: A brief History of atmega16/32 AVR microcontroller, , Internal structure of AVR , Harvard architecture in AVR ,RISC architecture in AVR , Pin configuration of atmega16/32 AVR microcontroller. Power resetting , Built up RAM & ROM ,EEPROM, Register Structure in AVR, I/O programming and Addressing modes.

UNIT II Instruction Set & Programming:-Instruction set and Assembly language programming using AVR 16/32 microcontroller.

Counter and Timer details: Counter and timer programming using AVR 16/32, interrupt programming, Types of interrupt.

UNIT III Serial communication: Basic of Serial Communication,Atmega16/32 connection to RS 232,AVR Serial Port Programming in Assembly language, AVR serial port programming in assembly using Interrupt.

UNIT IV Interfacing I: - Input Capture and Wave Generation in AVR, PWM programming, SPI protocol,I2C protocol

UNIT V Interfacing II: - ADC & DAC interfacing, stepper motor interfacing, .LCD interfaces, keyboard interfacing, Memory interfacing, DC Motor interfacing with atmega16/32 AVR microcontroller.

Text Book:

- 1.The AVR Microcontroller and Embedded Systems using Assembly and C, Mazidi, Mazidi& Sarmad Naimi,Sepehr Naimi Ed.,PHI
2. Microcontrollers: Architecture, Programming, Interfacing and System Design, Rajkamal, Pearson Education.

Course Outcomes:

- Gain knowledge about architecture of AVR Microcontroller.
- The Students will get basic knowledge of ATMEGA microcontroller.
- They will get the basic knowledge of programming techniques withmicrocontroller
- The basic concepts of embedded system are studied.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Manufacturing Technology**

Total Theory Periods: **02**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067514(067)**

Total Tutorial Periods: **01**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To understand the different types of heat treatment processes
- To study the different manufacturing processes
- To study the different types of machine tools
- To understand the unconventional machining

UNIT I a) Ferrous Material: Allotropy of iron, Fe-C Equilibrium diagram, TTT-diagram, Heat treatment

Processes. Plain Carbon steel, Alloy steel cast iron, special purpose steel: High speed steel, stainless steel, Heat resisting steel, free cutting steel, spring steel.

b) Non Ferrous Alloys: Copper alloys, Aluminum alloys, Mg alloy, Ni base alloy, Lead alloys.

UNIT II a) Casting Process: Green sand mould casting, die casting, Centrifugal casting, investment casting, shell casting.

b) Welding Process: Shielded metal arc welding, TIG, MIG, atomic hydrogen welding, resistance welding, soldering, brazing, braze welding, Thermit welding.

UNIT III Mechanical working of Metals

Rolling – Principle, Types of rolling mills, Types of rolled product.

Forging – Principle, forgeability, forging processes.

Extrusion, drawing of wires and tubes.

UNIT IV Machine Tools: Lathe – Types, specifications, operations, capstone and Turret lathe.

Drilling Machine – Types, operations Shaper, Planer, Slotter – Principle, types of operations,

UNIT V Unconventional Machining: Principles and applications of EDM, ECM, EBM, LBM processes

Press working: Principles, press working operations, die assembly, classification of dies, stock strip layout

TEXT BOOKS

• Manufacturing Technology, Metal Cutting and Machine Tool – P.N. Rao, Vol. (I & II) – TMH, New Delhi, 2004

• Production Technology – P.C. Sharma – S. Chand, Delhi, 1999

REFERENCES

1. Manufacturing Engineering & Technology – Kalpakjian S- Pearson Education India, 2001

2. Elements of Workshop Technology, Vol. I & II – HajraChoudhury S.K., HajraChoudhury A.K., Media Promoters and Publishers Private Limited, 1997

3. Materials & Processes in Manufacturing , Paul Degarma E, Black J.T. & Ronald A. Kosher – Prentice Hall of India, 1997

Course Outcomes:

- The Students will get the knowledge of heat treatment processes
- The students will know about the manufacturing processes.
- The students will become familiar to the machine tools.
- To students will understand the concepts of Unconventional Machining

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Signals and Systems(Professional Elective-I)**

Total Theory Periods: **02**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067531(067)**

Total Tutorial Periods: **00**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To describe continuous time and discrete-time signals and systems.
- Proficiently use various methods and approaches to solve problems with signals and systems prepared for upper-level courses in communication systems, control systems, and digital signal processing.

UNIT- I Classification of Signals and Systems: Representation of Discrete time signals, Elementary signals, Basic Operation on Signals, Classification of Signals: Deterministic and random, periodic and non-periodic, Energy and power, Causal and non-causal, Even and odd Signals, Classification of Systems: lumped and distributed parameter, static and dynamic, causal and non-causal, linear and non-linear, time variant and time invariant, stable and unstable, invertible and non-invertible, FIR and IIR systems.

UNIT-II Fourier analysis of Continuous time signals: Representation of Continuous time Fourier series(CTFS), Existence, Trigonometric form, Cosine representation, wave symmetry, Exponential Fourier series, Fourier spectrum, Power representation using Fourier series, Properties of CTFS. Fourier transform(CTFT) of nonperiodic functions, Magnitude and phase representation of Fourier transform, existence, Fourier transform of standard signals, Properties of CTFT, Fourier transform of periodic signals.

UNIT- III Analysis of discrete time signals and systems: Sampling and aliasing, Linear convolution, Circular convolution, correlation, cross correlation, autocorrelation, circular correlation, Fourier transform of Discrete time signals (DTFT), Properties of DTFT, Analysis of LTI Discrete time systems,.

UNIT-IV Z Transform: Relation between z transform and DTFT Region of convergence, Properties, Poles and Zeros of rational function of Z, Inverse Z transform, Analysis of LTI Discrete time systems using Z transform.

UNIT-V Structures for Realization of IIR and FIR Systems: Discrete time IIR and FIR systems, structures for realization of IIR systems, Structures for realization FIR systems: Direct form-I, Direct form-II, Cascade and parallel form. State model of discrete time systems, state model from direct form – II, transfer function using state model, solution of state equation and response of discrete time systems

Text Books:

1. Signals & Systems: A Anand Kumar, 2nd Ed, PHI
2. Signals & Systems: A Nagoor Kani, TMH Publication
3. Signals & Systems: Alan Oppenheim & Alan Wilsky, S Nawab, PHI

Reference Books:

1. Signals, Systems and Communications: B.P. Lathi, BS Publications

Course Outcomes:

- The student will be able to understand the classification of signals and systems.
- Gain knowledge about the frequency domain analysis of continuous time and discrete time signals.
- Use the Z-transform techniques to solve the system equations.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Engineering Economics (Professional Elective-I)**

Total Theory Periods: **02**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067533(067)**

Total Tutorial Periods: **00**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To prepare engineering student to analyze cost/revenue data and carry out economic analyses in the decision making process to justify or reject alternatives/projects on an economic basis.
- To prepare engineering students to function in the business and management side of professional engineering practice..

UNIT I Introduction & Scope: Engineers and Economics, Utility of its study, Managerial Economics, Nature and scope, basic terms and concept of economics like goods, kinds of goods, utility, value and wealth. Theory of Demand and supply, Elasticity of demand. Meaning, Characteristics, Objectives of Firm, Managerial and behavioral theories of a firm.

UNIT II Pricing and Market Competition: Industrial Establishments, various types of industrial establishments, Sole traders, partnership, Joint Stock Company, types of shares, financial goals of organization. Pricing Perspective approach: Pricing policy and price influencing factors, Basic data for price fixation. Market forms & Competition – Pure and perfect competition, monopoly, monopolistic competition, price determination under perfect and monopolistic competition.

UNIT III Economy, Monetary & Fiscal Policy: Balance of payments – money and monetary policy, fiscal policy, Inflation, measuring employment and unemployment. Credit policies Concept and measurement of national income. Working Capital, Factors deciding Working capital, Return on investment, Financial Planning.

UNIT IV Cost and Costing Factors: Cost Analysis – Types and Elements of cost, cost planning and control. Relationship between Average cost & Marginal cost, Short run and long run average cost curves.

UNIT V Depreciation & Capital Budgeting: Depreciation and its methods of calculation, marginal costing, break – even analysis, profit planning and forecasting, Capital budgeting, cost of capital, Appraising projects profitability.

TEXT BOOKS:

1. Managerial Economics – P.L. Mehta – S. Chand and sons
2. Engineering Economics- Penneerselvam- PHI, Delhi

REFERENCE BOOKS:

1. Elementary Economics Theory – K.K. Dewett – S. Chand ,Delhi
2. Economics – Samuelson, Pauls & W.D. Nordhan – McGraw Hill ,Delhi
3. Advanced Cost Accounting – Nigam, Sharma – Himalaya Publishing House
4. Managerial Economics – Mote and Paul – TMH, Delhi
5. Macro Economics for management Students – A. Nag - Macmillan India
6. Cost Accounting – Jain & Narang - Kalyan Publishers
7. Managerial Economics - G.S. Gupta – TMH, Delhi

8. Engineering Economics – J.L. Riggs, D.D. Bedford , Randhawa – TMH, Delhi

9. Essentials of Managerial Economics – Reddy & Ganesh – Himalaya Publishing Hosue

10. Managerial Economics – Joel Dean – PHI, Delhi

11. Economics - Michael Parkin, Addison Wesley Longman Publication, International Edition.

Course Outcomes:

- The student will be able to understand the classification of signals and systems.
- Gain knowledge about the frequency domain analysis of continuous time and discrete time signals.
- Use the Z-transform techniques to solve the system equations.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Maintenance Engineering (Professional Elective-I)**

Total Theory Periods: **02**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067532(067)**

Total Tutorial Periods: **00**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.
- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I

PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING

Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity – Importance and benefits of sound Maintenance systems –Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.

UNIT II

MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE

Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III

CONDITION MONITORING

Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

UNIT IV

REPAIR METHODS FOR BASIC MACHINE ELEMENTS

Repair methods for beds, slideways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V

REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT

Repair methods for Material handling equipment - Equipment records –Job order systems -Use of computers in maintenance.

TEXT BOOKS:

1. "Industrial Maintenance Management" , Srivastava S.K - S. Chand and Co., 1981
2. "Installation, Servicing and Maintenance" - Bhattacharya S.N, S. Chand and Co.1995

REFERENCES:

- 1 "Maintenance Planning" , White E.N., I Documentation, Gower Press, 1979.
2. "Industrial Maintenance" , Garg M.R., S. Chand & Co., 1986.

3. "Maintenance Engineering Hand book" , Higgins L.R., McGraw Hill, 5th Edition, 1988.
4. "Condition Monitoring" , Armstrong, BSIRSA, 1988.
5. "Handbook of Condition Monitoring" , Davies, Chapman & Hall, 1996.
6. "Advances in Plant Engineering and Management" , Seminar Proceedings - IPE, 1996.
7. Managerial Economics - G.S. Gupta – TMH, Delhi
8. Engineering Economics – J.L. Riggs, D.D. Bedford , Randhawa – TMH, Delhi
9. Essentials of Managerial Economics – Reddy & Ganesh – Himalaya Publishing House
10. Managerial Economics – Joel Dean – PHI, Delhi
11. Economics - Michael Parkin, Addison Wesley Longman Publication, International Edition.

Course Outcomes:

- The Students will be able to understand the Principles of maintenance planning
- The students will be able to understand Condition Monitoring
- The students will be able to understand the repair methods for basic machine elements and material handling equipment

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: **Bachelor of Technology**

Branch: **Mechatronics Engineering**

Subject: **Machine Tool Design (Professional Elective-I)**

Total Theory Periods: **02**

Class Tests: **Two (Minimum)**

ESE Duration: **Three Hours Maximum**

Semester: **V**

Code: **C067534(067)**

Total Tutorial Periods: **00**

Assignments: **Two (Minimum)**

Marks: **100** **Minimum Marks: 35**

Course Objectives:

- To understand the different types Cutting Tools
- To understand the Metal Cutting Process
- To design machine tool elements
- To design speed gear box and feed gear box

UNIT I Cutting Tool – types, requirements, specification & application

Geometry of Single Point Cutting Tool - tool angle, Tool angle specification system, ASA, ORS and NRS and inter-relationship.

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.

UNIT II Machinability: Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Tool life equation, Machinability index, factors affecting machinability.

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.

UNIT III Design of Machine Tool Element: Design of Lathe bed, Material and construction feature, various bed section, analysis of force under headstock, tail stock and saddle, torque analysis of lathe bed, bending of lathe bed, designing for torsional rigidity, use of reinforcing stiffener in lathe bed. Design of Guide ways, Material and construction features, over turning diagram, Antifriction guide ways.

UNIT IV 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 speed.

UNIT V 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.

Machine Tool Installation and Maintenance: Machine Tool installation, Machine Tool Maintenance, lubrication, reconditioning of machine tool.

Machine Tool Testing: Testing, Geometrical checks, measuring equipment for testing, acceptance test for Lathe and Radial drilling machines.

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. Production Engineering – P. C. Sharma – S. Chand & Company – New Delhi
2. Production Technology – R.K. Jain – Khanna Publisher – New Delhi
3. Principle of Metal Cutting - G.C. Sen, A. Bhattacharya – New Central Book Agency (P) Ltd., Calcutta
4. Machine Tool Practices – Kibbe Richard R – PHI, New Delhi
5. Principles of Machine Tool – G.C. Sen, A. Bhattacharya – New Central Book Agency, Calcutta

Course Outcomes:

- The students will get knowledge on cutting tools and metal cutting tool process
- They will receive the knowledge design of machine tool elements
- The students will be able to design speed gear box and feed gear box
- The students will be able to perform the geometrical check of machines

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Mechatronics Engineering

Subject: Dynamics of Machine Lab

Total Periods: 02

Maximum Marks: 40

Semester: V

Code: C067521(067)

Minimum Marks: 20

List of Experiments to be Performed (Minimum ten experiments are to be performed by each student)

1. To find out the oscillations of simple pendulum with universal vibration apparatus.
2. To find out the oscillations of Compound pendulum with universal vibration apparatus.
3. To find out the radius of gyration of bi-filler suspension with universal vibration apparatus.
4. To find out undamped torsional vibrations of single rotor system with universal vibration apparatus.
5. To find out the frequency of damped torsional vibration of single rotor system with universal vibration apparatus.
6. To measure the frequency of torsional vibrations of single rotor system with universal vibration apparatus.
7. To measure the frequency of torsional vibrations of double rotor system with universal vibration apparatus.
8. To find out free vibration of helical coiled spring with universal vibration apparatus.
9. To study forced damped vibration of a spring mass system and simple supported beam with universal vibration apparatus.
10. To find out the Gyroscopic couple and prove the Gyroscopic law with Gyroscope apparatus.
11. To find out the Power and effort of Proel, Porter & Hartnell Governor with Governor Apparatus.
12. To find out the critical speed for different diameters of shaft by whirling of shaft apparatus.
13. To verify the static and dynamic balancing for different planes and masses by balancing apparatus.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Universal Vibration Apparatus
2. Whirling of Shaft Apparatus.
3. Balancing Apparatus (Both Static & Dynamic)
4. Epicyclic Gear Train and Holding Torque Apparatus
5. Gyroscope apparatus
6. Governor apparatus with differential attachments

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Mechatronics Engineering

Subject: Fluid Machines and Fluidics Laboratory

Total Periods: 02

Maximum Marks: 40

Semester: V

Code: C067522(067)

Minimum Marks: 20

List of Experiments/Studies to be Performed (Minimum seven experiments and three studies are to be performed by each student)

1. Performance characteristics of Pelton wheel turbine.
2. Performance characteristics of Francis turbine.
3. Performance characteristics of Kaplan turbine.
4. Performance characteristics of variable speed centrifugal pump.
5. Performance characteristics of rated speed centrifugal pump.
6. Performance characteristics of multistage centrifugal pump.
7. Study of Wind Tunnel (Open Circuit blower type)
8. Determination of Lift and drag force over an air foil.
9. To study the working of fluidic devices (Analog and Digital)
10. To study the Hydraulic Accumulator
11. To study the Hydraulic Intensifier
12. To study the Hydraulic Crane
13. To study the Hydraulic lift
14. To study the Hydraulic Ram
15. To study the Jet Pump
16. To study the Air Lift Pump

List of Equipments/Machines Required:

1. Pelton Wheel Turbine
2. Francis Turbine Test Rig
3. Kaplan Turbine Test Rig
4. Variable Speed Centrifugal Pump Test Rig
5. Rated Speed Centrifugal Pump Test Rig
6. Multi Stage Centrifugal Pump Test Rig
7. Reciprocating Pump Test Rig
8. Complete setup of Wind Tunnel (Open circuit blow type) with minimum wind speed not less than 30m/sec.
9. Fluidic devices (Analog and Digital)
10. Aerofoil with the provision of measurement of pressure distribution over the surface.
11. Cut section model of Hydraulic Accumulator
12. Cut section model of Hydraulic Intensifier
13. Cut section model of Hydraulic Crane
14. Cut section model of Hydraulic Lift
15. Cut section model of Hydraulic Ram
16. Cut section model of Hydraulic Jet and Air lift pump.

Chhattisgarh Swami Vivekananda Technical University, Bhilai

Name of program: Bachelor of Technology

Branch: Mechatronics Engineering

Subject: System Design Lab

Total Periods: 02

Maximum Marks: 40

Semester: V

Code: C067523(067)

Minimum Marks: 20

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

1. Write a Assembly Language Program for Atmega16 to performed following task
 - a. ADD two 8 bit numbers and result store in R0 register.
 - b. SUBTRACT two 8 bit numbers and result store in R1 register.
 - c. MUL two 8 bit no. and store result in RAM location 40H
 - d. DIV two 8 bit no. and store result in RAM location 50H.
2. WAP to ADD two 16 bit unsign No. and result to be in R0-R1 Register Pairs.
3. WAP to convert HEX no. into Decimal no. Result to be in R0, R1, and R3 registers where LSB in R3 Register.
4. WAP to convert Packed BCD no. in Two ASCII no.
5. WAP to Transfer data (CHHATTISGARH) from ROM Location 300H to RAM Location 50H. using counter method and null char for end of sting.
6. Write a C language program to generate 1 kHz square at Pin PC.0
7. Write a C Language Program to Transfer Letter 'A' serially at 9600 baud Rate.
8. Write a C Language Program to Transfer Word (CSV TU) serially at 4800 baud Rate.
9. Write a C Language Program to Received Data Serially and copy it to Port B. At 9600 baud Rate.
10. Write a C language Program to Display (CHHATTISGARH) on 16x2 LCD. where data pin of LCD are conned to Port C of microcontroller, and command Pin RS,RW,EN are connected to PB.0,PB.1,PB.2 respectively.
11. Write a C language Program to interface 4x4 matrix key boards on port B and Display the result on Port C.
12. Write a C language program for stepper motor Interfacing.
13. Write a C language Program for BCD UP/DOWN counter and display the value on 7 SEGMENT DISPLAY.
14. Write a C language program to Interface LM35 Temperature Sensor with built in ADC. And Display the result on 7 segment Display.
15. Write a C language program to Interface PWM servo motor.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

Name of the Program: **BTech**
Subject: **Environmental Studies**
Period per week (L-T-P): **(2-0-0) / Week**
Total Contact Hours: **40**

Semester: **V**
Code: **C000506(020)**
Non-Credit
No. of assignments to be submitted: **05**

PREREQUISITE: Knowledge of basic Chemistry, Physics and Mathematics.

COURSE OBJECTIVES:

1. Basic knowledge of environment, ecology, ecosystems, biodiversity and conservation.
2. Fundamentals of natural resources, control, uses and its impact on environment.
3. Human population, growth, growing needs and its impact on society and environment.
4. Types of environmental pollution, legislations, enactment and management.

COURSE DETAILS:

UNIT I: Introduction to environmental studies, ecology and ecosystems (06 hours)

Introduction to environment; Concept and structure of ecology and ecosystem, energy flow; Community ecology; Food chains and webs; Ecological succession; Characteristic features of forest, grassland, desert and aquatic ecosystem; Multidisciplinary nature of environmental studies, scope and importance; Concept of sustainability and sustainable development.

UNIT II: Biodiversity and conservation (06 hours)

Introduction to biological diversity and levels of genetic, species and ecosystem diversity; Biogeographic zones of India; Biodiversity patterns and global biodiversity hot spots; Threats to biodiversity, habitat loss, conflicts and biological invasions; In-situ and Ex-situ conservation of biodiversity: Ecosystem and biodiversity services.

UNIT III: Natural resources and environment (08 hours)

Concept of Renewable and non-renewable resources; Land resources, land use change, land degradation, soil erosion; Desertification; Deforestation: causes, consequences and remedial measures; Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state); Energy resources: environmental impacts of energy generation, use of alternative and nonconventional energy sources, growing energy needs.

UNIT IV: Human communities, social issues and environment (08 hours)

Basic concept of human population, growth and communities; Impacts on environment, human health, welfare and human rights; Resettlement and rehabilitation; Environmental natural disaster: floods, earthquake, cyclones, tsunami and landslides; Manmade disaster; Environmental movements; Environmental ethics: role of gender and cultures in environmental conservation; Environmental education and public awareness; Human health risks and preventive measurements.

UNIT V: Environmental pollution, policies, legislations, assessment and practices (12 hours)

Environmental pollution: Causes, effects and controls of air, water, soil, noise and marine pollution; Concept of hazardous and non-hazardous wastes, biomedical and e-wastes; Solid waste management and control measures; Climate change, global warming, ozone layer depletion, acid rain and their societal impacts; Environment laws: Wildlife Protection Act, Forest Conservation Act, Water (Prevention and control of Pollution) Act, Air (Prevention & Control of Pollution) Act, Environment Protection Act, Biodiversity Act, International agreements negotiations, protocols and practices; EIA, EMP.

On completion of each unit, students have to submit one assignment from each unit.

COURSE OUTCOMES (CO):

On completion of the course, students will able to:

1. Interpret and demonstrate the concept of ecology and ecosystem for environmental sustainability.
2. Define and establish the diversified knowledge of biodiversity and its conservation.
3. Explain the uses of natural resources efficiently and its impact on environment.
4. Illustrate and solve the simple and complex social issues relating to human communities.
5. Exemplify and make useful solution to combat the environmental degradation with the aid of national and international legislations and protocols there under.
6. Demonstrate and elucidate the complicated issues and anthropological problems for societal development.

TEXT BOOKS:

1. De, A.K., (2006). *Environmental Chemistry*, 6th Edition, New Age International, New Delhi.
2. Bharucha, E. (2013). *Textbook of Environmental Studies for Undergraduate Courses*. Universities Press.
3. Asthana, D. K. (2006). *Text Book of Environmental Studies*. S. Chand Publishing.

REFERENCE BOOKS:

1. Odum, E. P., Odum, H. T., & Andrews, J. (1971). *Fundamentals of ecology*. Philadelphia: Saunders.
2. Basu, M., Xavier, S. (2016). *Fundamentals of Environmental Studies*, Cambridge University Press, India.
3. Sharma, P. D., & Sharma, P. D. (2005). *Ecology and Environment*. Rastogi Publications.

OPEN SOURCE LEARNING:

<http://nptel.ac.in/>