# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Signals & Systems** **Code: C025511(025)**
**Total Theory Periods: 36** **Total Tutorial Periods: 12**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To study the properties and representation of discrete and continuous signals.
- To understand the complete of the nature of continuous and discrete signals and their applications in engineering systems.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To understand the use of transforms for signal classification and analysis.
- To study the analysis and synthesis of discrete time systems.

**COURSE OUTCOMES:**

- ✓ Students will be able to understand the terminology of signals and basic engineering systems.
- ✓ Students will understand the role of signals and systems in engineering design.
- ✓ Students will have the understanding of the use of signals and basic system building blocks and their roles in large/complex system design.
- ✓ Students will understand signal representation techniques and signal characteristics.
- ✓ Students will understand the difference and the applications of analog versus discrete signals and the conversion between them.
- ✓ Students will understand the process of sampling and the effects of under-sampling.
- ✓ Students will understand the Fourier, Laplace and z-transforms.

**UNIT I Introduction to Signals and Systems:** Definition of signals, Continuous and discrete time signals: Classification of Signals – Periodic-a periodic, even – odd, energy and power signals - Deterministic and random signals - complex exponential and sinusoidal signals - periodicity - properties of discrete time complex exponential unit impulse - unit step impulse functions - Transformation in independent variable of signals: time scaling, time shifting. Basic properties of continuous time systems: Linearity, Causality, time invariance, stability.

**Total Period 10**

**UNIT II Fourier Series and Fourier Transform :** Determination of Fourier series representation of continuous time periodic signals -Explanation of properties of continuous time Fourier series, Continuous time Fourier Transform analysis with examples - properties of the Continuous time Fourier Transform basic properties, convolution in time and frequency domains. **Total Period 08**

**UNIT III Laplace Transform and Sampling Theorem:** Laplace Transform analysis with examples - properties of Laplace Transform basic properties, convolution in time and frequency domains. Analysis and characterization of LTI systems using Laplace transform: Computation of impulse response and transfer function using Laplace transform. Representation of continuous time signals by its sample -Sampling theorem - Reconstruction of a Signal from its samples, aliasing - discrete time processing of continuous time signals, sampling of band pass signals.

**Total Period 12**.

**UNIT IV Z – Transforms:** Basic principles of z-transform - z-transform definition- region of convergence - properties of ROC - Properties of z-transform - Poles and Zeros - inverse z-transform using Contour integration - Residue Theorem, Power Series expansion and Partial fraction expansion, Relationship between z-transform and Fourier transform. Computation of Impulse response and Transfer function using Z Transform, DTFT Properties and examples - LTI-DT systems -Characterization using difference equation. **Total Period 10**

**UNIT V Random Signals:** Introduction to probability, Bayes Theorem- concept of random variable- probability density and distribution functions- function of a random variable, Moments- Independence of a random variable. Introduction to random process, Auto and cross correlation. Wide-sense stationary- ower spectral density White noise. **Total Period 08.**

**TEXT BOOKS:**


1. Anand Kumar, Signals and Systems PHI 3rd edition, 2013.
2. Signals and Systems, Simon Haykin and Barry Van Veen, , John Wiley, 1999.
3. Signals and Systems: Oppenheim Alan- V- Willsky Alan. S- Pearson Edn.


**REFERENCE BOOKS:**


1. Linear Systems and Signals : B. P.Lathi, Oxford university Press, 2005.
2. Signals and Systems: I J Nagrarth- Tata Mc Graw Hill,2001.
3. Signals and Systems: Farooq Husain- Umesh pub.
4. Adaptive signal processing: W Bernad- Pearson Edn.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Control Systems** **Code: C025512(025)**
**Total Theory Periods: 36** **Total Tutorial Periods: 12**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- Identify the basic elements and structures of feedback control systems.
- Apply final value theorem to determine the steady state response of stable control system.
- Use root locus method for design of feedback control systems.
- Construct Bode, Polar and Nyquist plots for rational transfer function.
- Understand the fundamentals of modern control theory

**COURSE OUTCOMES:**

- ✓ Ability to acquire and apply fundamental principles of science and technology.
- ✓ Analyze continuous systems mathematically through the use of Laplace functions and state equations form.
- ✓ Represent any physical system in both transfer functions and state equations form.
- ✓ Apply classical design methods to improve the performance of continuous controlled system.

**UNIT I Mathematical Model of Physical Systems:** Concepts of Control Systems, Industrial Control Examples, Open Loop and closed Control Systems and their Differences, Classification of Control Systems, Transfer Function, Block Diagram Algebra, Signal Flow Graphs. Feedback Characteristics of Control Systems, Mathematical Models –Differential Equations– Translational And Rotational Mechanical Systems, Control System Components: DC Servo Motor, AC Servomotor, Tachometer, Synchro As A Error Detector. **Total Period 10**

**UNIT II Time Response Analysis:** Standard Text Signals, Time Response of First And Second Order System, Steady State Error and Error Constants, Effect of Adding Poles and Zeroes to a System,. Design Specifications of Second Order System, Stability Concept, Routh- Hurwitz Stability Criteria, Types 0f Stability, Root-Locus Technique. Construction of Root-Loci. **Total Period 10**.

**UNIT III Frequency-Response Analysis:**, Relationship Between Time and Frequency Response, Bode Plots. Polar Plots, Nyquist Stability Criterion, Nyquist Plots, Concept of Gain Margin and Phase Margin

**Total Period 08**.

**UNIT IV Basics on Controllers and Compensators:** Introduction, Types of Basic Compensators and Controllers, Application of Proportional, Integral and Derivative Controllers, Basic Control Actions and Effects of Integral and Derivative Control Actions on System Performance, Applications, Advantages and Disadvantages of Controllers, Compensator Design: (Cascade Lag, Cascade Lead,) using Bode Plots. **Total Period 10**.

**UNIT V Sate Variable Analysis And Design:** Concept of States, State Variables and State Model. State Model for Linear Continuous Time Systems (Electrical), Eigen Values, Determination of Transfer Function from State Matrices, Solution of State Equations, Concept of Controllability And Observability. **Total Period 10**

**TEXT BOOKS:**

1. Control System Engineering, L. Nagrath and Gopal, New Age International Publications

2. Control System Engineering, S K Bhattacharya, Pearson

**REFERENCE BOOKS:**

1. Modern Control Engineering, Ogata, Pearson Education

2. Automatic Control System, B.C. Kuo, PHI

3. Modern Control Engineering, Roy Choudhury, PHI

4. Introduction to Control Engineering, Ajit K. Mandal, New Age International Publications

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Electrical Power System-I** **Code: C025513(025)**
**Total Theory Periods: 36** **Total Tutorial Periods: 12**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To learn the fundamentals of transmission system and parameter for the design of transmission system.
- To comprehend the working and performance of transmission line with the help of its circuit model.
- To understand the concept of reactive power and voltage control in generation, transmission and distribution.
- To understand and analyze the performance of cables.
- To model the transmission lines in terms of mechanical parameter and stresses.
- To study the effect of surges in transmission and associated equipment

**COURSE OUTCOMES:**

- ✓ Student will be to calculate the resistance, inductance and capacitance of transmission line.
- ✓ Student will be able to learn how to model the element in power system and able to carry out studies of load flow, transient stability, harmonics and other relevant studies.
- ✓ Student will be able to calculate the voltage regulation of line and analyze the voltage profile of the transmission line.
- ✓ Student will gain an understanding of VAR control using component to improve p.f, location of capacitor, operation of load tap changing can be examine.
- ✓ Student will be able to calculate the sag, tension and mechanical stress of a transmission line.
- ✓ Student will be able to learn different types of conductor and cable with its performance.
- ✓ Student will able to understand the effect of surges in line

**UNIT- I Overhead Lines**: General structure of electrical power system, power generation, power transmission & voltage levels, power distribution through overhead lines, Type of overhead conductors, solid conductors, stranded conductors, bundled conductors, skin effect, proximity effects, corona, calculation of corona loss and factors affecting corona, inductance and capacitance of single-phase, three-phase single circuit and double circuit lines, concept of GMD, transposition of lines, effect of earth on capacitance of transmission lines.

**Total Period 10**

**UNIT-II Transmission Lines**: Transmission lines as four terminal networks, A, B, C, D constants, nominal-T, nominal-π, equivalent-T and equivalent- π representation of transmission lines, Characteristics and performance of transmission lines, distributed parameters of long lines, hyperbolic solutions, Ferranti effect, surge impedance loadings, power flow equations. **Total Period 10**.

**UNIT- III Underground Cables and Mechanical design of overhead transmission line:**

Types of cables, insulation resistance of cables, capacitance of cables, dielectric stress, capacitance grading of cables, use of inter-sheaths, Power factor of cable.

**Mechanical design of transmission line:** Types of Insulator, Conductors, Towers, Span, Conductor Configuration Spacing, Clearance, Voltage Distribution Over The Insulator String , String Efficiency, Sag and tension calculations. **Total Period 10**.

**UNIT-IV Voltage control and Power factor Correction**

Generator voltage control, line drop compensation by static capacitors and reactors, control of voltage profile, control of active and reactive power, calculation of synchronous phase modifier capacity, on-load tap changing transformer.

**Power factor Correction:**. Causes of low power factor, Methods of Improving power factor, Phase advancing and generation of reactive KVAR using static Capacitors, most economical power factor for constant KW load and constant KVA type loads, Numerical Problems. **Total Period 10**

**UNIT-V Distribution Systems:** Classification of Distribution Systems, Comparison of DC vs. AC and Under-Ground vs. Over - Head Distribution Systems, Radial D.C Distributor, Ring Main Distributor. **Total Period 08**

**Text Books:**

1. Electrical power systems, AshfaqHussain, CBS Publications.
2. Elements of Power System Analysis, William D Stevenson, Tata McGraw Hill Publishing Company Limited
3. Electrical Power System , D. Das , New Age publication

**Reference Books**:

1. A Course in Electrical Power, by Soni, Gupta and Bhatnagar, DhanpatRai Publications.
2. Electrical Power Systems, C. L. Wadhwa, New Age Publications.
3. Power System Engineering, I.J.Nagrath and D.P.Kothari, TMH Publications.
4. Power System, V.K. Mehta and Rohit Mehta, S. Chand Publications

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: MICRO PROCESSOR AND MICRO CONTROLLER** **Code: C025514(025)**
**Total Theory Periods: 24** **Total Tutorial Periods: 12**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- The objective of this course is to provide knowledge about the fundamentals of Microprocessors & Micro Controller and their evolution internal architecture and construction.
- This course is also useful to provide the knowledge of various supporting chips provided with the Microprocessor 8085 and Microcontroller 8051.
- The aim of this course is to give the knowledge of various instructions, basic programming with Microprocessors 8085 and Microcontroller 8051.
- The aim of this course is to give the knowledge of data transfer schemes, Instruction format and addressing modes.

**COURSE OUTCOMES:**

**At the end of this course the student will be able to:**

- Understand the basic architecture of Microprocessor 8085 Microcontroller 8051.
- Understand various instructions and their application in programming.
- Understand memory organization and mapping.

**UNIT I Microprocessor 8085 Architecture:** Fundamentals of Microprocessor Architecture. 8-bit Microprocessor and Microcontroller, Architecture of 8085, Pin Configuration and their Function; internal registers & flag register, memory-stack organization, Generation of Control Signals, de-multiplexing of address / data bus, Instruction Fetch Cycle, Execute Cycle, Instruction Cycle. **Total Period 08**.

**UNIT II The 8051 Architecture:** 8051 Microcontroller hardware, The 8051 oscillator and clock, program counter, data pointer, A and B CPU registers, Flags and program status word, Internal Memory, Internal RAM, the stack and the stack pointer, special function registers, Internal ROM, Input/output pins, ports and circuits, external memory, connecting external memory. **Total Period 07**.

**UNIT III Instruction Set and Programming of 8051**

Addressing modes: Introduction, Instruction syntax, Data types, Subroutines Immediate addressing, Register addressing, Direct addressing, Indirect addressing, Relative addressing, Indexed addressing, Bit inherent addressing, bit direct addressing. 8051 Instruction set, Instruction timings. Data transfer instructions, Arithmetic instructions, Logical instructions, Branch instructions, Subroutine instructions, Bit manipulation instruction. Assembly language programs. **Total Period 08**

**UNIT IV TIMERS, SERIAL COMMUNICATION, INTERRUPTS**

Timers/ counters of 8051 and programming in Assembly language, Serial Data Input/output and programming in Assembly language, Interrupt programming in Assembly language. **Total Period 06**.

**UNIT V Interfacing:**

8255A Programmable Peripheral Interface:, Architecture of 8255A, 4 x 4 keyboard interfacing and programming in assembly language, LCD interfacing and programming in assembly language, 8051 interfacing with external ROM, 8051 data memory space. **Total Period 07**

**Text Books**


1. Microprocessor Architecture, Programming, and Applications with the 8085 5/e, R. S. Gaonkar, Penram International Publishing.
2. The 8051 Microcontroller Architecture, Programming And Applications Kenneth J Ayala West Publishing company
3. The 8051 Micro Controller and Embedded Systems Using Assembly and C, Second Edition, Muhammad Ali Mazidi Janice Gillispie Mazidi Rolin D. McKinlay


**Reference Books**


1. The 8051 Microcontroller, V.Udayashankar and MalikarjunaSwamy, TMH, 2009.
2. Microcontrollers: Architecture, Programming, Interfacing, and System Design, Raj Kamal, Pearson Education, 2005.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

Branch: **Electrical & Electronics Engineering** Semester: **V**

Subject**: Environmental Studies** Code:

Total Theory Periods: 24 Total Tutorial Periods: Nil

No. of class Tests to be conducted: **02** No. of assignments to be submitted: **05**

**COURSE OBJECTIVES**:

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

**COURSE OUTCOMES:**

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

**UNIT I: Introduction to environmental studies, ecology and ecosystems:** 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.

**Total Period 05**

**UNIT II: Biodiversity and conservation:** 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. **Total Period 05**.

**UNIT III: Natural resources and environment :** 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. **Total Period 04**.

**UNIT IV: Human communities, social issues and environment :** 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.

**Total Period 05**

**UNIT V: Environmental pollution, policies, legislations, assessment and practices:** 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. **Total Period 05**.

**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 SOURSE LEARNING:** http://nptel.ac.in/

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**

**Subject: Control Systems Laboratory** **Code: C025521(025)**

**Total Lab Periods: 24** **Batch Size: 30**

**Maximum Marks in ESE: 40** **Minimum Marks in ESE: 20**

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

1. To determine the Gain of an Open Loop and Closed Loop System.
2. To Study the Effect of Disturbance on an Open loop and Closed Loop System.
3. Simulation of Transfer Function using OP-AMP (Analog Computer Trainer)
4. To Determine the Transfer function of a DC Servomotor.
5. To determine Transfer Function of an AC Servomotor.
6. To plot characteristics of Synchro- Transmitter and Receiver Pair.
7. To Plot characteristics of a Potentiometer as an Error Detector.
8. Study of a basic electrically controlled hydraulic system.
9. Study of a basic electrically controlled pneumatic system
10. To Study the time response of a first and second order system.
11. To determine the effect of P, PI controller on second order system.
12. To determine the effect of PID controller on second order system.
13. To determine TF using bode plot (type-0, type-I).
14. To design he Lag Compensator.
15. To Design he Lead Compensator.

**Apparatus Required**

1. An open and closed loop system with two input signals (one acting as reference and the other as the disturbance signal).
2. A R-L or R-C Circuit, Bread board, CRO, Multi-meters, Function Generator.
3. Synchro Transmitter-receiver Pair.
4. An AC Servomotor.
5. A Potentiometer.
6. Bode Plot Analyzer.
7. Linear Variable Differential Transformer.
8. Analog Computer trainer.
9. P, PI, PID Controller trainer.
10. Stepper Motor.
11. Lag Compensator, Lead Compensator.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**

**Subject: Electrical Power System-I Lab** **Code: C025522(025)**

**Total Lab Periods: 24** **Batch Size: 30**

**Maximum Marks in ESE: 40** **Minimum Marks in ESE: 20**

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

1. Study of types of cables.
2. Study of types of Insulator used in power system
3. Study of Bus –bar arrangement of a power supply sub – station.
4. Study of Synchronous phase modifier and calculation of its rating.
5. To measure the A, B, C, D constants of transmission lines.
6. To measure the A, B, C, D constants of series transmission lines (HV-HV).
7. To measure the A, B, C, D constants of series transmission lines (LV-LV).
8. To measure the A, B, C, D constants of parallel transmission lines.
9. To locate faults in a cable by Murray loop test.
10. Measurement of capacitance between conductor –conductor and conductor –earth.
11. Comparison of conductor Characteristics (Self GMD) between two different groups of conductors.
12. To find out the rating of capacitor required for improving the power factor of an inductive load.
13. Study of Ferranti effect.
14. Study of transmission structure used for different types of power supply system.
15. Study the lay out diagram of college power supply system.

**Equipment/Machines/Instruments/Tools/Software Required:**

Transformer, Voltmeter, Ammeter, Multimeter, Wattmeter, Insulators, Synchronous motor, Capacitor, resistors, inductor, Power supply.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Micro Processor and Micro Controller Lab** **Code: C025523(025)**
**Total Lab Periods: 24** **Batch Size: 30**
**Maximum Marks in ESE: 40** **Minimum Marks in ESE: 20**

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

1. 1 To add content of two memory locations and store result in another memory locations.
2. To find 2's complement of 8 bit number.
3. To transfer block of 10 data bytes from one memory location to another.
4. To multiply two 8 bit numbers.
5. To add contents of a block of 10 data bytes.
6. To find largest/smallest among the 10 given data bytes
7. To arrange given data bytes in ascending order.
8. Write a microcontroller 8051 program to get hex data on the range of 00-FFh from port 0 and convert it to decimal. Save the digits in R7, R6 and R5, where the least significant digit is in R7.
9. Write a microcontroller 8051 program to add two 16 Bit unsigned numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
10. Write a microcontroller 8051 program to subtract an unsigned 16 Bit number from another. Operands are two RAM variables. Results to be in R1-R0 pair.
11. Write a microcontroller 8051 program to add two unsigned 32-bit numbers. Operands are two RAM variables. Results to be in R1-R0 pair.
12. Write a microcontroller 8051 program to add two 16 Bit signed numbers.
13. Write a microcontroller 8051 program to convert a binary number to equivalent BCD.
14. Write a microcontroller 8051 program to convert a packed BCD number to two ASCII numbers and place them in R5 and R6.
15. Write a microcontroller 8051 program that generates 2kHz square wave on pin P1.0, 2.5 kHz on pin P1.2.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Linear Integrated Circuit** **Code: C025531(025)**
**Total Theory Periods: 24** **Total Tutorial Periods: Nil**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC.
- To introduce special function integrated circuits.

**COURSE OUTCOMES:**

- ✓ The students will have a thorough understanding of operational amplifiers with linear integrated circuits.
- ✓ The students will be able to design circuits using operational amplifiers for various applications.

**UNIT I Characteristics of OPAMP:** Basics of Differential amplifier, OPAMP Symbol, Equivalent circuit, Block diagram, Ideal and Practical OPAMP Characteristics, Open Loop and Closed Loop Configuration of OPAMP, Input & Output impedance of closed loop OPAMP, Input Bias and Offset Currents, Input Offset Voltage, Input Offset-error compensation voltage series feedback and shunt feedback amplifiers, Inverting Amplifier, Non-Inverting Amplifier, Frequency response of OPAMP. **Total Period 05**

**UNIT II Applications of OPAMP-I:** Voltage Follower, Summer, Subtractor, Differential amplifier, Differentiator, Integrator ,Voltage comparators , Zero Crossing Detector, Level Detector, Window Detector, peak detector, Precision Half Wave Rectifier, Precision Full Wave Rectifier, Instrumentation amplifier, Current to Voltage and Voltage to Current Converter, active clippers, active clampers, Bridge Amplifier, Logarithmic amplifier, Norton Amplifier. **Total Period 05**

**UNIT III Applications of OPAMP-II:** Sample & Hold circuit, D/A converter: R-2R ladder and weighted resistor types, A/D converter: Dual slope, successive approximation and flash types, First and Second order active filters, Phase Shifter, Waveform generator: Square, Triangular, Saw-tooth ,Schmitt trigger, multivibrator. **Total Period 05**

**UNIT IV Special ICs:** 555 Timer circuit: Functional block, Characteristics & Applications as Monostable and Astable multivibrator; 566-voltage controlled oscillator circuit; 565-Phase Lock Loop Circuit Functioning and Applications. **Total Period 04**

**UNIT V Analog Multiplier & Voltage Regulator:** Basics of Analog multiplier Voltage regulator: Characteristics, Regulator Performance parameters, Types of Voltage regulator ,Three Terminal IC Regulator (LM 317, LM 337, 78XX, 79XX), General Purpose IC Regulator (723): Important features and Internal Structure. **Total Period 05**

**Text Books:**

1. Integrated Circuits by K. R. Botkar, Khanna Publications

2. Operational Amplifiers by R. Gayekwad, 4th Ed., Pearson Education

**Reference Books:**

1. Pulse, Digital and Switching Waveforms by Millman & Taub, TMH Publishing Co.

2. Integrated Electronics by Millman & Halkias, TMH Publishing Co.

3. Operational Amplifiers and Linear Integrated Circuits, Lal Kishore, PHI

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Electrical Machine Design** **Code: C025532(025)**
**Total Theory Periods: 24** **Total Tutorial Periods: NIL**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

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

**COURSE OUTCOMES:**
**At the end of this course, students will demonstrate the ability to:**

- ✓ Understand the construction and performance characteristics of electrical machines.
- ✓ Understand the various factors which influence the design: electrical, magnetic and thermal loading of electrical machines
- ✓ Understand the principles of electrical machine design and carry out a basic design of an ac machine.
- ✓ Use software tools to do design calculations

**UNIT I: Introduction :** Major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings, thermal considerations, heat flow, temperature rise, rating of machines. **Total Period 04**

**UNIT II: Transformers :** Sizing of a transformer, main dimensions, kVA output for single- and three-phase transformers, window space factor, overall dimensions, operating characteristics, regulation, no load current, temperature rise in transformers, design of cooling tank, methods for cooling of transformers. **Total Period 05**

**UNIT III: Induction Motors :** Sizing of an induction motor, main dimensions, length of air gap, rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor, magnetic leakage calculations, leakage reactance of polyphase machines, magnetizing current, short circuit current, circle diagram, operating characteristics. **Total Period 05**.

**UNIT IV: Synchronous Machines :** Sizing of a synchronous machine, main dimensions, design of salient pole machines, short circuit ratio, shape of pole face, armature design, armature parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design. **Total Period 05**.

**UNIT V: Computer aided Design (CAD):** Limitations (assumptions) of traditional designs, need for CAD analysis, synthesis and hybrid methods, design optimization methods, variables, constraints and objective function, problem formulation. Introduction to FEM based machine design. Introduction to **c**omplex structures of modern machines-PMSMs, BLDCs, SRM and claw-pole machines. **Total Period 05**.

**Text / References:**


1. A. K. Sawhney, “A Course in Electrical Machine Design”, Dhanpat Rai and Sons, 1970.
2. M.G. Say, “Theory & Performance & Design of A.C. Machines”, ELBS London.
3. S. K. Sen, “Principles of Electrical Machine Design with computer programmes”, Oxford and IBH Publishing, 2006.
4. K. L. Narang, “A Text Book of Electrical Engineering Drawings”, SatyaPrakashan, 1969.
5. A. Shanmugasundaram, G. Gangadharan and R. Palani, “Electrical Machine Design Data Book”, New Age International, 1979.
6. K. M. V. Murthy, “Computer Aided Design of Electrical Machines”, B.S. Publications, 2008.
7. Electrical machines and equipment design exercise examples using Ansoft’s Maxwell 2D machine design package.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**

**Subject: Modern Instrumentation Techniques** **Code: C025533(025)**

**Total Theory Periods: 24** **Total Tutorial Periods: NIL**

**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**

**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To understand the concept of Current transformer and Potential transformer.
- To provide students the fundamental knowledge about the error presents in instruments.
- To provide students with the fundamental knowledge of different types of Transducer and their application.
- To provide students with the fundamental knowledge about the PLC and their programming.

**COURSE OUTCOMES:**

- ✓ Student can understand the use of CT and PT as a protective and measuring device.
- ✓ Student would be able to select proper Transducer for measurement of various Electrical quantities.
- ✓ Student would be able to find error and calibrate the instruments.
- ✓ Student can write programs for different processes using PLC.

**UNIT I Errors in Measuring Instruments:** Errors in measurement, general and statistical analysis of errors, Instrument transformers, errors of CTs and PTs, methods of reduction of errors of instrument transformers, Testing of CTs (Absolute and Silabee's methods), Testing of PTs: Absolute and method using wattmeter. **Total Period 04**

**UNIT II Passive and Active Electrical Transducers:** Resistive, capacitive, inductive, piezoelectric, photovoltaic, Hall effect transducers, selection of transducers, transducers characteristics, semiconductor photo-diode, photo transistor, frequency generating transducers, pressure inductive transducers, LVDT, differential output transducer, thermistor, strain gauge, measurement of angular and linear velocity using electrical transducers, reluctance pulse pick-ups, AC tachogenerators. **Total Period 05**

**UNIT III Data Acquisition System and Recorders:** Introduction of DAS, Objective of DAS, Signal conditioning of inputs, single and multi-channel DAS, Computer based DAS, Sample and hold, Multiplexing, D/A, A/D conversion general description of Data loggers, Digital transducers, optical encoders, resistive digitial encoders, shaft encoders.

**Recorders:** Introduction, Strip chart recorders, General description of XY recorders, galvanometer type recorders, potentiometric recorders. **Total Period 05**

**UNIT IV PLC:** Introduction, PLC and Operations, Basic ladder diagram, General PLC Programming Procedure, Devices to which PLC Input and Output Modules are connected. **Total Period 05**.

**UNIT V Basic PLC Programming and Functions:** Programming On-Off inputs to produce On-Off outputs, Relation of Digital Gate Logic to Contact / Coil Logic, Creating Ladder diagrams from process control descriptions. Basic PLC Functions, Register Basics, PLC Time Functions, PLC Counter Functions.

**Total Period 05**

**Text Books:**

1. Electrical and Electronics Measurements and Instrumentation: . Purkait, B Biswas, S. Das and C. Koley, McGraw hill
2. Electronic Measurements and Instrumentation: K. Lal Kishore, Pearson.
3. Programmable Logic Controllers, John W.Webb, Ronald A. Reis, Prentice Hall .

**Reference Books:**

1. Electronic Instrumentation by H. S. Kalsi, McGraw Hill
2. Instrumentation Measurement and Analysis: Nakra and Chaudhry, McGraw Hill.
3. Electronic Instruments and Instrumentation Technology" by M.M.S. Anand, PHI Publications.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Wind and Solar Energy Systems** **Code: C025534(025)**
**Total Theory Periods: 24** **Total Tutorial Periods: NIL**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To study the physics of wind power and energy
- To understand the principle of operation of wind generators
- To know the solar power resources
- To analyze the solar photo-voltaic cells
- To discuss the solar thermal power generation
- To identify the network integration issues

**COURSE OUTCOMES:**

- ✓ Understand the energy scenario and the consequent growth of the power generation from renewable energy sources.
- ✓ Understand the basic physics of wind and solar power generation.
- ✓ Understand the power electronic interfaces for wind and solar generation.
- ✓ Understand the issues related to the grid-integration of solar and wind energy systems.

**UNIT 1: Physics of Wind Power:** History of wind power, Indian and Global statistics, Wind physics, Betz limit, Tip speed ratio, stall and pitch control, Wind speed statistics-probability distributions, Wind speed and power-cumulative distribution functions. **Total Period 04**

**UNIT 2: Wind generator topologies:** Review of modern wind turbine technologies,Fixed and Variable speed wind turbines, Induction Generators, Doubly-Fed Induction Generators and their characteristics, Permanent-Magnet Synchronous Generators, Power electronics converters. Generator-Converter configurations, Converter Control. **Total Period 05**.

**UNIT 3: The Solar Resource:** Introduction, solar radiation spectra, solar geometry, Earth Sun angles, observer Sun angles, solar day length, Estimation of solar energy availability.

**Solar thermal power generation:** Technologies, Parabolic trough, central receivers, parabolic dish, Fresnel, solar pond, elementary analysis **Total Period 05**.

**UNIT 4: Solar photovoltaic:** Technologies-Amorphous, mono crystalline, polycrystalline; V-I characteristics of a PV cell, PV module, array, Power Electronic Converters for Solar Systems, Maximum Power Point Tracking (MPPT) algorithms. Converter Control. **Total Period 05**

**UNIT 5: Network Integration Issues:** Overview of grid code technical requirements. Fault ride-through for wind farms - real and reactive power regulation, voltage and frequency operating limits, solar PV and wind farm behavior during grid disturbances. Power quality issues. Power system interconnection experiences in the world. Hybrid and isolated operations of solar PV and wind systems. **Total Period 05**.

**Text / References:**


1. T. Ackermann, "Wind Power in Power Systems", John Wiley and Sons Ltd., 2005.
2. G. M. Masters, "Renewable and Efficient Electric Power Systems**",** John Wiley and Sons, 2004.
3. S. P. Sukhatme, "Solar Energy: Principles of Thermal Collection and Storage", McGraw Hill, 1984.
4. H. Siegfried and R. Waddington, "Grid integration of wind energy conversion systems" John Wiley and Sons Ltd., 2006.
5. G. N. Tiwari and M. K. Ghosal, "Renewable Energy Applications", Narosa Publications, 2004.
6. J. A. Duffie and W. A. Beckman, "Solar Engineering of Thermal Processes", John Wiley & Sons, 1991

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Branch: Electrical & Electronics Engineering** **Semester: V**
**Subject: Testing & Commissioning of Electrical Equipments** **Code: C025535(025)**
**Total Theory Periods: 40** **Total Tutorial Periods: 12**
**No. of class Tests to be conducted: 2 (Minimum)** **No. of assignments to be submitted: 2 (Minimum)**
**ESE Duration: Three Hours** **Maximum Marks in ESE: 100** **Minimum Marks in ESE: 35**

**COURSE OBJECTIVES**:

- To learn the industrial standards in testing and commissioning of electrical equipments.
- To understand the common problems in installing and commissioning of electrical equipments.
- To learn about safety measures and maintenance procedures for various electrical equipments.

**COURSE OUTCOMES:**

- ✓ After studying the subject students will be able to understand
- ✓ The common problems arising while commissioning of electric equipments.
- ✓ Learn about the routine tests to be performed and maintenance measures for various equipments.

**UNIT I Power Transformers:** Insulation resistance measurement and Meggering electrical equipment, temperature effect, polarization index, causes of poor insulation resistance, Drying out of transformer, Checks before paralleling, parallel operation Commissioning checks, Maintenance of transformer, maintenance of bushing and tap changers, Functions of breather, conservator, Troubles, Causes of failures, Ratings, Significance of impedance voltage, voltage regulation , Inspection, Storage, Handling, Transportation, civil works, site facilities, Commissioning tests capitalization of losses, Transformers oil: types, composition, properties, maintenance, testing, filtration, insulation resistance. **Total Period 05**.

**UNIT II Instrument transformers/Traction, Rectifier Transformer:** Current transformers (CT): applications, accuracy class, magnetization curve, burden, effect of open secondary, terms and definitions, type tests, routine tests on CTs, precautions, typical ratings, Voltage transformer (VT, PT): application, specifications, ratings, connections, accuracy class, and burdens, Types of VT construction. Traction transformers: Types, Special considerations, design and constructional features, Traction transformers for thyristor-controlled locomotives, Rectifier transformers: comparison between rectifier transformer and power transformer, utility factor, design feature of rectifier transformer, transductors. **Total Period 05**.

**UNIT III Rotating machines:** Troubles with D.C. Machines and Remedies, Troubles with Commutator, Maintenance of Commutator and Brushes, Troubles with D.C. Motors, Test to detect the causes of the troubles, Earth-fault Test. Testing of Induction Motors: Type Tests, Routine Tests, Commissioning Tests, Degree of Protection, Noise and its Control, Explosion Proof Motor, Installation and commissioning of induction machine and Rotating Machines. **Total Period 05**

**UNIT IV Parameters of Industrial Rotating Machines:** Drying-Out of Electrical Rotating Machines and Insulation Resistance Measurements Steps in drying-Out, Permissible Temp-rise, Log-sheets, Insulation Resistance, Power Required, Period of Drying Out, Polarisation Index, Definition of Degree of Protection and cooling Systems, standard IP codes, Definition, Types, Standard Designations, IC Code, Ratings of Industrial Rotating Machines: Thermal Rating, Operation Duties, Duty factor, Continuous Rating, Intermittent Duty, Short Time Duty STR, DTR, MCR. **Total Period 05**

**UNIT V Safety Precautions and live line Maintenance:** Shocks, Safety procedures, Permission to work, Safety Clearances, Procedures, Permit to work, Electric Field and Clearances, Live Line Maintenance, Hot-Line Maintenance, Safety, tools, Degree of Exposures, Biological effects of Electric Field, Electric shock and effects.

**Total Period 04**

**TEXT BOOKS:**

1. Testing Commissiong Operation & Maintenance of Electrical Equipment – S.Rao, DhanpatRai& Sons.
2. Electrical Power Distribution- Pabla, TMH

**REFRERNCE BOOKS:**

1. Transformers – Bharat Heavy Electrical Limited.

# Chhattisgarh Swami Vivekanand Technical University, Bhilai

**Name of the Program: BTech in Chemical Engineering** **Semester: V**
**Subject: Environmental Studies** **Code: C000506(020)**
**Period per week (L-T-P): (2-0-0) / Week** **Non-Credit**
**Total Contact Hours: 40** **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 SOURSE LEARNING:**

http://nptel.ac.in/