Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Power Electronics** Code: **C025611(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 understand and develop the firing circuit requirement for different power semiconductor devices used as switches.
- To understand the concepts of different types of AC-DC, DC-DC & DC-AC controlled converters for Industrial applications.
- To analyze the effect of controlled and uncontrolled converters in Power system and their mitigation.
- To design and develop the commutation circuits for semi controlled power semiconductor devices.
- To understand the rating specification for design and development of the protection circuits for Semiconductor devices.

COURSE OUTCOMES:

- ✓ To gain knowledge of various application of semiconductor switches by understanding their static and dynamic characteristics.
- ✓ To understand the performance characteristics of controlled AC-DC converters for R, RL & RLE loads.
- ✓ To gain knowledge on basic DC-DC converters and their operation under continuous /discontinuous mode of conduction for RLE loads
- ✓ To identify and formulate the requirements for four quadrant operation of DC motor.
- ✓ To differentiate and understand the significance of various commutation circuits and their consequence on device stress
- ✓ To understand the principle of DC-AC conversion and the different topology for three phase to three phase and single phase to single phase DC-AC conversion.

UNIT I Power Semiconductor Devices: Silicon controlled rectifier (SCR), structure, principle of operation, two transistor analogy, switching characteristics, trigger requirement , series and parallel operation of SCRs, ratings and protection, Triac structure and principle of operation only, Modern semiconductor devices, power BJT, MOSFET, IGBT structure, static characteristics. **Total Period 08**.

UNIT II Phase Controlled Rectifiers: Principle of phase control, performance parameters, single-phase half wave controlled mid -point full controlled converters and half controlled converters for R,RL and RLE load, comparison of controlled converters with and without freewheeling diode, Effect of source inductance in single-phase.Single phase dual converter in circulating and non circulating mode. Three-phase half wave and fully controlled bridge converter, three-phase semi-converter. **Total Period 12**

UNIT III DC to DC Converters: Forced Commutation Techniques for thyristor: Self commutation, Impulse commutation, Resonant pulse commutation and Complementary commutation Principle of chopper operation, controlled strategies, step up chopper, step down chopper, chopper configurations, Performance parameter of step down chopper with R-L-E load for continuous and discontinuous conduction .Working principle of Voltage commutated, Current commuted and Load commuted thyristor chopper, Buck-boost converter, **Total Period 10**.

UNIT IV DC to AC Converter: Inverter: Classification of inverters, voltage source inverter, current source inverter, Series and modified series resonant thyristor inverter. Performance parameters of single phase half bridge and full bridge inverter for R-L loads, 3-phase inverter-180 degree and 120 degree conduction mode using ideal switches for balanced R load only. Pulse width modulated switching scheme for voltage control. SPWM and modified SPWM of 1-phase inverters, PWM with Unipolar and Bipolar Voltage Switching. (Elementary analysis only) **Total Period 10**

UNIT V Cyclo-converters & AC Controllers: Basic principle of operation, step-up and step down single-phase to single-phase cyclo-converter. Principle of On-off and phase control, AC controller circuit configurations, Performance parameters of Single phase bidirectional controllers for R and RL only. **Total Period 08**.

Text Books:

1. Power Electronics Circuits, Devices and Applications: Muhammad H. Rashid, PHI
2. Power Electronics: P.S. Bhimbra, Khanna Publishers

Reference Books:

1. Power Electronics Converters, applications and Design: Mohan, Undeland, Robbins, John Wiley& Sons
2. A text book of Power Electronics: S.N Singh, DhanpatRai& Co.(P)Ltd.
3. An Introduction to Thyristor and its applications: M. Ramamoorty, East-West Press

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Electrical Power System-II** Code: **C025612(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:

- This course is an extension of Electrical Power systems course.
- It deals with basic theory of transmission line modeling and their performance analysis.
- A detailed study of Power System stability, Load flow studies and economic power dispatch is part of the curriculum for students.

COURSE OUTCOMES:

- ✓ Student should be able to make a one line representation of Power System.
- ✓ Student should be able to evaluate fault currents for different faults at different locations in Power System.
- ✓ Students should be able to identify cases of stable and unstable Power Systems.

UNIT I: Representation of Power System: Single line diagram, impedance diagram, reactance diagram, equivalent impedance of three phase transformer, per unit quantities, P.U. impedance of three phase transformer, positive sequence impedance diagram in per unit system, Expression for three phase power in p.u. Systems

Total Period 08.

UNIT II: Symmetrical Components: Expression for positive, negative & zero sequence components, existence of sequence components of current & voltages for three phase circuit, sequence impedance of alternator &transmission line, Sequence network of unloaded generator, zero sequence network of three phase transformers, phase shift in star-delta transformer. **Total Period 10**.

UNIT III Fault Calculations: Single line to ground fault, Line to line fault, Double line to ground fault on unloaded generator, faults through impedance, open conductor faults, unsymmetrical fault on power system, Three phase short circuit on synchronous machine, Three phase short circuit on power system, Calculation of different current ratings and interrupting capacity of circuit breaker. **Total Period 12**

UNIT IV Power System Stability: The stability problem, steady-state stability, transient stability, Swing equation, Equal area criterion of stability, application of equal area criterion, critical clearing angle. **Total Period 08**

UNIT V a) Economic operation of power systems: Input output curves, criteria for economical distribution of power between generating units in a plant, Expression for transmission line loss in terms of loss formula coefficients, criteria for economical distribution of power between generating plants

b) Load Flow Studies: Bus admittance matrix, formation of load flow equation, Gauss Shield method, Newton Raphson method. **Total Period 10**

Text Books:

1. Elements of power system analysis By W.D. Stevenson (4th Ed. Mc Graw Hill)
2. Power System Engg. By I.J. Nagrath & Kothari (Tata McGraw Hill)

Reference Books:

1. Power System Analysis and Design by B.R. Gupta (3rd Ed S. Chand)
2. Power System Engg. BY A. Chakrabarti, M.L. Soni,P.V.Gupta, V.S.Bhatnager(6th Ed Dhanpat Rai & Co.)
3. Electrical Power System by Ashfaq Hussain (4th Ed. CBS Pub. & Dist.)

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Digital Signal Processing** Code: **C025613(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 determine the zero-input and zero-state responses of system described by constant-coefficient difference equations, and determining the complete response of such systems.
- To determine the linear and circular convolutions of discrete-time systems.
- To evaluate the Discrete-Time Fourier Transform.
- To evaluate and plot the frequency (magnitude and phase) of linear-time invariant systems.
- To determine the Discrete-Fourier transform of a sequence.

COURSE OUTCOMES:

- ✓ Design digital IIR filters by designing prototypical analog filters and then applying analog to digital conversion techniques such as the bilinear transformation.
- ✓ Design digital FIR filters using the window method.
- ✓ Use a computer to design digital filters via the frequency sampling approach and the Remez exchange Algorithm.
- ✓ Implement digital filters in a variety of forms: direct form I and II, parallel, and cascade, and then analyze their sensitivity to finite precision effects such as input quantization, coefficient quantization, and multiplication round-off.
- ✓ Analyze signals using the discrete Fourier transform (DFT).
- ✓ Understand circular convolution, its relationship to linear convolution

UNIT I Discrete-Fourier Transform & Fast Fourier Transform:: Linear and Circular convolutions: Circular Convolution (Concentric Circle method, DFTs and IDFTs, Matrix method), Performing Linear Convolution using DFTs, Fast Fourier Transform (FFT), Radix-2FFT algorithm, Decimation-in-time (DIT) Radix-2 algorithm, Decimation-in-Frequency (DIF) Radix-2algorithm. **Total Period 05**.

UNIT II FIR Filter Approximations: Ideal characterization of standard filters- Low-pass, High-pass, Band-pass and Band-stop filters, Differentiators, Hilbert Transforms, Symmetric and Anti-symmetric FIR filters FIR filter approximations by window functions- Hanning window, Hamming and Blackmann window, FIR filter Approximation by Frequency Sampling, Maximally flat FIR filter approximation. **Total Period 05**.

UNIT III IIR Filter Approximations: Introduction, Analog Filter specification, Continuous –time to discrete time transformation-Impulse Invariance method, Bilinear transformation, Design of low-pass Butterworth Filter, Design of low-pass Chebyshev Filter, frequency Transformation in discrete-time domain- Low-pass to low-pass, low-pass to high-pass, low-pass to band-pass, low-pass to band-stop transformation **Total Period 05**.

UNIT IV Realization of Digital Filters: Introduction, Basic structures of non-recursive digital filters- Direct form, Cascade form and Linear-phase form, Basic structures of recursive digital filters- Direct form, cascade form, Parallel form, State space structure, Ladder form **.** **Total Period 04**.

UNIT V Finite Word Length Effects: Fixed point and floating point number representations - Comparison - Rounding and Truncation errors, Quantization effects in Analog-to Digital Conversion of Signals, Output noise power from a digital system, Coefficient quantization effects in Direct Form realization of IIR filters, Coefficient quantization effects in Direct Form realization of FIR filters. **Total Period 05**.

TEXT BOOKS:

1**.** Digital Signal Processing by S Salivahanan, AVallavaraj, Tata McGraw-Hill Education.

2. Discrete Time Signal Processing,: Oppeheim, Schafer, Buck Pearson education publication, 2nd Edition, 2003.

3. Digital Signal Processing by S. Palani and K. Kalaiyarasi, Ane books, Pvt. LtD.

REFERENCE BOOKS:

1.Digital Signal Processing Principles, Algorithms and Applications: John G Proakis and Manolakis, Pearson.

2.Digital Signal Processing: Sanjit. K. Mitra, Mc Graw Hill.

3. Digital Signal Processing: C. Ramesh Babu Durail, Laxmi Publications.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Technical Communication & Soft Skills** Code: **C000601(046)**

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

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

UNIT-1 Communication Skills-Basics: Understanding the communicative environment, Verbal Communication; Non Verbal Communication & Cross Cultural Communication, Body Language & Listening Skills; Employment Communication&writing CVs, Cover Letters for correspondence.Common errors during communication, Humour in Communication.

UNIT-2 Interpersonal communication: Presentation, Interaction and Feedbacks, Stage Manners, Group Discussions (GDs) and facing Personal Interviews, Building Relationships, Understanding Group Dynamics- I, Emotional and Social Skills, Groups, Conflicts and their Resolution, Social Network, Media and Extending Our Identities.

UNIT- 3 Vocational skills: Managing time: Planning and Goalsetting, managing stress: Types of Stress; Making best out of Stress, Resilience, Work-life balance, Applying soft-skills to workplace.

UNIT-4 Mindsets and Handling People: Definitions and types of Mindset, Learning Mindset, Developing Growth Mindset, Types of People, How to Lead a Meeting, How to Speak Effectively in Meetings, Behavior & Roles in Meetings, Role Play: Meeting.On Saying "Please", How to say "NO".

UNIT-5 Positive Pschycology: Motivating oneself, Persuasion, Survival Strategies, Negotiation, Leadership and motivating others**,** controlling anger**,** Gaining Power from Positive Thinking.

Text Books:

1. Petes S. J., Francis. Soft Skills and Professional Communication. New Delhi: Tata McGraw-Hill Education, 2011.
2. Stein, Steven J. & Howard E. Book. The EQ Edge: Emotional Intelligence and Your Success. Canada: Wiley & Sons, 2006.
3. Dorch, Patricia. What Are Soft Skills? New York: Execu Dress Publisher, 2013.

Reference Books:

- Kamin, Maxine. Soft Skills Revolution: A Guide for Connecting with Compassion for Trainers, Teams, and Leaders. Washington, DC: Pfeiffer & Company, 2013.
- Peale Norman Vincent. The Power of Positive Thinking: 10 Traits for Maximum Result. Paperback Publication. 2011.
- Klaus, Peggy, Jane Rohman& Molly Hamaker. The Hard Truth about Soft Skills. London: Harper Collins E-books, 2007.

Course Outcomes

1. Learn to listen actively to analyse audience and tailor the delivery accordingly.
2. Increase their awareness of communication behaviour by using propriety-profiling tool.
3. Master three "As" of stressful situation: Avoid, Alter, Accept; to cope with stressors and create a plan to reduce or eliminate them.
4. Develop growth mind-set and able to handle difficult person and situations successfully.
5. Develop technique of turning negativity into positivity and generate self-motivation skills.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Power Electronics lab** Code: **C025621(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 study and plot the V-I characteristics of an SCR.
2. To study and plot the drain characteristics of a MOSFET.
3. To study and plot the drain characteristics of a IGBT.
4. To study single-phase half-wave bridge controlled rectifier for R and RL load.
5. To study single-phase full-wave bridge controlled rectifier for R and RL load with and without freewheeling diode.
6. To study of three-phase half-wave controlled rectifier for resistive load.
7. To study of three-phase full-wave controlled rectifier for resistive load.
8. To study step down and step up chopper circuit.
9. To study class A/B/C forced commutation chopper circuits.
10. To study Single Phase series inverter with R and RL loads.
11. To study Single Phase parallel inverter with R and RL loads.
12. To study the bipolar and unipolar switching scheme of a single phase full bridge inverter using MATLAB / PSPICE simulation.
13. To study the three phase VSI for 180/120 mode of conduction using MATLAB / PSPICE simulation.
14. To study Single Phase step down cycloconverter for R and RL loads.
15. To study single-phase AC voltage control by using TRIAC for R and RL loads.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Electrical Power System-II Lab** Code: **C025622(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. Determination of the phase sequence of a three phase supply by static method.
2. Determination of vector group (Dy1) of a three phase transformer.
3. Determination of vector group (Dy11) of a three phase transformer.
4. Determination of zero sequence impedance and currents for different connections of a three phase transformer.
5. Determination of the zero sequence reactance of a synchronous generator.
6. Determination of Negative Sequence Reactance of synchronous generator.
7. Study of the effect of load angle δ on the stability of synchronous machines.
8. Determination of the fault current in case of three phase fault on a power system.
9. Determination of the fault current in case of line to ground fault on a power system.
10. Determination of the fault current in case of line to line fault on a power system.
11. Determination of the fault current in case of double line to ground fault on a power system.
12. Determination of the change in fault current with the change in the fault location of the power system.
13. Computer Simulation of balanced and unbalanced faults on a power system and observation of the change in system currents and voltages from that of a healthy system.
14. Simulation of Short, Medium & Long transmission line.
15. Computer simulation of a simple system, formation of the bus admittance/ impedance matrix and power flow on the system using software.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Computer Simulation Lab** Code: **C025623(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. Simulation of different types of controllers (PID, PI, PLL).
2. Simulation for the addition of poles and zeros in a given transfer function.
3. Simulation of different types of filters.
4. Simulation of the performance of a full wave bridge rectifier for RL and RLC load.
5. Simulation of step up and step down choppers.
6. Simulation of chopper controlled DC motor.
7. Simulation and modeling of synchronous machine (Xd,Xd')
8. Write a program for computation of real, reactive power and line loss.

9 Write a program to plot V and inverted V curve.

10. Write a program for transformer parameter calculation.

11 Write a program for transmission line parameter calculation (Z, Y, A, B, C, D).

12 Write a program for load flow solution by Gauss Seidal Method.

13 Write a program for load flow solution by Newton Raphson Method.

14 Write a program for economic load dispatch calculation.

15 To Determine fault location in a cable.

Requirements for the Simulation Lab:

PSCAD, MiPower, MATLAB/Simulink

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Digital Signal Processing Laboratory** Code: **C025624(025)**

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

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

List of Experiments to be performed:

1. Write a program to generate the basic Analog and Discrete Signals.
2. Write a program to plot Fourier Transform amplitude spectrum and phase spectrum for a given function.
3. Write a program to sample a sinusoidal signal at Nyquist rate, above the Nyquist Rate and below the Nyquist Rate.
4. Write a program to plot frequency response in Z-domain for the given transfer function.
5. Write a program for linear convolution of two sequences.
6. Write a program for circular convolution.
7. Write a program to correlate two given signals.
8. Write a program to perform FFT on a sequence using the following methods: (a) Decimation in time (b) Decimation in frequency.
9. Write a program to perform IDFT on a transformed sequence using DFT.
10. Write a program to design an FIR filter using windowing technique.
11. Write a program to design IIR Filter using Impulse Invariant Method.
12. Write a program to design IIR Filter using Bilinear Transformation.
13. Write a program to design FIR Filter using Frequency Sampling Method.

List of Equipments/Machine Required: MATLAB with Tool boxes, DSP Processor Kit.

Recommended Book: Digital Signal Processing by Salivahanan, Vallavaraj, Gnanapriya, Tata McGraw Hillpublisher

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Communication System (Professional Elective – II)** Code: **C025631(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:

- The course provides an introduction to analog and digital communication systems.
- This course responds to the needs of the engineering and technological aspirants

COURSE OUTCOMES:

- ✓ Understand amplitude modulation method and its working
- ✓ Understand angle modulation technique viz. FM and PM.
- ✓ Understand pulse modulation technique and their advantages.
- ✓ Understand digital modulation technique and their advantages over analog modulation techniques.
- ✓ Understand the basics of information theory and coding scheme used in communication.

UNIT I: Amplitude Modulation: Need of modulation, Amplitude modulation, Amplitude Modulation Index, power relation. AM wave, generation of AM, balanced modular signal side band technique, suppression of unwanted sideband, side band transmission, demodulation, envelop detector, synchronous detector.

Total Period 08

UNIT II: Angle Modulation: Mathematical equation of frequency modulation (FM), frequency spectrum, phase modulation (PM), relationship between PM and FM, pre-emphasis and de-emphasis, adjacent channel interference, comparison of narrow band and wide band FM, generation of FM, reactance modulator. **Total Period 10**.

UNIT III Pulse Modulation System: Sampling theorem, Sampling of Low Pass and band pass signals, Aliasing, Aperture effect, Basic principles of PAM, PWM and PPM, their generation and detection, FDM, TDM, Comparison of TDM and FDM **Total Period 10**

UNIT IV Digital Modulation Techniques: Pulse code modulation signal to quantization noise ratio, DPCM, DM and ADM, Digital transmission through Career Modulation: Fundamentals of Binary ASK, PSK and FSK; generation and detection of BASK, BPSK and BFSK, Differential phase shift keying. **Total Period 10**.

UNIT V Information Theory: Introduction, Sources of information, Contents in DMS, Contents of a symbol, Entropy, Information rate, Discrete memory less channel, Conditional joint entropies, mutual information, Channel capacity, Source coding, Coding efficiency, Entropy coding. **Total Period 10**.

Text Books:

1. Principles of Communication Systems –Taub and Shilling, Tata Mc Graw Hill.
2. A Text Book of Analog & Digital Communication –P. Chakrabarti, Dhanpat Rai& Co.

Reference Books:

1. Electrical Communication Systems, Kennedy, TMH
2. Digital Communications, Sanjay Sharma, S.K. Kataria & Sons, New Delhi

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Distributed Generation (Professional Elective – II)** Code: **C025632(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 become aware of the modern energy generation scenario.
- To learn the principles and applications of various non-conventional energy sources.
- To learn about the interconnection of various energy generating systems and their impact on the environment.

COURSE OUTCOMES:

- ✓ After studying the subject students will be able to visualize the working principles and design aspects of various renewable energy sources and their interconnection.

UNIT I Concepts of Distributed Generation: Centralized Generation: Main features, Economics, Advantages & Disadvantages De-centralised/ Distributed / Embeded/Dispersed Generation, Operation of Distributed, Generation Systems, Consideration of Reliability & Economics Advantages & Disadvantages, Introduction to energy conversion, Principles of renewable energy systems-technical and social implication**.** **Total Period 05**.

UNIT II Direct energy conversion (DEC): DEC devices-photo voltaic system-solar cells-cell efficiency-Limitations-PV modules-Battery back up-Systems design -Lighting and water pumping application.

Total Period 05

UNIT III Other Energy Sources-I: Fuel cells, types-losses in fuel cell, Application Biofuels-classification – biomass conversion process-application, Ocean thermal energy conversion systems. **Total Period 05**

UNIT IV Other Energy Sources- II: Thermionic Conversion – Principles of working. Hydrogen Energy – Principles of conversion, production of H2. Tidal and wave power-applications, Micro and mini hydel power, Hybrid Energy System implementation –case study, Geo Thermal Energy. **Total Period 05**

UNIT V Deregulated Systems: Deregulated Systems: Reconfiguring Power systems, Unbundling of Electric Utilities, Competition and Direct access. **Total Period 05**

Text Books:

1. G.D. Rai, Non-Conventional energy Sources, Khanna Publications, New Delhi.

2. Sukhatme, S.P., Solar Energy -Principles of Thermal Collection and Storage, TataMcGraw –Hill, New Delhi.

Reference Books:

1. Kreith, F. and Kreider,J.F., Principles of Solar Engineering,Mc-Graw-Hill Book Co.

2. James Larminie, Andrew Dicks,Fuel Cell Systems,John Weily & Sons Ltd.

3. J.F. Manwell, J.G. McGowan, A.L. Rogers, Wind Energy Explained John Willy & Sons Ltd.

4. E.J. Womack MHD Power Generation Engineering aspects, Chapman and Hall Publication.

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Testing and Commissioning of Electrical Equipments (Professional Elective – II)**

Code:

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 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. They will also be able to 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 04**

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 I **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 05.

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

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

Subject: **Simulation & Programming (Professional Elective – II)** Code: **C025634(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 Learn the basic programming concepts in C++ and MATLAB
- To use C++ and MATLAB for solving important Engineering problems
- To develop rational thinking and visualize the theoretical concepts of various engineering subjects with the help of programs and models..

COURSE OUTCOMES:

- ✓ After studying the subject students will be able to understand the basic programming in C++ and MATLAB.
- ✓ They will also be able to solve various engineering problems through Programming and Simulation through these software.

UNIT I Basic Programming elements in C++: Introduction to computer systems; number systems, integer, signed integer, fixed and floating point arithmetic; Input/output; Constants, Variables, Strings, expressions and operators; Looping and control structures; header files, pre-processor directives, Compiling and linking.

Total Period 04

UNIT II Programming through functional decomposition in C++: Design of functions and their interfaces (concept of functional decomposition), scope and lifetime of variables, passing by value, passing by reference. Recursive function, function overloading and default arguments; Library functions. Arrays and passing arrays to functions, Dynamic data and pointers, use of pointers in linked structures. **Total Period 05**.

UNIT III Object Oriented Programming Concepts in C++: Data hiding, abstract data types, classes and access control; Class implementation- default constructor, constructors, copy constructor, destructor, operator overloading; object oriented design (an alternative to functional decomposition), inheritance and composition; Dynamic binding and virtual functions; Polymorphism; Dynamic data in classes. **Total Period 05**.

UNIT IV MATLAB Programming and Common Applications of MATLAB Functions: Matrices in MATLAB and their applications, Generating a simple linear plot and plot annotations, writing a MATLAB program, writing MATLAB functions with single and multiple arguments, MATLAB library functions, Application of MATLAB in Electrical & Electronics Engineering: DSP Applications: Generating and plotting various waveforms, DFT, FFT, Control System Applications: Laplace transform, Transfer Function and State Space forms, Pole-Zero plot, time response analysis: step, ramp and impulse response, Bode plots, root locus plots and Nyquist plots. Image Processing with MATLAB: Image as a Matrix, Extracting Image features. **Total Period 05**

UNIT V Modeling with MATLAB-Simulink : Introduction to SIMULINK, making SIMULINK model for various systems, creating and masking subsystems in SIMULINK, Simulation of Electrical and Electronics Circuits with MATLAB/SIMULINK: Basic Circuit Simulation with R,L,C elements and their time response, Power Electronics: Simulating Single and Three phase rectifiers, FFT analysis for input/output waveforms, Converter simulation with DC/AC motor load, Design of firing circuits. OPAMP Applications (using SimScape): Inverting and Non-inverting Amplifiers, Adder, Integrator and Differentiator, Creating Graphical User Interface (GUI), linking m-file and SIMULINK model, Introduction to various Toolboxes of MATLAB/Simulink, Introduction to MATLAB Hardware Interface. **Total Period 05**

Text Books:

1. Programming in C++: Balaguruswami, TMH.
2. Programming in MATLAB: A Problem Solving Approach, Ram N Patel and Ankush Mittal, Pearson Education, India.
3. Modelling& Simulation using MATLAB-SIMULINK: Dr. Shailendra Jain, Wiley India

Reference Books:

1. C++ How to Program: Deitel and Deitel,Prentice Hall
2. Let us C: Y. Kanetkar, BMB publications

Chhattisgarh Swami Vivekanand Technical University, Bhilai

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

Subject: **Medical Electronics (Professional Elective – II)** Code: **C025635(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:

- The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance.
- The fundamental principles of equipment that are actually in use at the present day are introduced.

COURSE OUTCOMES:

- ✓ To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration.
- ✓ To make the students understand the various sensing and measurement devices of electrical origin.
- ✓ To provide the latest ideas on devices of non-electrical devices.
- ✓ To bring out the important and modern methods of imaging techniques.
- ✓ To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I Human Physiology and Basics: Brief introduction to human physiology, Basic components of bio-medical instruments, bioelectric signals, action potentials, Bio-electrodes. **Total Period 04**

UNIT II Transducers and Electro-Physiological Measurements: Biomedical Transducers: displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases, Analysis of EEG, ECG, EMG, EOG, & Bio-Potential Amplifiers for ECG, EMG, EEG, etc. **Total Period 05**.

UNIT III Monitoring Systems: Patient care and monitoring system, Remote monitoring through telephone, Internet, Satellite link. **Total Period 05**

UNIT IV Electrical Parameter Measurements: Cardiovascular measurement-blood pressure, blood flow, stroke volume, Impedance Plethysmography, Cardiac output, heart sound etc. Instrumentation for respiratory and nervous systems. **Total Period 05**

UNIT V Assisting and Therapeutic Equipments and Safety: Safety aspects associated with Biomedical Instrumentation. Recent advances in Bio-Medical Instrumentation, Microprocessor based systems, Laser & optical Fiber systems. **Total Period 05**

Text books:

1. Biomedical Instruments & Measurements: Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer,
2. P E Handbook of Biomedical Instrumentation:R.S.Khandpur, TMH

Reference books:

1. Biomedical Instrumentation: Arumungam, Anuradha Agencies.
2. Introduction to biomedical engineering: Domach, Pearson Education