

UNIT – III

Protection of Power Equipment: Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter-turn fault Protection. Numerical Problems on % Winding Unprotected.

Protection of transformers: Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

Protection of Lines: Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays. Translay Relay.

Protection of Bus bars – Differential protection.

UNIT – IV

Neutral Grounding: Grounded and Ungrounded Neutral Systems. - Effects of Ungrounded Neutral on system performance. Methods of Neutral Grounding: Solid, Resistance, Reactance - Arcing Grounds and Grounding Practices.

UNIT - V

Protection Against Overvoltages: Generation of Over Voltages in Power Systems.- Protection against Lightning Over Voltages - Valve type and Zinc-Oxide Lighting Arresters - Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

TEXT BOOKS:

1. “Badri Ram , D. N Viswakarma”, “Power System Protection and Switchgear”, TMH Publications, 2011
2. “Sunil S Rao”, “Switchgear and Protection”, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. “Paithankar and S. R. Bhide”, “Fundamentals of Power System Protection”, PHI, 2003.
2. “C R Mason”, Art & Science of Protective Relaying – Wiley Eastern Ltd, 1966.
3. “C. L. Wadhwa”, “Electrical Power Systems”, New Age international (P) Limited, Publishers, 6th Edition 2007

**EM611PE: COMPUTER ORGANIZATION
(PROFESSIONAL ELECTIVE – I)**

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Switching theory and Logic Design

Course Objectives:

- To understand basic components of computers.
- To understand the architecture of 8086 processor.
- To understand the instruction sets, instruction formats and various addressing modes of 8086.
- To understand the representation of data at the machine level and how computations are performed at machine level.
- To understand the memory organization and I/O organization.
- To understand the parallelism both in terms of single and multiple processors.

Course Outcomes:

- Able to understand the basic components and the design of CPU, ALU and Control Unit.
- Ability to understand memory hierarchy and its impact on computer cost/performance.
- Ability to understand the advantage of instruction level parallelism and pipelining for high performance Processor design.
- Ability to understand the instruction set, instruction formats and addressing modes of 8086.
- Ability to write assembly language programs to solve problems.

UNIT - I

Digital Computers: Introduction, Block diagram of Digital Computer, Definition of Computer Organization, Computer Design and Computer Architecture.

Basic Computer Organization and Design: Instruction codes, Computer Registers, Computer instructions, Timing and Control, Instruction cycle, Memory Reference Instructions, Input – Output and Interrupt, Complete Computer Description.

Micro Programmed Control: Control memory, Address sequencing, micro program example, design of control unit.

UNIT - II

Central Processing Unit: The 8086 Processor Architecture, Register organization, Physical memory organization, General Bus Operation, I/O Addressing Capability, Special Processor Activities, Minimum and Maximum mode system and timings.

8086 Instruction Set and Assembler Directives-Machine language instruction formats, Addressing modes, Instruction set of 8086, Assembler directives and operators.

UNIT - III

Assembly Language Programming with 8086- Machine level programs, Machine coding the programs, Programming with an assembler, Assembly Language example programs.
Stack structure of 8086, Interrupts and Interrupt service routines, Interrupt cycle of 8086, Interrupt programming, Passing parameters to procedures, Macros, Timings and Delays.

UNIT - IV

Computer Arithmetic: Introduction, Addition and Subtraction, Multiplication Algorithms, Division Algorithms, Floating - point Arithmetic operations.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous data transfer, Modes of Transfer, Priority Interrupt, Direct memory Access, Input –Output Processor (IOP), Intel 8089 IOP.

UNIT - V

Memory Organization: Memory Hierarchy, Main Memory, Auxiliary memory, Associate Memory, Cache Memory.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors.

Multi Processors: Characteristics of Multiprocessors, Interconnection Structures, Inter processor arbitration, Inter processor communication, and synchronization.

TEXT BOOKS:

1. Computer System Architecture, M. Moris Mano, Third Edition, Pearson. (**UNIT-I , IV , V**)
2. Advanced Microprocessors and Peripherals, K M Bhurchandi, A.K Ray ,3rd edition, McGraw Hill India Education Private Ltd. (**UNITS - II, III**).

REFERENCES:

1. Microprocessors and Interfacing, D V Hall, SSSP Rao, 3rd edition, McGraw Hill India Education Private Ltd.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky: Computer Organization, 5th Edition, Tata McGraw Hill, 2002
3. Computer Organization and Architecture, William Stallings, 9th Edition, Pearson.
4. David A. Patterson, John L. Hennessy: Computer Organization and Design – The Hardware / Software Interface ARM Edition, 4th Edition, Elsevier, 2009.

**EE612PE: LINEAR SYSTEMS ANALYSIS
(PROFESSIONAL ELECTIVE – I)**

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Mathematics – II & Network Theory

Course Objectives:

- To develop ability to analyze linear systems and signals
- To develop critical understanding of mathematical methods to analyze linear systems and signals

Course Outcomes: After successfully completing this course, students will be able to:

1. Use mathematical modeling tools to represent linear systems
2. Use mathematical modeling tools to analyze linear systems

UNIT-I

State Variable Analysis: Choice of state variables in Electrical networks-Formulation of state equations for Electrical networks Equivalent source method. Network topological method - Solution of state equations-Analysis of simple networks with state variable approach.

UNIT-II

Fourier Series and Fourier Transform Representation: Introduction, Trigonometric form of Fourier series, Exponential form of Fourier series, Wave symmetry, Fourier integrals and transforms, Fourier transform of a periodic function, Properties of Fourier Transform, Parseval's theorem, Fourier transform of some common signals, Fourier transform relationship with Laplace Transform.

Applications of Fourier series and Fourier Transform Representation: Introduction, Effective value, and average values of non sinusoidal periodic waves, currents, Power Factor, Effects of harmonics, Application in Circuit Analysis, Circuit Analysis using Fourier Series.

UNIT – III

Laplace Transform Applications: Application of Laplace transform Methods of Analysis – Response of RL, RC, RLC Networks to Step, Ramp, and impulse functions, Shifting Theorem – Convolution Integral – Applications

Testing of Polynomials: Elements of realisability - Hurwitz polynomials-positive real functions-Properties-Testing-Sturm's Test, examples.

Network Synthesis: Network synthesis: Synthesis of one port LC networks-Foster and Cauer methods-Synthesis of RL and RC one port networks-Foster and Cauer methods

UNIT-IV

Sampling: Sampling theorem – Graphical and Analytical proof for Band Limited Signal impulse sampling, natural and Flat top Sampling, Reconstruction of signal from its samples, effect of under sampling – Aliasing, introduction to Band Pass sampling, Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Power density spectrum, Relation between auto correlation function and Energy / Power spectral density function.

UNIT-V

Z-Transforms: Fundamental difference between continuous and discrete time signals, discrete time complex, exponential and sinusoidal signals, periodicity of discrete time complex exponential, concept of Z Transform of a discrete sequence. Distinction between Laplace, Fourier, and Z-Transforms. Region of convergence in Z-Transforms, constraints on ROC for various classes of signals, Inverse Z-Transform properties of Z-Transforms.

Text Books:

1. “B. P. Lathi”, “Signals, Systems and Communications”, BS Publications 2003.
2. “Umesh Sinha” “Network Analysis and Synthesis”, Satya Prakashan Publications, 2013.

Reference Books:

1. “A. N. Tripathi”, “Linear System Analysis”, New Age International, 2nd Edition 1987.
2. “D. Roy Chowdhary”, “Network and Systems”, New Age International, 2005.
3. “Gopal G Bhise, Prem R. Chadha”, Engineering Network Analysis and Filter Design, Umesh Publications 2009.
4. “A. Cheng”, linear system analysis, Oxford publishers, 1999.

**EE613PE: LINEAR AND DIGITAL IC APPLICATIONS
(PROFESSIONAL ELECTIVE – I)**

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Electronic circuits & Digital logic fundamentals

Course Objectives: The main objectives of the course are:

- 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 the concepts of waveform generation and introduce some special function ICs.
- To understand and implement the working of basic digital circuits

Course Outcomes: On completion of this course, the students will have:

- A thorough understanding of operational amplifiers with linear integrated circuits.
- Understanding of the different families of digital integrated circuits and their characteristics.
- Also students will be able to design circuits using operational amplifiers for various applications.

UNIT - I

Operational Amplifier: Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

UNIT - II

Op-Amp, IC-555 & IC 565 Applications: Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, Description of Individual Blocks, Applications.

UNIT - III

Data Converters: Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

UNIT - IV

Digital Integrated Circuits: Classification of Integrated Circuits, Comparison of Various Logic Families, CMOS Transmission Gate, IC interfacing- TTL Driving CMOS & CMOS Driving TTL, Combinational Logic ICs – Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, Demultiplexers, LED & LCD Decoders with Drivers , Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

UNIT - V

Sequential Logic ICs and Memories: Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

TEXT BOOKS:

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Operational Amplifiers - George Clayton and Steve Winder, 5th Ed, Elsevier

REFERENCE BOOKS:

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2nd Ed., 2003.
2. Modern Digital Electronics – RP Jain – 4/e – TMH, 2010.
3. Digital Fundamentals – Floyd and Jain, Pearson Education, 8th Edition, 2005
4. Digital Design Principles and Practices – John. F. Wakerly 3/e, 2005.
5. Operational Amplifiers with Linear Integrated Circuits, 4/e William D. Stanley, Pearson Education India, 2009.

**EE614PE: ELECTRICAL AND ELECTRONICS INSTRUMENTATION
(PROFESSIONAL ELECTIVE – I)**

B.Tech. III Year II Sem.

L	T	P	C
3	0	0	3

Prerequisite: Electrical Measurements & Instrumentation

Course Objectives:

- Instrumentation is essential in monitoring and analysis of any Physical system and its control.
- This course deals with different types of transducers, digital voltmeters, oscilloscopes, and measurement of non electrical quantities.

Course Outcomes: After completion of this course, the student will be able to

- Design and implement systems utilizing analog / digital control devices.
- Apply the concepts of automatic control, including measurement, feedback, and feed forward regulation for the operation of continuous and discrete systems.
- Solve technical problems and be proficient in the analysis, design, test, and implementation of instrumentation and control systems.
- Apply the concepts of heat transfer to the design of process control systems.
- Able to utilize modern and effective management skills for performing investigation, analysis, and synthesis in the implementation of automatic control systems.

UNIT – I

Characteristics of Signals and Their Representation: Measuring Systems, Performance Characteristics - Static characteristics, Dynamic Characteristics; Errors in Measurement - Gross Errors, Systematic Errors, Statistical Analysis of Random Errors.

Signals and their representation: Standard Test, periodic, aperiodic, modulated signal, sampled data, pulse modulation, and pulse code modulation

UNIT – II

Oscilloscope and Digital Voltmeters: Cathode ray oscilloscope-Cathode ray tube-time base generator - horizontal and vertical amplifiers - CRO probes-applications of CRO - Measurement of phase and frequency - lissajous patterns - Sampling oscilloscope-analog and digital type.

Digital voltmeters - Successive approximation, ramp, dual-Slope integration, continuous balance type - Micro processor based ramp type DVM, digital frequency meter - digital phase angle meter.

UNIT – III

Signal Analyzers: Wave analyzers - Frequency selective analyzers, Heterodyne, Application of Wave analyzers - Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters.

UNIT – IV

Transducers: Definition of transducers, Classification of transducers, Advantages of electrical transducers, Characteristics and choice of transducers; Principle of operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, gauge factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photovoltaic, photo conductive cells, photo diodes.

UNIT – V

Measurement of Non-Electrical Quantities: Measurement of strain, Gauge sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Vacuum, Flow and Liquid level.

Text Books:

1. D. V. S Murthy, “Transducers and Instrumentation”, Prentice Hall of India, 2nd edition, 2009.
2. K. Sawhney, “A course in Electrical and Electronic Measurements and Instrumentation”, Dhanpatrai & Co., 12th edition, 2010.

Reference Books:

1. D O Doebelin, “Measurements Systems, Applications and Design”, TMH Publications, 5th edition, 2003.
2. D Helfrick and W. D. Cooper, “Modern Electronic Instrumentation and Measurement techniques”, Pearson/Prentice Hall of India, 12th edition, 2010.
3. S Morris, “Principles of Measurement and Instrumentation”, Pearson /Prentice Hall of India, 2nd edition, 1994.
4. H. S. Kalsi, “Electronic Instrumentation”, Tata McGraw-Hill Edition, 1995, 1st edition, 1995.

EE604PC: POWER SYSTEMS LAB**B.Tech. III Year II Sem.**

L	T	P	C
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Prerequisite: Power Systems & Electrical Machines**Course Objectives:**

- perform testing of CT, PT's and Insulator strings
- To find sequence impedances of 3- Φ synchronous machine and Transformer
- To perform fault analysis on Transmission line models and Generators.

Course Outcomes: After completion of this lab, the student will be able to

- Perform various load flow techniques
- Understand Different protection methods
- Analyze the experimental data and draw the conclusions.

The following experiments are required to be conducted as compulsory experiments:**Part - A**

1. Characteristics of IDMT Over Current Relay.
2. Differential protection of 1- Φ transformer.
3. Characteristics of Micro Processor based Over Voltage/Under Voltage relay.
4. Testing of CT, PT's and Insulator strings.
5. Finding the sequence impedances of 3- Φ synchronous machine.
6. Finding the sequence impedances of 3- Φ Transformer.

In addition to the above six experiments, at least any four of the experiments from the following list are required to be conducted.**Part - B**

1. Formation of Y_{BUS} .
2. Load Flow Analysis using Gauss Seidal (GS) Method.
3. Load Flow Analysis using Fast Decoupled (FD) Method.
4. Formation of Z_{BUS} .
5. LG, LL and 3- Φ fault analysis of 3- Φ synchronous machine.
6. Power circle diagrams of a 3- Φ transmission line model.
7. ABCD constants and Regulation of a 3- Φ transmission line model.

8. Transient Stability Analysis for Single Machine connected to Infinite Bus by Point by Point method.

Reference Books:

1. C.L. Wadhwa: Electrical Power Systems –Third Edition, New Age International Pub. Co., 2001.
2. Hadi Sadat: Power System Analysis –Tata Mc Graw Hill Pub. Co. 2002.
3. D. P. Kothari: Modern Power System Analysis-Tata Mc Graw Hill Pub. Co. 2003.

EE605PC: POWER ELECTRONICS LAB**B.Tech. III Year II Sem.**

L	T	P	C
0	0	3	2

Prerequisite: Power Electronics**Course Objectives:**

- Apply the concepts of power electronic converters for efficient conversion/control of power from source to load.
- Design the power converter with suitable switches meeting a specific load requirement.

Course Outcomes: After completion of this course, the student is able to

- Understand the operating principles of various power electronic converters.
- Use power electronic simulation packages & hardware to develop the power converters.
- Analyze and choose the appropriate converters for various applications

Any eight experiments should be conducted

1. Study of Characteristics of SCR, MOSFET & IGBT,
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase half controlled & fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, Class D & Class E)
6. Single Phase Cycloconverter with R and RL loads
7. Single Phase series & parallel inverter with R and RL loads
8. Single Phase Bridge inverter with R and RL loads

Any two experiments should be conducted

1. DC Jones chopper with R and RL Loads
2. Three Phase half controlled bridge converter with R-load
3. Single Phase dual converter with RL loads
4. (a) Simulation of single-phase Half wave converter using R and RL loads
(b) Simulation of single-phase full converter using R, RL and RLE loads
(c) Simulation of single-phase Semi converter using R, RL and RLE loads

5. (a)Simulation of Single-phase AC voltage controller using R and RL loads
(b)Simulation of Single phase Cyclo-converter with R and RL-loads
6. Simulation of Buck chopper
7. Simulation of single phase Inverter with PWM control
8. Simulation of three phase fully controlled converter with R and RL loads, with and without freewheeling diode. Observation of waveforms for Continuous and Discontinuous modes of operation.
9. Study of PWM techniques

Reference Books:

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related softwares
3. Reference guides of related softwares
4. Rashid, Spice for power electronics and electric power, CRC Press

EN606HS: ADVANCED ENGLISH COMMUNICATION SKILLS LAB**B.Tech. III Year II Sem.**

L	T	P	C
0	0	3	2

Introduction

A course on *Advanced English Communication Skills (AECS) Lab* is considered essential at the third year level of B.Tech and B.Pharmacy courses. At this stage, the students need to prepare themselves for their career which requires them to listen to, read, speak, and write in English both for their professional and interpersonal communication. The main purpose of this course is to prepare the students of Engineering for their placements.

Course Objectives: This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve students' fluency in spoken English
- To enable them to listen to English spoken at normal conversational speed
- To help students develop their vocabulary
- To read and comprehend texts in different contexts
- To communicate their ideas relevantly and coherently in writing
- To make students industry-ready
- To help students acquire behavioral skills for their personal and professional life
- To respond appropriately in different socio-cultural and professional contexts

Course Outcomes: Students will be able to:

- Acquire vocabulary and use it contextually
- Listen and speak effectively
- Develop proficiency in academic reading and writing
- Increase possibilities of job prospects
- Communicate confidently in formal and informal contexts

Syllabus:

The following course activities will be conducted as part of the Advanced English Communication Skills (AECS) Lab:

1. **Inter-personal Communication and Building Vocabulary** - Starting a Conversation – Responding Appropriately and Relevantly – Using Appropriate Body Language – Role Play in Different Situations - Synonyms and Antonyms, One-word Substitutes, Prefixes and Suffixes, Idioms and Phrases and Collocations.

2. **Reading Comprehension** –General Vs Local Comprehension, Reading for Facts, Guessing Meanings from Context, Skimming, Scanning, Inferring Meaning.
3. **Writing Skills** – Structure and Presentation of Different Types of Writing – Letter Writing/Resume Writing/ e-correspondence/ Technical Report Writing.
4. **Presentation Skills** – Oral Presentations (individual or group) through JAM Sessions/Seminars/PPTs and Written Presentations through Posters/Projects/Reports/ e-mails/Assignments etc.,
5. **Group Discussion and Interview Skills** – Dynamics of Group Discussion, Intervention, Summarizing, Modulation of Voice, Body Language, Relevance, Fluency and Organization of Ideas and Rubrics of Evaluation - Concept and Process, Pre-interview Planning, Opening Strategies, Answering Strategies, Interview through Tele-conference & Video-conference and Mock Interviews.

Minimum Hardware Requirement:

Advanced English Communication Skills (AECS) Lab shall have the following infrastructural facilities to accommodate at least 35 students in the lab:

- Spacious room with appropriate acoustics
- Eight round tables with five movable chairs for each table.
- Audio-visual aids
- LCD Projector
- Public Address system
- Computer with suitable configuration

Suggested Software: The software consisting of the prescribed topics elaborated above should be procured and used.

- Oxford Advanced Learner's Compass, 8th Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.

References:

1. Kumar, Sanjay, and Pushp Lata. English for Effective Communication, Oxford University Press, 2015.
2. **Konar, Nira**, English Language Laboratories – A Comprehensive Manual, PHI Learning Pvt. Ltd., 2011.