

|   |         |                              |           |          |          |           |
|---|---------|------------------------------|-----------|----------|----------|-----------|
| 2 | EE402PC | Electrical Machines – II     | 3         | 1        | 0        | 4         |
| 3 | EE403PC | Digital Electronics          | 3         | 0        | 0        | 3         |
| 4 | EE404PC | Control Systems              | 3         | 1        | 0        | 4         |
| 5 | EE405PC | Power System - I             | 3         | 0        | 0        | 3         |
| 6 | EE406PC | Digital Electronics Lab      | 0         | 0        | 2        | 1         |
| 7 | EE407PC | Electrical Machines Lab - II | 0         | 0        | 2        | 1         |
| 8 | EE408PC | Control Systems Lab          | 0         | 0        | 2        | 1         |
| 9 | *MC409  | Constitution of India        | 3         | 0        | 0        | 0         |
|   |         | <b>Total Credits</b>         | <b>18</b> | <b>3</b> | <b>6</b> | <b>21</b> |

**III YEAR I SEMESTER**

| S. No. | Course Code | Course Title                              | L         | T        | P        | Credits   |
|--------|-------------|---|-----------|----------|----------|-----------|
| 1      | EE501PE     | Power Electronics                         | 3         | 1        | 0        | 4         |
| 2      | EE502PE     | Power System-II                           | 3         | 1        | 0        | 4         |
| 3      | EE503PE     | Measurements and Instrumentation          | 3         | 1        | 0        | 4         |
| 4      |             | Professional Elective-I                   | 3         | 0        | 0        | 3         |
| 5      | SM504MS     | Business Economics and Financial Analysis | 3         | 0        | 0        | 3         |
| 6      | EE505PC     | Power System Simulation Lab               | 0         | 0        | 2        | 1         |
| 7      | EE506PC     | Power Electronics Lab                     | 0         | 0        | 2        | 1         |
| 8      | EE507PC     | Measurements and Instrumentation Lab      | 0         | 0        | 2        | 1         |
| 9      | EN508HS     | Advanced Communication Skills Lab         | 0         | 0        | 2        | 1         |
| 10     | *MC510      | Intellectual Property Rights              | 3         | 0        | 0        | 0         |
|        |             | <b>Total Credits</b>                      | <b>18</b> | <b>3</b> | <b>8</b> | <b>22</b> |

**III YEAR II SEMESTER**

| S. No | Course Code | Course Title                           | L         | T        | P        | Credits   |
|-------|-------------|--|-----------|----------|----------|-----------|
| 1     |             | Open Elective-I                        | 3         | 0        | 0        | 3         |
| 2     |             | Professional Elective-II               | 3         | 0        | 0        | 3         |
| 3     | EE601PC     | Signals and Systems                    | 2         | 1        | 0        | 3         |
| 4     | EE602PC     | Microprocessors & Microcontrollers     | 3         | 0        | 0        | 3         |
| 5     | EE603PC     | Power System Protection                | 3         | 1        | 0        | 4         |
| 6     | EE604PC     | Power System Operation and Control     | 3         | 0        | 0        | 3         |
| 7     | EE605PC     | Power System Lab                       | 0         | 0        | 2        | 1         |
| 8     | EE606PC     | Microprocessors & Microcontrollers Lab | 0         | 0        | 2        | 1         |
| 9     | EE607PC     | Signals and Systems Lab                | 0         | 0        | 2        | 1         |
| 10    | *MC609      | Environmental Science                  | 3         | 0        | 0        | 0         |
|       |             | <b>Total Credits</b>                   | <b>20</b> | <b>2</b> | <b>6</b> | <b>22</b> |

**\*MC609 - Environmental Science – Should be Registered by Lateral Entry Students Only.**

**IV YEAR I SEMESTER**

| S. No. | Course Code | Course Title                             | L | T | P | Credits |
|--------|-------------|--|---|---|---|---------|
| 1      |             | Open Elective-II                         | 3 | 0 | 0 | 3       |
| 2      |             | Professional Elective-III                | 3 | 0 | 0 | 3       |
| 3      |             | Professional Elective-IV                 | 3 | 0 | 0 | 3       |
| 4      | SM701MS     | Fundamentals of Management for Engineers | 3 | 0 | 0 | 3       |
| 5      | EE701PC     | Electrical & Electronics Design Lab      | 1 | 0 | 4 | 3       |

**EE501PE: POWER ELECTRONICS****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Prerequisite:** Analog Electronics, Digital Electronics**Course Objectives:**

- To Design/develop suitable power converter for efficient control or conversion of power in drive applications
- To Design / develop suitable power converter for efficient transmission and utilization of power in power system applications.

**Course Outcomes:** At the end of this course students will demonstrate the ability to

- Understand the differences between signal level and power level devices.
- Analyze controlled rectifier circuits.
- Analyze the operation of DC-DC choppers.
- Analyze the operation of voltage source inverters.

**UNIT - I:**

**Power Switching Devices:** Concept of power electronics, scope and applications, types of power converters; Power semiconductor switches and their V-I characteristics - Power Diodes, Power BJT, SCR, Power MOSFET, Power IGBT; Thyristor ratings and protection, methods of SCR commutation, UJT as a trigger source, gate drive circuits for BJT and MOSFETs

**UNIT - II:**

**AC-DC Converters (Phase Controlled Rectifiers):** Principles of single-phase fully-controlled converter with R, RL, and RLE load, Principles of single-phase half-controlled converter with RL and RLE load, Principles of three-phase fully-controlled converter operation with RLE load, Effect of load and source inductances, General idea of gating circuits, Single phase and Three phase dual converters

**UNIT - III:**

**DC-DC Converters (Chopper/SMPS):** Introduction, elementary chopper with an active switch and diode, concepts of duty ratio, average inductor voltage, average capacitor current. Buck converter - Power circuit, analysis and waveforms at steady state, duty ratio control of output voltage. Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage. Buck-Boost converter - Power circuit, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

**UNIT - IV:**

**AC-DC Converters (Inverters):** Introduction, principle of operation, performance parameters, single phase bridge inverters with R, RL loads, 3-phase bridge inverters - 120- and 180-degrees mode of operation, Voltage control of single-phase inverters –single pulse width modulation, multiple pulse width modulation, sinusoidal pulse width modulation.

**UNIT - V:**

**AC-AC Converters:** Phase Controller (AC Voltage Regulator)-Introduction, principle of operation of single-phase voltage controllers for R, R-L loads and its applications. Cyclo-converter-Principle of operation of single phase cyclo-converters, relevant waveforms, circulating current mode of operation, Advantages and disadvantages.

**TEXT BOOKS:**

1. M. H. Rashid, "Power electronics: circuits, devices, and applications", Pearson Education India, 2009.

2. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 2007.

**REFERENCE BOOKS:**

1. R. W. Erickson and D. Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2007.
2. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.

**EE502PE: POWER SYSTEM – II****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Prerequisite:** Power System –I and Electro Magnetic Fields**Course Objectives:**

- To analyze the performance of transmission lines.
- To understand the voltage control and compensation methods.
- To understand the per unit representation of power systems.
- To examine the performance of travelling waves.
- To know the methods of overvoltage protection and Insulation coordination of transmission lines
- To know the symmetrical components and fault calculation analysis

**Course Outcomes:**

- Analyze transmission line performance.
- Apply load compensation techniques to control reactive power
- Understand the application of per unit quantities.
- Design over voltage protection and insulation coordination
- Determine the fault currents for symmetrical and unbalanced faults

**UNIT- I:**

**Performance of Lines:** Representation of lines, short transmission lines, medium length lines, nominal T and PI- representations, long transmission lines. The equivalent circuit representation of a long Line, A, B, C, D constants, Ferranti Effect, Power flow through a transmission line, receiving end power circle diagram.

**UNIT- II:**

**Voltage Control:** Introduction – methods of voltage control, shunt and series capacitors / Inductors, tap changing transformers, synchronous phase modifiers.

**Compensation In Power Systems:** Introduction - Concepts of Load compensation – Load ability characteristics of overhead lines – Uncompensated transmission line – Symmetrical line – Radial line with asynchronous load – Compensation of lines.

**UNIT- III:**

**Per Unit Representation of Power Systems:** The one-line diagram, impedance and reactance diagrams, per unit quantities, changing the base of per unit quantities, advantages of per unit system.

**Travelling Waves on Transmission Lines:** Production of travelling waves, open circuited line, short circuited line, line terminated through a resistance, line connected to a cable, reflection and refraction at T-junction line terminated through a capacitance, capacitor connection at a T-junction, Attenuation of travelling waves.

**UNIT- IV:**

**Overvoltage Protection and Insulation Coordination:** Over voltage due to arcing ground and Peterson coil, lightning, horn gaps, surge diverters, rod gaps, expulsion type lightning arrester, valve type lightning arrester, ground wires, ground rods, counter poise, surge absorbers, insulation coordination, volt-time curves.

**UNIT - V:**

**Symmetrical Components and Fault Calculations:** Significance of positive, negative and zero sequence components, Average 3-phase power in terms of symmetrical components, sequence

impedances and sequence networks, fault calculations, sequence network equations, single line to ground fault, line to line fault, double line to ground fault, three phase fault, faults on power systems, faults with fault impedance, reactors and their location, short circuit capacity of a bus.

**TEXT BOOKS:**

1. John J. Grainger & W.D. Stevenson: Power System Analysis – Mc Graw Hill International 1994.
2. C.L. Wadhwa: Electrical Power Systems – New Age International Pub. Co. Third Edition, 2001.

**REFERENCE BOOKS:**

1. Hadi Scadat: Power System Analysis – Tata Mc Graw Hill Pub. Co. 2002
2. W.D. Stevenson: Elements of Power system Analysis – McGraw Hill International Student Edition.
3. D.P. Kothari and I. J. Nagrath, Modern Power System Analysis - Tata Mc Graw Hill Pub. Co., New Delhi, Fourth edition, 2011

**EE503PE: MEASUREMENTS AND INSTRUMENTATION****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 1 | 0 | 4 |

**Pre-requisite:** Basic Electrical Engineering, Analog Electronics, Electrical Circuit Analysis & Electro Magnetic fields.

**Course objectives:**

- To introduce the basic principles of all measuring instruments
- To deal with the measurement of voltage, current, Power factor, power, energy and magnetic measurements.
- To understand the basic concepts of smart and digital metering.

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

- Understand different types of measuring instruments, their construction, operation and characteristics
- Identify the instruments suitable for typical measurements
- Apply the knowledge about transducers and instrument transformers to use them effectively.
- Apply the knowledge of smart and digital metering for industrial applications

**UNIT- I:****Introduction to Measuring Instruments**

Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations, extension of range using shunts and series resistance. Electrostatic Voltmeters-electrometer type and attracted disc type – extension of range of E.S. Voltmeters.

**UNIT- II:****Potentiometers & Instrument Transformers**

Principle and operation of D.C. Crompton's potentiometer – standardization – Measurement of unknown resistance, current, voltage. A.C. Potentiometers: polar and coordinate type's standardization – applications. CT and PT – Ratio and phase angle errors

**UNIT- III:****Measurement of Power & Energy**

Single phase dynamometer wattmeter, LPF and UPF, Double element and three element dynamometer wattmeter, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems. Single phase induction type energy meter – driving and braking torques – errors and compensations – testing by phantom loading using R.S.S. meter. Three phase energy meter – tri-vector meter, maximum demand meters.

**UNIT- IV:****DC & AC Bridges**

Method of measuring low, medium and high resistance – sensitivity of Wheat-stone's bridge – Carey Foster's bridge, Kelvin's double bridge for measuring low resistance, measurement of high resistance – loss of charge method.

Measurement of inductance- Maxwell's bridge, Hay's bridge, Anderson's bridge - Owen's bridge. Measurement of capacitance and loss angle –Desauty's Bridge - Wien's bridge – Schering Bridge.

**UNIT-V:****Transducers**

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

**Introduction to Smart and Digital Metering:** Digital Multi-meter, True RMS meters, Clamp-on meters, Digital Storage Oscilloscope

**TEXT BOOKS:**

1. G. K. Banerjee, "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2<sup>nd</sup> Edition, 2016
2. S. C. Bhargava, "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

**REFERENCES:**

1. A. K. Sawhney, "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. R. K. Rajput, "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.
3. Buckingham and Price, "Electrical Measurements", Prentice – Hall, 1988.
4. Reissland, M. U, "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1<sup>st</sup> Edition 2010.
5. E.W. Golding and F. C. Widdis, "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

**EE511PE: COMPUTER ARCHITECTURE (Professional Elective - I)****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisite:** Digital Electronics**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:** At the end of this course, students will demonstrate the ability to

- Understand the concepts of microprocessors, their principles and practices.
- Write efficient programs in assembly language of the 8086 family of microprocessors.
- Organize a modern computer system and be able to relate it to real examples.
- Develop the programs in assembly language for 80286, 80386 and MIPS processors in real and protected modes.
- Implement embedded applications using ATOM processor.

**UNIT- I****Introduction to Computer Organization**

Architecture and function of general computer system, CISC Vs RISC, Data types, Integer Arithmetic - Multiplication, Division, Fixed and Floating-point representation and arithmetic, Control unit operation, Hardware implementation of CPU with Micro instruction, microprogramming, System buses, Multi-bus organization.

**UNIT- II****Memory Organization**

System memory, Cache memory - types and organization, Virtual memory and its implementation, Memory management unit, Magnetic Hard disks, Optical Disks.

**Input – Output Organization**

Accessing I/O devices, Direct Memory Access and DMA controller, Interrupts and Interrupt Controllers, Arbitration, Multilevel Bus Architecture, Interface circuits - Parallel and serial port. Features of PCI and PCI Express bus.

**UNIT- III****16 AND 32 Microprocessors**

80x86 Architecture, IA – 32 and IA – 64, Programming model, Concurrent operation of EU and BIU, Real mode addressing, Segmentation, addressing modes of 80x86, Instruction set of 80x86, I/O addressing in 80x86

**UNIT- IV****Pipelining**

Introduction to pipelining, Instruction level pipelining (ILP), compiler techniques for ILP, Data hazards, Dynamic scheduling, Dependability, Branch cost, Branch Prediction, Influence on instruction set.



**UNIT-V:****Different Architectures**

VLIW Architecture, DSP Architecture, SoC architecture, MIPS Processor and programming

**TEXT BOOKS:**

1. V. Carl, G. Zvonko and S. G. Zaky, "Computer organization", McGraw Hill, 1978.
2. B. Brey and C. R. Sarma, "The Intel microprocessors", Pearson Education, 2000.

**REFERENCE BOOKS:**

1. J. L. Hennessy and D. A. Patterson, "Computer Architecture A Quantitative Approach", Morgan Kauffman, 2011.
2. W. Stallings, "Computer organization", PHI, 1987.
3. P. Barry and P. Crowley, "Modern Embedded Computing", Morgan Kaufmann, 2012.
4. N. Mathivanan, "Microprocessors, PC Hardware and Interfacing", Prentice Hall, 2004.
5. Y. C. Lieu and G. A. Gibson, "Microcomputer Systems: The 8086/8088 Family", Prentice Hall India, 1986.
6. J. Uffenbeck, "The 8086/8088 Design, Programming, Interfacing", Prentice Hall, 1987.
7. B. Govindarajalu, "IBM PC and Clones", Tata McGraw Hill, 1991.
8. P. Able, "8086 Assembly Language Programming", Prentice Hall India.

**EE512PE: HIGH VOLTAGE ENGINEERING (Professional Elective-I)****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisite:** Power Systems – I, Electro Magnetic Fields**Course Objectives:**

- To deal with the detailed analysis of Breakdown occurring in gaseous, liquids and solid dielectrics
- To inform about generation and measurement of High voltage and current
- To introduce High voltage testing methods

**Course outcomes:** At the end of the course, the student will demonstrate

- Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
- Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.
- Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
- Knowledge of how over-voltages arise in a power system, and protection against these over-voltages.

**UNIT - I****Breakdown in Gases**

Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge

**Breakdown in Liquid and Solid Insulating Materials**

Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

**UNIT - II****Generation of High Voltages**

Generation of high voltages, generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

**UNIT- III****Measurements of High Voltages and Currents**

Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements.

**UNIT - IV****LIGHTNING AND SWITCHING OVER-VOLTAGES**

Charge formation in clouds, Stepped leader, Dart leader, Lightning Surges. Switching overvoltages, Protection against over-voltages, Surge diverters, Surge modifiers.

**UNIT - V**

**High Voltage Testing of Electrical Apparatus and High Voltage Laboratories** Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

**TEXT BOOKS:**

1. M. S. Naidu and V. Kamaraju, "High Voltage Engineering", McGraw Hill Education, 2013.
2. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

**REFERENCE BOOKS:**

1. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
2. E. Kuffel, W. S. Zaengl and J. Kuffel, "High Voltage Engineering Fundamentals", Newnes Publication, 2000.
3. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
4. Various IS standards for HV Laboratory Techniques and Testing

**EE513PE: ELECTRICAL MACHINE DESIGN (Professional Elective - I)****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Prerequisite:** Electrical Machines-I, Electrical Machines-II**Course Objectives:**

- To know the major considerations in electrical machine design, electrical engineering materials, space factor, choice of specific electrical and magnetic loadings,
- To analyze the thermal considerations, heat flow, temperature rise, rating of machines.
- To understand the design of transformers
- To study the design of induction motors
- To know the design of synchronous machines
- To understand the CAD design concepts

**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.

**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.

**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 poly-phase machines, magnetizing current, short circuit current, circle diagram, operating characteristics.

**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 airgap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, design of turbo alternators, rotor design.

**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 complex structures of modern machines- PMSMs, BLDCs, SRM and claw-pole machines.

**TEXT BOOKS:**

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.

**REFERENCE BOOKS:**

1. S. K. Sen, "Principles of Electrical Machine Design with computer programmes", Oxford and IBH Publishing, 2006.
2. K. L. Narang, "A Text Book of Electrical Engineering Drawings", Satya Prakashan, 1969.
3. A. Shanmugasundaram, G. Gangadharan and R. Palani, "Electrical Machine Design Data Book", New Age International, 1979.
4. M. V. Murthy, "Computer Aided Design of Electrical Machines", B.S. Publications, 2008.
5. Electrical machines and equipment design exercise examples using Ansoft's Maxwell 2D machine design package.

**SM504MS: BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 3 | 0 | 0 | 3 |

**Course Objective:** To learn the basic business types, impact of the economy on Business and Firms specifically. To analyze the Business from the Financial Perspective.

**Course Outcome:** The students will understand the various Forms of Business and the impact of economic variables on the Business. The Demand, Supply, Production, Cost, Market Structure, Pricing aspects are learnt. The Students can study the firm's financial position by analysing the Financial Statements of a Company.

**UNIT – I: Introduction to Business and Economics**

**Business:** Structure of Business Firm, Theory of Firm, Types of Business Entities, Limited Liability Companies, Sources of Capital for a Company, Non-Conventional Sources of Finance.

**Economics:** Significance of Economics, Micro and Macro Economic Concepts, Concepts and Importance of National Income, Inflation, Money Supply and Inflation, Business Cycle, Features and Phases of Business Cycle. Nature and Scope of Business Economics, Role of Business Economist, Multidisciplinary nature of Business Economics.

**UNIT - II: Demand and Supply Analysis**

**Elasticity of Demand:** Elasticity, Types of Elasticity, Law of Demand, Measurement and Significance of Elasticity of Demand, Factors affecting Elasticity of Demand, Elasticity of Demand in decision making, Demand Forecasting: Characteristics of Good Demand Forecasting, Steps in Demand Forecasting, Methods of Demand Forecasting.

**Supply Analysis:** Determinants of Supply, Supply Function and Law of Supply.

**UNIT- III: Production, Cost, Market Structures & Pricing**

**Production Analysis:** Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions.

**Cost analysis:** Types of Costs, Short run and Long run Cost Functions.

**Market Structures:** Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, Monopolistic Competition.

**Pricing:** Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**UNIT - IV: Financial Accounting:** Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

**UNIT - V: Financial Analysis through Ratios:** Concept of Ratio Analysis, Importance, Liquidity Ratios, Turnover Ratios, Profitability Ratios, Proprietary Ratios, Solvency, Leverage Ratios – Analysis and Interpretation (simple problems).

**TEXT BOOKS:**

1. D. D. Chaturvedi, S. L. Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
2. Dhanesh K Khatri, Financial Accounting, Tata Mc –Graw Hill, 2011.
3. Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury, Managerial Economics, 2e, Tata Mc Graw Hill Education Pvt. Ltd. 2012.

**REFERENCE BOOKS:**

1. Paresh Shah, Financial Accounting for Management 2e, Oxford Press, 2015.
2. S. N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari, Financial Accounting, 5e, Vikas Publications, 2013.

**EE505PC: POWER SYSTEM SIMULATION LAB****B.Tech. III Year I Sem.****L T P C**  
**0 0 2 1****Prerequisites:** Power System-I, Power System-II**Course Objectives:**

- To perform voltage distributions across insulator strings
- To understand the high frequency transients
- To perform parameter estimation and fault analysis on Transmission lines
- To calculate Time constant calculations
- To perform Tariff Estimation
- To perform resonance circuit simulation

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

- Perform various transmission line calculations
- Understand Different circuits time constants
- Analyze the experimental data and draw the conclusions.

**List of Experiments:**

1. Generation of high frequency transients through RLC circuit
2. Voltage distribution across insulator string
3. Comparison of lumped and distributed transmission lines
4. Calculation of fault currents of transmission line
5. Time constant calculation of RL circuit
6. Time constant calculation of RC circuit
7. Time constant calculation of RLC circuit
8. Simulation of Resonance circuit
9. Calculation of R, L, C,  $Z_s$  of 3-phase Transmission Line
10. Estimation of TARIFF based on load curve

**NOTE:** The above experiments shall be conducted using any software tool



**EE506PC: POWER ELECTRONICS LAB****B.Tech. III Year I Sem.**

| L | T | P | C |
|---|---|---|---|
| 0 | 0 | 2 | 1 |

**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 Cyclo-converter 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

**TEXT BOOKS:**

1. M. H. Rashid, Simulation of Electric and Electronic circuits using PSPICE – by M/s PHI Publications.
2. User's manual of related software's

**REFERENCE BOOKS:**

1. Reference guides of related software's
2. Rashid, Spice for power electronics and electric power, CRC Press

**EE507PC: MEASUREMENTS AND INSTRUMENTATION LAB****B.Tech. III Year I Sem.**

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**Pre-requisite:** Measurements and Instrumentation**Course Objectives:**

- To calibrate LPF Watt Meter, energy meter, P. F Meter using electro dynamo meter type instrument as the standard instrument
- To determine unknown inductance, resistance, capacitance by performing experiments on D.C Bridges & A. C Bridges
- To determine three phase active & reactive powers using single wattmeter method practically
- To determine the ratio and phase angle errors of current transformer and potential transformer.

**Course Outcomes:** After completion of this lab the student is able to

- to choose instruments
- test any instrument
- find the accuracy of any instrument by performing experiment
- calibrate PMMC instrument using D.C potentiometer

**The following experiments are required to be conducted as compulsory experiments**

1. Calibration and Testing of single-phase energy Meter.
2. Calibration of dynamometer power factor meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter.
4. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance.
5. Dielectric oil testing using H.T. testing Kit.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 - Phase reactive power with single-phase wattmeter.
8. Measurement of displacement with the help of LVDT.

**In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted**

9. Calibration LPF wattmeter – by Phantom testing.
10. Measurement of 3-phase power with single watt meter and two CTs.
11. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given CT by Null method.
12. PT testing by comparison – V. G. as Null detector – Measurement of % ratio error and phase angle of the given PT
13. Resistance strain gauge – strain measurements and Calibration.
14. Transformer turns ratio measurement using AC bridges.
15. Measurement of % ratio error and phase angle of given CT by comparison.

**TEXT BOOKS:**

1. "G. K. Banerjee", "Electrical and Electronic Measurements", PHI Learning Pvt. Ltd., 2<sup>nd</sup> Edition, 2016
2. "S. C. Bhargava", "Electrical Measuring Instruments and Measurements", BS Publications, 2012.

**REFERENCE BOOKS:**

1. "A. K. Sawhney", "Electrical & Electronic Measurement & Instruments", Dhanpat Rai & Co. Publications, 2005.
2. "R. K. Rajput", "Electrical & Electronic Measurement & Instrumentation", S. Chand and Company Ltd., 2007.

3. "Buckingham and Price", "Electrical Measurements", Prentice – Hall, 1988.
4. "Reissland, M. U", "Electrical Measurements: Fundamentals, Concepts, Applications", New Age International (P) Limited Publishers, 1<sup>st</sup> Edition 2010.
5. "E.W. Golding and F. C. Widdis", "Electrical Measurements and measuring Instruments", fifth Edition, Wheeler Publishing, 2011.

**EN508HS: ADVANCED COMMUNICATION SKILLS LAB****B.Tech. III Year I Sem.**

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**1. INTRODUCTION:**

The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalized context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

**2. OBJECTIVES:**

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

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

**3. SYLLABUS:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

1. **Activities on Fundamentals of Inter-personal Communication and Building Vocabulary** - Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.
2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading& effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one's writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/ e-mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening

strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

#### 4. MINIMUM REQUIREMENT:

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

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

#### 5. SUGGESTED SOFTWARE:

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

- Oxford Advanced Learner's Compass, 7<sup>th</sup> Edition
- DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.
- Lingua TOEFL CBT Insider, by Dream tech
- TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)

#### TEXT BOOKS:

1. Effective Technical Communication by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2<sup>nd</sup> Edition
2. Academic Writing: A Handbook for International Students by Stephen Bailey, Routledge, 5<sup>th</sup> Edition.

#### REFERENCES:

1. Learn Correct English – A Book of Grammar, Usage and Composition by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
2. Professional Communication by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
3. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
4. Technical Communication by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
5. English Vocabulary in Use series, Cambridge University Press 2008.
6. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
7. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
8. Job Hunting by Colm Downes, Cambridge University Press 2008.
9. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.

**\*MC510: INTELLECTUAL PROPERTY RIGHTS****B.Tech. III Year I Sem.**

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**UNIT – I**

Introduction to Intellectual property: Introduction, types of intellectual property, international organizations, agencies and treaties, importance of intellectual property rights.

**UNIT – II**

Trade Marks: Purpose and function of trademarks, acquisition of trade mark rights, protectable matter, selecting, and evaluating trade mark, trade mark registration processes.

**UNIT – III**

Law of copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law.

Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer

**UNIT – IV**

Trade Secrets: Trade secrete law, determination of trade secrete status, liability for misappropriations of trade secrets, protection for submission, trade secrete litigation.

Unfair competition: Misappropriation right of publicity, false advertising.

**UNIT – V**

New development of intellectual property: new developments in trade mark law; copy right law, patent law, intellectual property audits.

International overview on intellectual property, international – trade mark law, copy right law, international patent law, and international development in trade secrets law.

**TEXT & REFERENCE BOOKS:**

1. Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
2. Intellectual property right – Unleashing the knowledge economy, prabuddha ganguli, Tata McGraw Hill Publishing company ltd.