EVALUATION SCHEME & SYLLABUS FOR

B. TECH. 2\textsuperscript{nd} YEAR

ELECTRICAL & ELECTRONICS ENGINEERING

BASED ON

AICTE MODEL CURRICULUM

[Effective from the Session: 2019-20]
## EVALUATION SCHEME - B.TECH 2nd YEAR (ELECTRICAL & ELECTRONICS ENGINEERING)

### SEMESTER- III

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Codes</th>
<th>Subject</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>End Semester</th>
<th>Total</th>
<th>Credit</th>
</tr>
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<td></td>
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<tr>
<td>1</td>
<td>KOE307</td>
<td>Analog Devices &amp; Electronic Circuits</td>
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<td>4</td>
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<td>9</td>
<td>KEE354</td>
<td>Mini Project or Internship Assessment*</td>
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<td>0</td>
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<td>10</td>
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<tr>
<td>11</td>
<td>MOOCs (Essential for Hons. Degree)</td>
<td></td>
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<td><strong>Total</strong></td>
<td><strong>14</strong></td>
<td><strong>3</strong></td>
<td><strong>10</strong></td>
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</tr>
</tbody>
</table>

*The Mini Project or internship (3-4 weeks) conducted during summer break after II semester and will be assessed during III semester.

### SEMESTER IV

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Subject Codes</th>
<th>Subject</th>
<th>Periods</th>
<th>Evaluation Scheme</th>
<th>End Semester</th>
<th>Total</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
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<td>5</td>
<td>KEE403</td>
<td>Networks Analysis &amp; Synthesis</td>
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<td>KEE452</td>
<td>Electrical Machines-I Lab</td>
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<td>0</td>
<td>2</td>
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<td>8</td>
<td>KEE453</td>
<td>Digital Electronics Lab</td>
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<td>2</td>
<td></td>
<td></td>
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<tr>
<td>9</td>
<td>KNC402/ KNC401</td>
<td>Environmental Science/Cyber Security</td>
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<td>0</td>
<td>15</td>
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<td></td>
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<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>3</strong></td>
<td><strong>6</strong></td>
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</tr>
</tbody>
</table>

MOOCs (Essential for Hons. Degree)

Total: 17 3 6
Credit: 900 21


ANALOG DEVICES & ELECTRONIC CIRCUITS

<table>
<thead>
<tr>
<th>Course Outcomes:</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1 Choose proper semiconductor device for various applications.</td>
<td>K₃</td>
</tr>
<tr>
<td>CO2 Analyze the Special Diodes and Power Devices with their characteristics and applications.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO3 Analyze the structure operation, V-I characteristics and detail circuit of BJT with help of small signal model.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO4 Analyze the structure operation, V-I characteristics and detail circuit of MOSFET with help of small signal model.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO5 Demonstrate the use of Op-Amp circuits and its internal parameters along with its applications.</td>
<td>K₃</td>
</tr>
</tbody>
</table>

KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand  K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

Detailed Syllabus:

UNIT I
Semiconductors: Charge carriers, Hall effects.

Unit II
Special Diodes: LED, Photo-diode, Schottky diode, Tunnel diode, their characteristics and applications.
Uni Polar Devices: FET, MOSFET.
Introduction to Power devices: Characteristics of SCR, TRIAC, DIAC. UJT.

Unit III
BJT: Review of device structure operation and V-I characteristics, BJT circuits at DC, BJT as amplifier and switch, biasing in BJT amplifier circuit, small-signal operation and models, single stage BJT amplifier, BJT internal capacitances and high frequency model, frequency response of CE amplifier.

Unit IV
MOSFET: Device structure and its operation in equilibrium, V-I characteristics. Circuits at DC, MOSFET as Amplifier and switch, Biasing in MOS amplifier circuits, small-signal operation and models, single stage MOS amplifier, MOSFET internal capacitances and high frequency model, frequency response of CS amplifier.

Unit V
Ideal Op-Amp, non-idealities in an Op-Amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

Text Books:
2. AS Sedra and K.C. Smith “Microelectronics Circuits” Oxford University Press (India)

Reference Books:
1. Robert L. Boylestad, Louis Nashelsky, “Electronic Devices And Circuits Theory” Pearson India

**ELECTROMAGNETIC FIELD THEORY**

<table>
<thead>
<tr>
<th>Course Outcomes:</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO 1</strong></td>
<td>Apply different coordinate systems and their application in electromagnetic field theory, establish a relation between any two systems and also understand the vector calculus.</td>
</tr>
<tr>
<td><strong>CO2</strong></td>
<td>Understand the concept of static electric field. Understand the concept of current and properties of conductors. Establish boundary conditions and to calculate capacitances of different types of capacitors.</td>
</tr>
<tr>
<td><strong>CO3</strong></td>
<td>Understand the concept of static magnetic field, magnetic scalar and vector potential.</td>
</tr>
<tr>
<td><strong>CO4</strong></td>
<td>Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.</td>
</tr>
<tr>
<td><strong>CO5</strong></td>
<td>Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.</td>
</tr>
</tbody>
</table>

KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand  K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

**Detailed Syllabus:**

**UNIT I**

**Unit II**
Electrostatic fields: Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gausses’ Law- Maxwell’s equation, Electric dipole and flux line, Energy density in electrostatic fields, Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, Dielectric-constants, Continuity equation and relaxation time, boundary conditions, Electrostatic boundary value problems: Poisson’s and Laplace’s equations., Methods of Images.

**Unit III**
Magneto statics: Magneto-static fields, Biot-Savart’s Law, Ampere’s circuit law, Maxwell’s equation, Application of ampere’s law, Magnetic flux density- Maxwell’s equation, Maxwell’s equation for static fields, magnetic scalar and vector potential.

Unit IV
Magnetic forces: Materials and devices, Forces due to magnetic field, Magnetic torque and moment, a magnetic dipole. Magnetization in materials, Magnetic boundary conditions, Inductors and inductances, Magnetic energy.

Unit V


ELECTRICAL MEASUREMENTS & INSTRUMENTATION

Pre-requisites of course: Basic Electrical Engineering

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy.</td>
</tr>
<tr>
<td>CO2</td>
<td>Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges.</td>
</tr>
<tr>
<td>CO3</td>
<td>Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers.</td>
</tr>
<tr>
<td>CO4</td>
<td>Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.</td>
</tr>
<tr>
<td>CO5</td>
<td>Display the knowledge of transducers, their classifications and their applications for the measurement of physical quantities like motion, force, pressure, temperature, flow and liquid level.</td>
</tr>
</tbody>
</table>

KL - Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand  K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create
Detailed Syllabus:

UNIT I
**Electrical Measurements:** Measurement system, Characteristics of instruments, Methods of measurement, Errors in Measurement & Measurement standards, Review of indicating and integrating instruments: Voltmeter, Ammeter and Wattmeter.

UNIT II
**Measurement of Resistance, Inductance and Capacitance:** Measurement of low, medium and high resistances, insulation resistance measurement, AC bridges for inductance and capacitance measurement.

UNIT III
**Instrument Transformers:** Current and Potential transformer, ratio and phase angle errors, design considerations and testing.

UNIT IV
**Electronic Measurements:** Electronic instruments: Voltmeter, Multimeter, Wattmeter & energy meter. Time, Frequency and phase angle measurements using CRO; Storage oscilloscope, Spectrum & Wave analyzer, Digital counter, frequency meter, and Digital Voltmeter.

UNIT V

**Text Book:**

**Reference Books:**
1. Forest K. Harris, “Electrical Measurement”, Willey Eastern Pvt. Ltd. India
**BASIC SIGNAL & SYSTEMS**

**Pre-requisites of course:** Basic Electrical Engineering, Engineering Mathematics

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Represent the various types of signals &amp; systems and can perform mathematical operations on them.</td>
</tr>
<tr>
<td>CO2</td>
<td>Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis.</td>
</tr>
<tr>
<td>CO3</td>
<td>Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs.</td>
</tr>
<tr>
<td>CO4</td>
<td>Implement the concepts of Z transform to solve complex engineering problems using difference equations.</td>
</tr>
<tr>
<td>CO5</td>
<td>Develop and analyze the concept of state-space models for SISO &amp; MIMO system.</td>
</tr>
</tbody>
</table>

**KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)**

K₁ – Remember  K₂ – Understand   K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

**Detailed Syllabus:**

**UNIT I**

**Pre-requisites:** *Differential Equations.*

**Introduction to Continuous Time Signals and Systems:** Introduction to continuous time and discrete time signals, Classification of signals with their mathematical representation and characteristics. Transformation of independent variable, Introduction to various type of system, basic system properties.

**Analogous System:** Linear & Rotational mechanical elements, force-voltage and force-current analogy, modeling of mechanical and electro-mechanical systems: Analysis of first and second order linear systems by classical method.

**UNIT II**

**Pre-requisites:** *Fourier Series & Fourier Transform*

**Fourier Transform Analysis:** Exponential form and Compact trigonometric form of Fourier series, Fourier symmetry, Fourier transform: Properties, application to network analysis. Definition of DTFS, and DTFT, Sampling Theorem.

**UNIT III**

**Pre-requisites:** *Laplace Transform*

**Laplace Transform Analysis:** Review of Laplace Transform, Properties of Laplace Transform, Initial & Final value Theorems, Inverse Laplace Transform, Convolution Theorem, Impulse response, Application of Laplace Transform to analysis of networks, waveform synthesis and Laplace Transform to complex waveforms
UNIT IV
Pre-Requisites: Matrix Calculations.


UNIT V
Pre-Requisite: Z-Transforms.


Text Books:

Reference Books:
1. David K. Cheng; “Analysis of Linear System”, Narosa Publishing Co
5. ME Van-Valkenberg; “ Network Analysis”, Prentice Hall of India
**ANALOG ELECTRONICS LAB**

**Course Outcomes:**

<table>
<thead>
<tr>
<th>CO</th>
<th>Knowledge Level, KL</th>
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</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>KL 1 – Remember, KL 2 – Understand, KL 3 – Apply, KL 4 – Analyze, KL 5 – Evaluate, KL 6 – Create</td>
</tr>
<tr>
<td>CO2</td>
<td>Understand the characteristics and applications of the Semiconductor devices.</td>
</tr>
<tr>
<td>CO3</td>
<td>Draw the characteristics of BJT, FET and MOSFET.</td>
</tr>
<tr>
<td>CO4</td>
<td>Understand the parameters of Operational Amplifier and instrumentation Amplifier with their applications.</td>
</tr>
<tr>
<td>CO4</td>
<td>Understand the V-I characteristics of Power devices like SCR, TRIAC.</td>
</tr>
</tbody>
</table>

**Upon the completion of the course, the student will be able to:**

1. To Plot V-I characteristics of P-N junction diode and Zener diode.
2. To draw wave shape of the electrical signal at input and output points of the half wave, full wave and bridge rectifiers.
3. To Plot input/output characteristics for common base transistor.
4. To determine voltage gain, current gain, input impedance and output impedance and frequency response of R-C coupled common emitter amplifier.
5. To Plot input/output characteristics of FET and determine FET parameters at a given operating point.
6. To Plot input/output characteristics of MOSFET and determine MOSFET parameters at a given operating point.
7. To study transistor as a switch and determine load voltage and load current when the transistor is ON.
10. Study of Instrumentation Amplifier.
11. To plot V-I characteristics of SCR.
12. To plot V-I characteristics of TRIAC.
ELECTRICAL MEASUREMENT AND INSTRUMENTATION LAB

Pre-requisites of course: Basic Electrical Engineering

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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</thead>
<tbody>
<tr>
<td>CO 1</td>
<td></td>
</tr>
<tr>
<td>Understand the importance of calibration of measuring instruments.</td>
<td>K2</td>
</tr>
<tr>
<td>CO2</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the construction and working of different measuring instruments.</td>
<td>K3</td>
</tr>
<tr>
<td>CO3</td>
<td></td>
</tr>
<tr>
<td>Demonstrate the construction and working of different AC and DC bridges, along with their applications.</td>
<td>K3</td>
</tr>
<tr>
<td>CO4</td>
<td></td>
</tr>
<tr>
<td>Ability to measure electrical engineering parameters like voltage, current, power &amp; phase difference in industry as well as in power generation, transmission and distribution sectors.</td>
<td>K2</td>
</tr>
<tr>
<td>CO5</td>
<td></td>
</tr>
<tr>
<td>Capability to analyze and solving the variety of problems in the field of electrical measurements.</td>
<td>K2</td>
</tr>
</tbody>
</table>

KL - Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand  K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

Note: Minimum ten experiments are to be performed from the following list:

1. Calibration of AC voltmeter and AC ammeter.
5. Measurement of power using CT and PT.
6. Measuring displacement using LVDT.
8. Measuring pressure using piezoelectric pick up.
10. Speed measurement using Hall Effect sensor.
11. PC based data logging of temperature sensor using LabVIEW/ MATLAB.
12. Signal conditioning of analog signal using LabVIEW/ MATLAB.
ELECTRICAL WORKSHOP

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1  Perform various types of Electrical connections.</td>
<td>K&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO2  Develop small circuits on PCB</td>
<td>K&lt;sub&gt;6&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO3  Differentiate between various electrical wires, cables and accessories.</td>
<td>K&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO4  Demonstrate the layout of electrical substation &amp; various safety measures.</td>
<td>K&lt;sub&gt;2&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

KL - Bloom’s Knowledge Level (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>, K<sub>5</sub>, K<sub>6</sub>)
K<sub>1</sub> – Remember  K<sub>2</sub> – Understand  K<sub>3</sub> – Apply  K<sub>4</sub> – Analyze  K<sub>5</sub> – Evaluate  K<sub>6</sub> – Create

Detailed Syllabus:

Note: Minimum ten experiments are to be performed from the following list:
1. To study the working and Control of two lamps in series and in parallel
2. To perform the stair case working and it’s testing.
3. To study the working principle and wiring of fluorescent lamp.
4. To study and wiring of distribution board including power plug using isolator, MCB, ELCB.
5. To study and estimate a typical, BHK house wiring.
6. Familiarization, soldering, testing and observing the wave forms on CRO of a HW and FW uncontrolled rectifier (using diodes) with capacitor filter.
7. Visit your college substation and familiarize the supply system, Transformer, HT Paneland Distribution etc.
8. To study construction, working and application of workshop tools. Also study the Electrical and Electronics Symbols.
9. To study the wires, cables and their gauges, Domestic Electrical Accessories.
10. Mini Project on PCB.
11. To study fault, Remedies in Domestic Installation and Indian Electricity Rules.
12. To study the different types of earthing system and measure the earth resistance.

DIGITAL ELECTRONICS

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1  Apply concepts of Digital Binary System and implementation of Gates.</td>
<td>K&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO2  Analyze and design of Combinational logic circuits.</td>
<td>K&lt;sub&gt;4&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO3  Analyze and design of Sequential logic circuits with their applications.</td>
<td>K&lt;sub&gt;4&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO4  Implement the Design procedure of Synchronous &amp; Asynchronous Sequential Circuits.</td>
<td>K&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
<tr>
<td>CO5  Apply the concept of Digital Logic Families with circuit implementation.</td>
<td>K&lt;sub&gt;3&lt;/sub&gt;</td>
</tr>
</tbody>
</table>

KL - Bloom’s Knowledge Level (K<sub>1</sub>, K<sub>2</sub>, K<sub>3</sub>, K<sub>4</sub>, K<sub>5</sub>, K<sub>6</sub>)
K<sub>1</sub> – Remember  K<sub>2</sub> – Understand  K<sub>3</sub> – Apply  K<sub>4</sub> – Analyze  K<sub>5</sub> – Evaluate  K<sub>6</sub> – Create
Detailed Syllabus

UNIT I
Digital System And Binary Numbers: Number System and its arithmetic, Signed binary numbers, Binary codes, Cyclic codes, Hamming Code, the map method up to five variable, Don’t care conditions, POS simplification, NAND and NOR implementation, Quine McClusky method (Tabular method).

UNIT II
Combinational Logic: Combinational Circuits: Analysis Procedure, Design procedure, Binary adder-subtractor, Decimal adder, Binary multiplier, Magnitude comparator, Multiplexers, Demultiplexers, Decoders, Encoders.

UNIT III
Sequential Logic And Its Applications: Storage elements: latches & flip flops, Characteristic Equations of Flip Flops, Flip Flop Conversion, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters: Johnson & Ring Counter.

UNIT IV

UNIT V
Memory & Programmable Logic Devices: Digital Logic Families: DTL, DCTL, TTL, ECL & CMOS etc., Fan Out, Fan in, Noise Margin; RAM, ROM, PLA, PAL; Circuits of Logic Families, Interfacing of Digital Logic Families, Circuit Implementation using ROM, PLA and PAL; CPLD and FPGA.

Text Books:

ELECTRICAL MACHINES – I

Pre-requisites of course: Basic Electrical Engineering, Engineering Mathematics

<table>
<thead>
<tr>
<th>Course Outcomes:</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1 Analyze the various principles &amp; concepts involved in Electromechanical Energy conversion.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO2 Demonstrate the constructional details of DC machines as well as transformers, and principle of operation of brushless DC motor, Stepper and DC Servo motors.</td>
<td>K₂</td>
</tr>
<tr>
<td>CO3 Evaluate the performance and characteristics of DC Machine as motor and as well as generator.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO4 Evaluate the performance of transformers, individually and in parallel operation.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO5 Demonstrate and perform various connections of three phase transformers.</td>
<td>K₃</td>
</tr>
</tbody>
</table>
Detailed Syllabus:

UNIT I

Pre- Requisites: Magnetic Materials, BH characteristics


UNIT II

Pre- Requisites: Principle & Construction, Classification and circuit model, EMF equation of generator and torque equation of motor

DC Machines: Armature winding (Concentrated and Distributed), Winding Factor, Armature reaction, Commutation, Interpoles and compensating windings, Performance characteristics of DC generators, Applications.

UNIT III

DC Machines (Contd.): Performance characteristics of DC motors, Starting of DC motors; 3 point and 4 point starters, Speed control of DC motors; Field control, Armature control and Voltage control (Ward Leonard method); Efficiency and Testing of DC machines (Hopkinson's and Swinburne's Test), Applications, Introduction to Brushless DC Motor, stepper motor and DC Servo motor and their applications.

UNIT IV

Pre- Requisite: Construction & Principle, Ideal and practical transformer, equivalent circuit & phasor diagram, losses in transformers.

Single Phase Transformer: Efficiency and voltage regulation, all day efficiency, Excitation phenomenon and harmonics in transformers.


Auto Transformer- Single phase and three phase autotransformers, Volt-amp relation, Copper saving in autotransformer Efficiency, Merits & demerits and applications.

UNIT V

Pre- Requisite: Three-phase connections – Star/Delta.

Three Phase Transformers: Construction, Three phase transformer, phasor groups and their connections, open delta connection, three phase to 2 phase and their applications, Three winding transformers. Parallel operation of single phase and three phase transformers and load sharing.

Text Books:
1. IJ Nagrath & D.P. Kothari, "Electrical Machines", Tata McGraw Hill
2. Rajendra Prasad, "Electrical Machines", PHI
3. PS Bimbhra, "Electrical Machinery", Khanna Publisher

**Reference Books:**
3. PS Bimbhra, "Generalized Theory.

**NETWORK ANALYSIS & SYNTHESIS**

**Pre-requisites of course:** Basic Electrical Engineering, Basic signal & systems.

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CO 1</strong></td>
<td>Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.</td>
</tr>
<tr>
<td><strong>CO 2</strong></td>
<td>Analyze the AC and DC circuits using Kirchhoff’s law and Network simplification theorems.</td>
</tr>
<tr>
<td><strong>CO 3</strong></td>
<td>Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.</td>
</tr>
<tr>
<td><strong>CO 4</strong></td>
<td>Demonstrate the concept of complex frequency and analyze the structure and function of one and two port network. Also evaluate and analysis two-port network parameters.</td>
</tr>
<tr>
<td><strong>CO 5</strong></td>
<td>Synthesize one port network and analyze different filters.</td>
</tr>
</tbody>
</table>

**KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)**

K₁ – Remember  K₂ – Understand    K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

**Detailed Syllabus:**

**UNIT I**

**Graph Theory:**

**Pre- Requisites:** Basic circuital law, Mesh & Nodal analysis.

Importance of Graph Theory in Network Analysis, Graph of a network, Definitions, planar &Non-Planar Graphs, Isomorphism, Tree, Co Tree, Link, basic loop and basic cutset, Incidence matrix, Cut set matrix, Tie set matrix, Duality, Loop and Nodal methods of analysis.

**UNIT II**

**AC Network Theorems** (Applications to dependent & independent sources):

**Pre- Requisites:** Concepts of DC Network Theorems, Electrical Sources&Basic circuital law.

Superposition theorem, Thevenin’s theorem, Norton’s theorem, Maximum power transfer theorem, Reciprocity theorem, Millman’s theorem, Compensation theorem, Tellegen’s Theorem.

**UNIT III**

**Transient Circuit Analysis:**

**Pre- Requisites:** Laplace Transform& Concept of Initial conditions.
Natural response and forced response, Transient response and steady state response for arbitrary inputs (DC and AC), Evaluation of time response both through classical and Laplace methods.

Unit IV
Network Functions:
Pre-Requisites: Concept of basic circuit law, parallel, series circuits.
Concept of complex frequency, Transform impedances network functions of one port and two port networks, Concept of poles and zeros, Properties of driving point and transfer functions.
Two Port Networks- Characterization of LTI two port networks; Z, Y,ABCD, A’B’C’D’, g and h parameters, Reciprocity and symmetry, Inter-relationships between the parameters, Inter-connections of two port networks, Ladder and Lattice networks: T & II representation, terminated two Port networks, Image Impedance.

Unit V
(a) Network Synthesis:
Pre-Requisites: Laplace Transform, Concept of immittance functions.
Positive real function; definition and properties, Properties of LC, RC and RL driving point functions, Synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.

(b) Filters
Pre-Requisites: Concept of Passive & active elements.
Image parameters and characteristics impedance, Passive and active filter fundamentals, Low pass filters, High pass (constant K type) filters, Introduction to active filters.

Text Books:
1. ME Van Valkenburg, “Network Analysis”, Prentice Hall of India.

Reference Books:
CIRCUIT AND SIMULATION LAB

Pre-requisites of course: Basic Electrical Engineering

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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<tbody>
<tr>
<td>CO 1 Apply the knowledge of basic circuital law, nodal and mesh analysis for given circuit.</td>
<td>K2</td>
</tr>
<tr>
<td>CO2 Analysis of the AC and DC circuits using simulation techniques.</td>
<td>K3</td>
</tr>
<tr>
<td>CO3 Analysis of transient response of AC circuits.</td>
<td>K3</td>
</tr>
<tr>
<td>CO4 Evaluation and analysis of two-port network parameters.</td>
<td>K2</td>
</tr>
<tr>
<td>CO5 Estimation of parameters of different filters.</td>
<td>K2</td>
</tr>
</tbody>
</table>

KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand   K₃ – Apply  K₄ – Analyze  K₅ – Evaluate   K₆ – Create

List of Experiments

Ten experiments to be performed

1) Verification of principle of Superposition with AC sources using Multisim/ PSPICE.
2) Verification of Thevenin and Maximum Power Transfer theorems in AC Circuits using Multisim/ PSPICE.
3) Verification of Norton theorems in AC Circuits using Multisim/ PSPICE.
4) Verification of Tellegen’s theorem for two networks of the same topology using Multisim/ PSPICE.
5) Determination of Z and h-parameters (DC only) for a network and computation of Y and ABCD Parameters using Multisim/ PSPICE.
6) Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values using Multisim/ PSPICE.
7) Determination of transient response of current in RL and RC circuits with step voltage input.
8) Determination of transient response of current in RLC circuit with step voltage input for under damped, critically damped and over damped cases.
10) Verification of parameter properties in inter-connected two port networks: series, parallel and cascade using Multisim/ PSPICE.


12) To determine attenuation characteristics of a low pass / high pass active filters.

ELECTRICAL MACHINES-I LAB

Pre-requisites of course: Basic Electrical Engineering

<table>
<thead>
<tr>
<th>Course Outcomes</th>
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</tr>
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<tbody>
<tr>
<td><strong>CO1</strong> Analyze and conduct basic tests on DC Machines and single-phase Transformer</td>
<td>K2</td>
</tr>
<tr>
<td><strong>CO2</strong> Obtain the performance indices using standard analytical aswell as graphical methods.</td>
<td>K3</td>
</tr>
<tr>
<td><strong>CO3</strong> Determine the magnetization, Load and speed-torque characteristics of DC Machines.</td>
<td>K3</td>
</tr>
<tr>
<td><strong>CO4</strong> Demonstrate procedures and analysis techniques to perform electromagnetic and electromechanical tests on electrical machines.</td>
<td>K2</td>
</tr>
</tbody>
</table>

KL- Bloom’s Knowledge Level (K1, K2, K3, K4, K5, K6)

K1 – Remember  K2 – Understand   K3 – Apply  K4 – Analyze  K5 – Evaluate   K6 – Create

List of Experiments

Note: Minimum ten experiments are to be performed from the following list, out of which there should be at least two software-based experiments.

1. To obtain magnetization characteristics of a DC shunt generator.
2. To obtain load characteristics of a DC shunt generator and compound generator (a) Cumulatively compounded (b) Differentially compounded.
3. To obtain efficiency of a DC shunt machine using Swinburne’s test.
4. To perform Hopkinson’s test and determine losses and efficiency of DC machine.
5. To obtain speed- torque characteristics of a DC shunt motor.
6. To obtain speed control of DC shunt motor using (a) armature resistance control (b) field control
10. To obtain 3-phase to 2-phase conversion by Scott connection.
11. To demonstrate the parallel operation of three phase transformer and to obtain the load sharing at a load.
Institute may add any two software-based experiments [Develop computer Program in ‘C’ language]

DIGITAL ELECTRONICS LAB

<table>
<thead>
<tr>
<th>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</td>
<td>Understanding of Digital Binary System and implementation of Gates.</td>
</tr>
<tr>
<td>CO 2</td>
<td>Design the Sequential circuits with the help of combinational circuits and feedback element.</td>
</tr>
<tr>
<td>CO 3</td>
<td>Design data selector circuits with the help of universal Gates.</td>
</tr>
<tr>
<td>CO 4</td>
<td>Design the counters with the help of sequential circuit and basic Gates.</td>
</tr>
<tr>
<td>CO 5</td>
<td>Implement the projects using the digital ICs and electronics components.</td>
</tr>
</tbody>
</table>

KL- Bloom’s Knowledge Level (K₁, K₂, K₃, K₄, K₅, K₆)
K₁ – Remember  K₂ – Understand  K₃ – Apply  K₄ – Analyze  K₅ – Evaluate  K₆ – Create

1. Introduction to digital electronics lab- nomenclature of digital ICs, specifications, study of the data sheet, Concept of Vcc and ground, verification of the truth tables of logic gates using TTL ICs.
2. Implementation of the given Boolean function using logic gates in both SOP and POS forms.
3. Verification of state tables of RS, JK, T and D flip-flops using NAND & NOR gates.
4. Implementation and verification of Decoder using logic gates.
5. Implementation and verification of Encoder using logic gates.
8. Implementation of 4-bit parallel adder using 7483 IC.
9. Design, and verify the 4-bit synchronous counter.
10. Design, and verify the 4-bit asynchronous counter.
11. Implementation of Mini Project using digital integrated circuit’s and other components.