EVALUATION SCHEME & SYLLABUS FOR

B. TECH. 2nd YEAR

ELECTRICAL ENGINEERING

BASED ON

AICTE MODEL CURRICULUM

[Effective from the Session: 2019-20]
### EVALUATION SCHEME - B.TECH 2nd YEAR (ELECTRICAL 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>
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<td>1</td>
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*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>
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<td>KEE403</td>
<td>Networks Analysis &amp; Synthesis</td>
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<td>2</td>
<td>25</td>
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<td>Digital Electronics Lab</td>
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<td>9</td>
<td>KNC402/ KNC401</td>
<td>Python Programming/Computer System Security</td>
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<td>10</td>
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<tr>
<td>10</td>
<td>MOOCs (Essential for Hons. Degree)</td>
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</tbody>
</table>
Course Outcomes: Knowledge Level, KL

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

<table>
<thead>
<tr>
<th>CO</th>
<th>Description</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO 1</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>
<td>K₃</td>
</tr>
<tr>
<td>CO 2</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>
<td>K₄</td>
</tr>
<tr>
<td>CO 3</td>
<td>Understand the concept of static magnetic field, magnetic scalar and vector potential</td>
<td>K₄</td>
</tr>
<tr>
<td>CO 4</td>
<td>Understand the forces due to magnetic field, magnetization, magnetic boundary conditions and inductors.</td>
<td>K₄</td>
</tr>
<tr>
<td>CO 5</td>
<td>Understand displacement current, time varying fields, propagation and reflection of EM waves and transmission lines.</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

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>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO 1 Evaluate errors in measurement as well as identify and use different types of instruments for the measurement of voltage, current, power and energy.</td>
<td>K₁</td>
</tr>
<tr>
<td>CO2 Display the knowledge of measurement of electrical quantities resistance, inductance and capacitance with the help of bridges.</td>
<td>K₂</td>
</tr>
<tr>
<td>CO3 Demonstrate the working of instrument transformers as well as calculate the errors in current and potential transformers.</td>
<td>K₂</td>
</tr>
<tr>
<td>CO4 Manifest the working of electronic instruments like voltmeter, multi-meter, frequency meter and CRO.</td>
<td>K₂</td>
</tr>
<tr>
<td>CO5 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>
<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

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

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>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td><strong>CO 1</strong> Represent the various types of signals &amp; systems and can perform mathematical operations on them.</td>
<td>K₂</td>
</tr>
<tr>
<td><strong>CO2</strong> Analyze the response of LTI system to Fourier series and Fourier transform and to evaluate their applications to network analysis.</td>
<td>K₄</td>
</tr>
<tr>
<td><strong>CO3</strong> Analyze the properties of continuous time signals and system using Laplace transform and determine the response of linear system to known inputs.</td>
<td>K₄</td>
</tr>
<tr>
<td><strong>CO4</strong> Implement the concepts of Z transform to solve complex engineering problems using difference equations.</td>
<td>K₃</td>
</tr>
</tbody>
</table>
Develop and analyze the concept of state-space models for SISO & MIMO system.

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


UNIT III

Pre- Requisites: Laplace Transform


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>Course Outcomes</th>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO1 Understand the characteristics and applications of the Semiconductor devices.</td>
<td>K2, K3</td>
</tr>
<tr>
<td>CO2 Draw the characteristics of BJT, FET and MOSFET.</td>
<td>K2, K4</td>
</tr>
<tr>
<td>CO3 Understand the parameters of Operational Amplifier and instrumentation Amplifier with their applications.</td>
<td>K2, K4</td>
</tr>
<tr>
<td>CO4 Understand the V-I characteristics of Power devices like SCR, TRIAC.</td>
<td>K2, K4</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. 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>
<th>Knowledge Level, KL</th>
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</thead>
<tbody>
<tr>
<td>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO 1</td>
<td>Understand the importance of calibration of measuring instruments.</td>
</tr>
<tr>
<td>CO2</td>
<td>Demonstrate the construction and working of different measuring instruments.</td>
</tr>
<tr>
<td>CO3</td>
<td>Demonstrate the construction and working of different AC and DC bridges, along with their applications.</td>
</tr>
<tr>
<td>CO4</td>
<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>
</tr>
<tr>
<td>CO5</td>
<td>Capability to analyze and solving the variety of problems in the field of electrical measurements.</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>
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<tbody>
<tr>
<td>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO 1</td>
<td>Perform various types of Electrical connections.</td>
</tr>
<tr>
<td>CO2</td>
<td>Develop small circuits on PCB</td>
</tr>
<tr>
<td>CO3</td>
<td>Differentiate between various electrical wires, cables and accessories.</td>
</tr>
<tr>
<td>CO4</td>
<td>Demonstrate the layout of electrical substation &amp; various safety measures.</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:

**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.
Semester-IV

DIGITAL ELECTRONICS

Course Outcomes: | Knowledge Level, KL
---|---

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

| CO 1 | Apply concepts of Digital Binary System and implementation of Gates. | K3 |
| CO2 | Analyze and design of Combinational logic circuits. | K4 |
| CO3 | Analyze and design of Sequential logic circuits with their applications. | K4 |
| CO4 | Implement the Design procedure of Synchronous & Asynchronous Sequential Circuits. | K3 |
| CO5 | Apply the concept of Digital Logic Families with circuit implementation. | K3 |

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
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>
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<th>Course Outcomes:</th>
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<tbody>
<tr>
<td>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO 1   Analyze the various principles &amp; concepts involved in Electromechanical Energy conversion.</td>
<td>K_4</td>
</tr>
<tr>
<td>CO 2   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>K_2</td>
</tr>
<tr>
<td>CO 3   Evaluate the performance and characteristics of DC Machine as motor and as well as generator.</td>
<td>K_4</td>
</tr>
<tr>
<td>CO 4   Evaluate the performance of transformers, individually and in parallel operation.</td>
<td>K_4</td>
</tr>
<tr>
<td>CO 5   Demonstrate and perform various connections of three phase transformers.</td>
<td>K_3</td>
</tr>
</tbody>
</table>

KL - Bloom’s Knowledge Level (K_1, K_2, K_3, K_4, K_5, K_6)
K_1 - Remember   K_2 - Understand   K_3 - Apply   K_4 - Analyze   K_5 - Evaluate   K_6 - Create

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- Requisites: 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>CO 1 Apply the knowledge of basic circuital law, nodal and mesh methods of circuit analysis and simplify the network using Graph Theory approach.</td>
<td>K3</td>
</tr>
<tr>
<td>CO2 Analyze the AC and DC circuits using Kirchhoff’s law and Network simplification theorems.</td>
<td>K4</td>
</tr>
<tr>
<td>CO3 Analyze steady-state responses and transient response of DC and AC circuits using classical and Laplace transform methods.</td>
<td>K4</td>
</tr>
<tr>
<td>CO4 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>
<td>K4</td>
</tr>
<tr>
<td>CO5 Synthesize one port network and analyze different filters.</td>
<td>K4</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 circuital 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 & Π 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>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<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>CO 2 Analysis of the AC and DC circuits using simulation techniques.</td>
<td>K3</td>
</tr>
<tr>
<td>CO 3 Analysis of transient response of AC circuits.</td>
<td>K3</td>
</tr>
<tr>
<td>CO 4 Evaluation and analysis of two-port network parameters.</td>
<td>K2</td>
</tr>
<tr>
<td>CO 5 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 ACCircuits 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>
<th>Knowledge Level, KL</th>
</tr>
</thead>
<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 as well 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>Upon the completion of the course, the student will be able to:</td>
<td></td>
</tr>
<tr>
<td>CO 1 Understanding of Digital Binary System and implementation of Gates.</td>
<td>K₂, K₃</td>
</tr>
<tr>
<td>CO2 Design the Sequential circuits with the help of combinational circuits and feedback element.</td>
<td>K₃, K₄</td>
</tr>
<tr>
<td>CO3 Design data selector circuits with the help of universal Gates.</td>
<td>K₃, K₄</td>
</tr>
<tr>
<td>CO4 Design the counters with the help of sequential circuit and basic Gates.</td>
<td>K₃, K₄</td>
</tr>
<tr>
<td>CO5 Implement the projects using the digital ICs and electronics components.</td>
<td>K₃, K₅</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.