2nd Year Scheme and Syllabus

(For session: 2017-18)
## COURSES AND EVALUATION SCHEME
### YEAR II, SEMESTER III
(B. Tech. Electrical Engineering)

<table>
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<tr>
<th>S. No.</th>
<th>COURSE CODE</th>
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<tr>
<td>1</td>
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<td>Network Analysis &amp; Synthesis</td>
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<td>Electrical Measurements and Measuring Instruments</td>
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<td>TEE 233</td>
<td>Signal &amp; Systems</td>
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<td>Analog Electronics</td>
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<td>TAH 232</td>
<td>Mathematics –III</td>
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**PRACTICALS**

| 1 | PEE 231 | Network Analysis & Synthesis Lab | 0 | 0 | 2 | 15 | 10 | 25 | 25 | 50 |
| 2 | PEE 232 | Electrical Measurement Lab | 0 | 0 | 2 | 15 | 10 | 25 | 25 | 50 |
| 3 | PEE 233 | Simulation Lab-I. | 0 | 0 | 2 | 15 | 10 | 25 | 25 | 50 |
| 4 | PEE 234 | Analog Electronics Lab | 0 | 0 | 2 | 15 | 10 | 25 | 25 | 50 |

**Semester Total**

|          | | | | | | | | 950 |

| GPP 231 | General Proficiency | | 50 | 50 |

**Grand Total**

| 15 | 5 | 8 | 400 | 600 | 1000 |
UNIT-1
**Graph Theory:** Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.

UNIT-2
**Network Theorems (Applications to ac networks):** Super-position theorem, Thevenin’s theorem, Norton’s theorem, maximum power transfer theorem, Reciprocity theorem. Millman’s theorem, compensation theorem, Tellegen’s theorem.

UNIT-3
**Network Functions:** 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, time response and stability from plot, frequency response and Bode plots.

UNIT-4
**Two Port Networks:** Characterization of LTI two port networks, ZY, ABCD and h-parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & π Representation.

UNIT-5
**Network Synthesis:** 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.

**Books:**
1. Network Analysis with Applications, 4/e (with CD), Stanley. pearson
Philosophy Of Measurement: Methods of Measurement, Measurement System, Classification of instrument system, Characteristics of instruments & measurement system, Errors in measurement & its analysis, Standards.


Instrument Transformers: Theory, construction, characteristics and their application of current and potential transformers. Ratio and phase angle errors and their minimization, Introduction to measurement of speed, frequency and power factor.

Measurement of R,L,C Parameters: Different methods of measuring low, medium and high resistances, measurement of inductance & capacitance with the help of Wheatstone, Kelvin, Maxwell, Hay’s, Anderson, Owen, Heaviside, Campbell, Schering, Wien bridges; Bridge sensitivity; Wagner Earthing Device; Q Meter.

AC Potentiometer: Polar type & Co-ordinate type AC potentiometers, application of AC Potentiometers in electrical measurement.

Magnetic Measurement: Ballistic Galvanometer, flux meter, determination of hysteresis loop, measurement of iron losses.

Digital Measurement of Electrical Quantities: Concept of digital measurement, block diagram, Study of digital voltmeter, frequency meter, Power Analyzer and Harmonics Analyzer; Electronic Multimeter.

Cathode Ray Oscilloscope: Basic CRO circuit (Block Diagram), Cathode ray tube (CRT) & its components, application of CRO in measurement, Lissajous Pattern; Dual Trace & Dual Beam Oscilloscopes.

Books:
UNIT-1
Signals and Systems: Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equations.

UNIT-2
Z-Transform: Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.

UNIT-3

UNIT-4
Sampling and Laplace Transform: Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.

UNIT-5
Random variable, random process correlation functions, cumulative distribution function, probability density function, joint-cumulative distribution, probability density function. Expectation, mean, variance, covariance, auto-correlation, power spectral density, Gaussian PDF and Raleigh PDF.

Books:
5. Chen ‘Signals & Systems, Oxford University, Press.
UNIT 1


MULTISTAGE AND TUNED AMPLIFIERS: Cascade amplifiers, coupling of amplifiers, RC coupled, direct coupled, and transformer coupled amplifiers, differential amplifier, Darlington amplifier, bootstrapping, tuned and double tuned amplifiers.

UNIT 2

FEEDBACK AMPLIFIERS: Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifiers, Analysis of voltage-series voltage-shunt, current-series and current-shunt feedback amplifiers, Stability criterion.

UNIT 3

OSCILLATORS: Classification, Criterion for oscillations, Hartley, Colpitts, Clapp, RC Phase shift, Wien Bridge and crystal oscillators, astable, monostable and bistable multivibrators using transistors.

UNIT 4

HIGH FREQUENCY AMPLIFIERS: Hybrid π-model, conductances and capacitances of hybrid π-model, high frequency analysis of CE amplifier, gain-bandwidth product, Emitter follower at high frequencies, High frequency analysis of common source, common gate and drain amplifiers.

UNIT 5

POWER AMPLIFIERS: Power amplifier circuits, Class A, class B and class AB and, class C amplifiers, push pull amplifiers with and without transformers, Complementary symmetry amplifiers, Distortion, thermal consideration and power dissipation of power amplifiers.

BOOKS:

2. Millman & Halkias, “Electronic Devices And Circuits” TMH
3. R.K. Singh & D. S. Chauhan, Solid State Devices and Material, Wiley India
5. Razevi - Fundamentals of Solid State Engineering, Springer
Mathematics - III (TAH 232/242)

Unit - I: Integral Transforms
Fourier Integral, Fourier complex transforms, Fourier sine and cosine transforms and applications to simple heat transfer equations.
Z-transforms and its application to solve difference equations.

Unit - II: Functions of a Complex Variable - I
Analytic functions, C-R equations and harmonic functions; Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula for derivative of analytic functions. Liouville's theorem, Fundamentals theorem of algebra.

Unit - III: Functions of a Complex Variable II
Representation of a function by power series, Taylor's and Laurent's series, Singularities, Zeros and Poles. Residue theorem, evolution of real integrals of type \( \int f(\cos \theta, \sin \theta) d\theta \) and \( \int f(x) dx \), Conformal mapping and bilinear transformation.

Unit - IV: Statistics and Probability

Unit - V: Curve Fitting and Solution of Equation
Method of least squares and curve fitting of straight line and parabola. Solution of cubic and bi-quadratic equations.
PEE-231: NETWORK ANALYSIS & SYNTHESIS LAB

1. Verification of principle of Maximum power transfer and superposition with dc and ac sources.
2. Verification of Thevenin and Norton theorems in ac circuits.
3. Verification of Tellegen’s theorem for two networks.
4. Study the series resonance and parallel resonance.
5. Study the response in RLC series circuit with step voltage input for underdamp, critically damp and overdamp cases.
7. Determination of Z and Y parameters for a network
8. Determination of ‘h’ and ABCD parameters
9. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values.
11. Verification of parameter properties in inter-connected two port networks: series, parallel and cascade also study loading effect in cascade.

****Additional or any other experiment may be added based on contents of syllabi.
1. Calibration of energy meter, voltmeter and ammeter.
2. Determination of frequency and phase angle using CRO.
3. Measurement of low resistance by Kelvin’s double Bridge.
8. Measurement of capacitance by Owen’s Bridge.
9. Measurement of capacitance by De Sauty Bridge.
10. Measurement of capacitance by Schering Bridge.
11. Measurement of frequency using Wein's Bridge.
12. Study the Current and Potential transformers and find out ratio & phase angle error.

****Additional or any other experiment may be added based on contents of syllabi.****
Experiments based on MATLAB and C Programming

1. Study and verify basic arithmetic operators using MATLAB and C programming.
2. Write a MATLAB and C program to verify Thevenin’s and Norton’s theorems for variable load in DC and AC systems.
3. Write a MATLAB and C program to plot I Vs Z in series and parallel resonance circuit.
4. Write a MATLAB and C program to determine the parameters of single phase transformer using (i) O.C. test (ii) S.C. test.
5. Write a MATLAB and C program to plot V-I characteristics for DC (i) Series (ii) Shunt (iii) Compound machines on different plots as well as in the one plot.
6. Write a MATLAB and C program to plot Torque-slip (T-s) characteristics of induction machine for (i) Breaking Region (ii) Motoring Region (iii) Generating Region.

Experiments based on LabVIEW

7. Create a VI (Virtual Instrument) to perform the arithmetic operations like: addition, subtraction, multiplication, division, increment, decrement, etc.
8. Create a VI (Virtual Instrument) to perform the string operations like: lower to upper case, upper to lower case, string length, concatenate strings, string subset, replace substring, etc.
9. Create a VI for averaging the marks obtained by a student in four subjects and grading. Use Sub-VI and MATLAB script.
10. Create a VI for simulating sine wave. Add a particular noise to this signal. Finally study the use filter to remove this noise.
11. Create a VI for the amplitude & level measurement and spectrum measurement on a signal.

*** Additional or any other experiments using different softwares like PROTEUS, OrCAD, PSPICE, PSCAD, EMTP etc. may be added.
1. To verify the configuration of various biasing techniques for BJTs.
2. To determine voltage gain output impedance and output power of a Darlington pair compound amplifier.
3. To determine “h” parameters of a PNP transistor in common emitter mode.
4. To determine the frequency response of an IFT amplifier.
5. To determine voltage gain and plot the frequency response of a FET amplifier in common source mode.
6. To study the effect of negative feedback on voltage gain & bandwidth in a two stage amplifier.
7. To determine frequency of a Hartley Oscillator circuit with change in the capacitor of the tank circuit.
8. To determine frequency and wave shape of a Colpitt’s oscillator circuit.
9. To determine frequency and wave shape of a crystal oscillator circuit.
10. To determine frequency and wave shape of a phase shift oscillator circuit.
11. To determine voltage gain and plot the frequency response of a single stage, two stage RC coupled and direct coupled amplifiers.

****Additional or any other experiment may be added based on contents of syllabi.
# COURSES AND EVALUATION SCHEME
## YEAR II, SEMESTER IV
(B. Tech. Electrical Engineering)

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**Theory Subject**

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**Semester Total**

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Unit - 1

Unit - 2

Unit -3
D.C. Machines (Contd.): Characteristics of D.C. motors, Starting of D.C. motors; 3-point and 4-point starters, Speed control of D.C. motors: Field Control, armature control and Voltage Control (Ward Leonard method); Efficiency and Testing of D.C. machines- Brake test, Hopkinson’s, Field test and Swinburne’s Test.

Unit - 4

Unit - 5
Three Phase Transformers: Construction, phasor groups and their connections, open delta connection, three phase to two phase, six phase or twelve phase connections, and their applications, parallel operation and load sharing of single phase and three phase transformers, excitation phenomenon and harmonics in transformers, three winding transformers.

Books:
2. Bhimbra P. S., “Electrical Machinery” Khanna Publication
UNIT – 1
Crystal Structure of Materials
Bonds in solids, crystal structure, co-ordination number, atomic radius representation of plane distance b/w two planed packing factor, Miller Indices, Bragg’s law and x-ray diffraction, structural Imperfections, crystal growth.

UNIT – 2
Dielectric Materials
Polarization and Dielectric constant, Dielectric constant of mono-atomic, Poly atomic gases and solids, frequency dependence of electronic and ionic polarizabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials.

UNIT – 3
Conductivity
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, Half effect, Drift and Diffusion currents, continuity equation, thermoelectric effect.

UNIT – 4
Conducting and Insulating Materials
Properties and applications of electrical conducting and insulating materials, mechanical properties of metals, Properties of semi-conducting materials, Properties of insulating materials, Superconductivity and super conducting materials, optical properties of solids.

UNIT – 5
Magnetic Material

Books:
Unit-1
Coordinate Systems and Transformation: Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, $\Delta$-operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke’s theorem, Laplacian of a scalar.

Unit-2
Electrostatics: Electrostatic fields, Coulomb’s law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss’s Law, Electric dipole and flux lines, energy density in electrostatic fields.

Unit-3
Electric field in material space: Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. Poission’s and Laplace’s equations.

Unit-4
Magneto-statics: Magneto-static fields, Biot-Savart’s Law, Ampere’s circuit law, Forces due to magnetic field, magnetic torque and moment, magnetic dipole, magnetization in materials, magnetic boundary conditions, magnetic energy. Application of ampere’s law, magnetic flux density, magnetic scalar and vector potential.

Unit-5
Electromagnetic wave propagation: Maxwell’s equations in point and integral forms, Wave equation, displacement current, Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, Poynting vector and Poynting theorem.

Book:
1. Kaduskar, Principles of Electromagnetics, Wiley India
**Unit-1**  
**Logic Families:** Circuit concepts and comparison of logic families: RTL, DTL, TTL, CMOS, NMOS and ECL; Characteristic parameters: logic levels/fan-in and fan out, noise margin, propagation delay and power consumption.

**Unit-2**  
**Minimization of Boolean functions using** Karnaugh Map and Karnaugh Map with don't care entries, tabular method.  
**Arithmetic Logic Circuits:** Representation of negative numbers, 9's and 10's complements, 1's and 2's complements, arithmetic operation using 2's complements, binary codes. Adders and Subtracters, magnitude comparator.

**Unit-3**  
**Combinational Logic Circuits:** Multiplexers/Demultiplexers, encoders/decoders, ROM, RAM, PAL and PLA.  
**Sequential Logic Circuits:** Latches & Flip-Flops: SR, D, T, JK and Master-slave JK.

**Unit-4**  
**Shift Registers:** Basic principle, serial and parallel data transfer, shift left/right register, universal shift register.  
**Counters:** Mode N counters, ripple counters, synchronous counters, ring & Johnson counters.

**Unit-5**  
**Analog to Digital Converters:** Transfer characteristics, A/D conversion technique: Simple potentiometer and servo method, successive approximation method ramp type, integrating and dual slope integrating method.  
**Digital to Analog Converters:** Transfer characteristic, D/A conversion technique, digital mode of operation, performance characteristics of D/A convertors.  
**Display Devices:** Alpha numeric display using LCD and LED

**Reference Books:**
1. Digital Electronics: Principles and Integrated Circuits, Maini, Wiley India  
3. Degital Design, Vahid, Wiley India  
5. R.A. Gayakwad, "Op-Amps and Linear Integrated Circuits" Prentice Hall of India,  
7. IJ. Nagrath, "Electronics Analog and Digital" Prentice Hall of India Ltd.
UNIT-1
Introduction to Microprocessors: Evolution of Microprocessors, Classification of microprocessors, Basic functional blocks of a microprocessor, Microprocessor-based system (Organization of microcomputer).

UNIT-2
8-bit Microprocessors (8085): Architecture; Addressing modes; Instruction Set: Data transfer instructions, Arithmetic instructions, Logical instructions, Branching instructions, Machine control instructions; Timing diagram of 8085 instructions; Assembly Language Programming.

UNIT-3
16-bit Microprocessors (8086): Architecture, Physical address, segmentation, memory organization, Bus cycle, Instruction Set, Addressing modes, difference between 8085 & 8086, Assembler Directives, Assembly Language Programming of 8086.

UNIT-4
8-bit Microcontrollers (8051): Fundamental differences of microprocessors and microcontrollers, Introduction to Architecture and instruction set of 8051 microcontroller.

UNIT-5
Peripheral Devices and Interfacing: Architecture and functional description of Programmable Peripheral Interface (8255), operating modes: BSR, I/O mode- Mode 0, 1 and 2, Programming 8255, Architecture and functional description of USART (8251), Priority Interrupt Controller (8259), interfacing of A/D and D/A converters, Memory Interfacing, Application of peripheral devices: temperature control, waveform generation and stepper motor control.

Books:
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 Swinburn’s test.
4. To perform Hopkinson’s test and determine losses and efficiency of DC machine.
5. To obtain performance curves of DC shunt motor.
6. To obtain performance curves of DC series motor.
7. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control.
8. To obtain equivalent circuit, efficiency and voltage regulation of a single phase transformer using O.C. and S.C. tests.
9. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner’s test.
10. To obtain 3-phase to 2-phase conversion by Scott connection.

**** Additional or any other experiment may be added based on contents of syllabi.
1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Experiments with clocked Flip-Flop.
5. Design of Counters.
7. Bread Board implementation of Adder/Subtractor (Half, Full)
8. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
9. Transfer characteristics of CMOS inverters series and CD40 series and
10. Estimation of Gate delay of CD40 series CMOS inverter.
11. Mono-shotmulti-vibrators using 74121 and 74123.
12. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
14. To verify experimentally output of A/D and D/A converters.

****Additional or any other experiment may be added based on contents of syllabi.
A. Programming based Experiments (8085/8086 µP)
1. To perform the addition/ subtraction of two 8-bit numbers.
2. To perform the addition/ subtraction of two digit BCD numbers.
3. To perform multiplication/ division of given numbers.
4. To find the sum of a series of numbers.
5. To create a table of 5.

B. Interfacing based Experiments (any five)
6. Stepper motor controller interfacing
7. DC Motor interfacing
8. Seven Segment Display interfacing
9. Digital to Analog Convertor interfacing
10. Analog to Digital Convertor interfacing
11. Elevator Simulator interfacing
12. Traffic light controller interfacing
13. Temperature controller interfacing
14. IC Tester interfacing

****Additional or any other experiment may be added based on contents of syllabi.