THIRD SEMESTER

Electrical Circuits (EL20313)

Objectives:

- The subject deals with the various methods of analysis of electrical circuits under transient and steady state conditions.
- It provides a solid foundation for later learning as well as for future professional activities.

Syllabus:

UNIT – I Development Of Circuit Concepts:
The relationship of field and circuit concept for parameters, lumped, linear and bilateralElements, voltage and current sources, duality of simple circuit, network topology: graphTree, branch link, ties set, cutest, loop and nodal analysis, equilibrium equations.

UNIT – II Network Solution and Reduction:
Solution of network equation of determination method of network reductions, nodalAnalysis, mesh analysis, super node, super mesh network theorems, superposition theorem, reciprocity theorem, Thevenin's theorem, Norton's theorem, star delta transformation theorem, Tellegen's theorem.

UNIT – III Network Solution and Reduction:
Electrostatic and electromagnetic coupling, self-inductance, mutual inductance, couplingCoefficient, complete network with conductive and inductive coupling, Series and parallelResonance, quality factor, band width, selectivity, half power frequencies, circle diagramOf simple series and parallel circuits, inversion of circle and straight line impedance andAdmittance loci.

UNIT – IV Poly Phase Circuits:
Examples of two, three, four-loop circuits and their solutions, unbalanced poly phaseCircuits, determination of phase sequence, star/delta connections, and power measurement in poly phase circuits.

UNIT – V Non – sinusoidal Ideal Wave Forms:
Common non-sinusoidal waveforms, Fourier series, analytical evaluation of FourierCoefficients, exponential form of Fourier series, frequency spectra of periodic waveforms,Semi graphical method of analysis, effective value and equivalent power factor solution of circuits with non sinusoidal currents and voltages, harmonic resonance and harmonicsin poly phase circuits.

Text Books:
1. "*Electric Circuit Analysis*", Hayt, Kemmerly, Durbin, TMH Pbs.
2. *AC Circuits*", Kerchner and Cocoran

Reference Books:
1. A. Sudhakar&Shyam Mohan "Electric Circuits"
2. Network Analysis by M.E. Van Valkenberg
3. "*Basic Circuit Theory*", Desoer and Kuh, Mc Graw Hill Pbs.
4. Network Analysis & Synthesis, D. Roy Choudhary
5. "*Fundamentals of Electric Circuits*" Alexander &Sadiku, TMH Pbs.

Course Outcomes:

After the completion of the course the students will be able to :

1. Analyse the electrical circuits with nodal and mesh analysis.
2. Apply electrical network theorems for analysing various electrical circuits.
3. Solve different balanced and unbalanced poly phase circuits.
4. Utilize Fourier series for synthesis of non sinusoidalwaveforms.

POs / COs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓	✓	✓				✓	✓
2	✓	✓	✓	✓	✓	✓				✓	✓
3	✓	✓	✓	✓	✓	✓					✓
4	✓	✓	✓	✓	✓	✓				✓	✓

Generation of Electrical Energy (Conventional & Non-conventional) (EL20315)

Objectives:

- To provide the students with a broad understanding of predictions of different load demands of the consumers.
- Student will understand the layout diagrams of power system by drawing the typical load curves
- To provide the students with a broad understanding of electricity generation.

- Students will understand the operation and major components of electric generating plants.
- Students will have a basic understanding of conversion of coal, oil, gas, nuclear, hydro, solar, geothermal, etc. energy to electrical energy.

Syllabus:

UNIT – I Introduction to Generating station & Loads: Choice of Power station and units: Types of power station, choice of type of generation, choice of size of generator units and number of units. Definition of connected load, maximum load, maximum demand, demand factor, load factor, diversity factor, plant capacity factor, plant utilization factor, load duration curve, mass curve

UNIT – II Steam Power station: Main parts and working of a steam station, characteristics of steamTurbines, characteristics of turbo alternator, steam station auxiliaries, steam station layout,super pressure Steam station.

UNIT- III Hydro power stations: Hydrology, hydrographs, flow duration curve, mass curve, types of Dam, principle of working of a hydro electric plant, tidal power plant, power to be developed, types of Turbine and their characteristics, characteristics of generators, power station structure and layout.

UNIT – IV (A) Nuclear power stations: Main parts of nuclear power station principle of nuclear energy, main parts of reactor, types of power reactor, location of nuclear power plant, layout of power station, reactor control, nuclear waste disposal.
(B) MHD generation: History of MHD generation, principle of MHD generation, MHD cycles and working fluids, open cycle MHD system, closed cycle MHD system, advantage of MHD generation.

UNIT – V (A) New Energy Sources: Solar radiation, Solar energy collectors, Conversion of solar energy into electric energy, Solar hydrogen energy cycle, Wind mills, Tidal power generation schemes, Tidal barrage, Environmental aspects of new and old electric energy generation.
(B) Economic operation of power systems: Criteria for distribution of load between units of a plant and between plants, transmission loss as a function of plant generation, loss formula coefficients, brief aspects of load dispatching.

Text Books:
1. Generation of Electrical Energy by B.R. Gupta, S.ChandPbs.
2. Electric Power Station, Car, T.H., Chappman& Hall

Reference Books:

1. Elements of Electric Power Station Design by M.V. Deshpande
2. A Course in Electrical Power by Soni Gupta Bhatnagar, Dhanpat Rai
3. A Course in Electrical Power by J.B.Gupta, KatariaPbs.

Course Outcomes:

After the completion of the course the student will be able to:

- Explain the basic requirements for the design and development of modern power plant.
- Answer how economically power can be generated and distributed among the load centres.
- Demonstrate the cheapest ways of electric power generation.
- Explain the operation of different accessories associated with conventional and nonconventional power plants.
- Develop new renewable power devices for socioeconomic application.

POs / COs	a	b	c	d	e	f	g	h	i	j	k
1	✓		✓	✓	✓	✓			✓	✓	✓
2	✓	✓							✓	✓	✓
3	✓	✓							✓	✓	✓
4	✓		✓	✓					✓	✓	✓
5	✓	✓	✓	✓	✓	✓			✓	✓	✓

Electrical Machines – I (EL20316)

Objectives*:*

- To understand the operating concepts, equivalent circuit and phasor diagrams of single phase, three phase transformer and auto transformer for examining their performance.
- To acquire the knowledge of vector groups for analysing three phase transformers under different conditions.
- To understand the operating concepts and related tests of DC machine for examining it's performance.
- To acquire the knowledge of starting and speed control methods of DC motor.
- To acquire the knowledge about different industrial and domestic applications of transformer and DC machine.

Syllabus:

UNIT – I Single Phase Transformer Review of transformer theory:
Construction and Principle of operation of single phase transformer, equivalent circuit representation of a practical transformer, Phasor diagrams under no load and load condition, Auto-transformer equivalent circuit and phasor diagram.

UNIT – II Three Phase Transformer:
Three-phase transformers, core and shell type transformer, three-phase tank, three-phase unit, Different connections and vector groups, three winding transformer connections, parameters of three winding transformer, coupled circuit view point.

UNIT – III Parallel Operation And Testing Of Single Phase and Three Phase Transformers: Parallel operation of single-phase and three-phase transformer, open delta, Scott connection, back-to-back test, separation of losses, excitation phenomenon in transformers. transformer cooling, pulse transformer, wide band transformer.

UNIT – IV DC Generators:
Electromagnetic principle of DC machine, constructional details, production of voltage and torque, BLV and BLI concepts, classification of DC machine, conditions of self excitation, Cross-field machines, armature winding, armature reaction and its effect, flux and mmf waves, effect of brush shift, commutation, methods of improving commutation, Operating characteristics of DC generator, parallel operation**.**

UNIT – V DC Motors:
DC machine as motor, electrical and mechanical characteristics of DC motor, starting and speed control of DC motors, losses in DC machines, Testing of DC machines, Swinburne's test, regenerative and retardation test.

Text Books:
1. Electrical Machines by Smarajit Ghosh, Pearson Education
2. Performance & Design of A.C. Machines by M.G. Say, C.B.S. Publishers

Reference Books:
1. Performance & Design of D.C. Machines by A.E. Clayton & Hancock, C.B.S. Pbs.
2. Electric Machines by Nagrath& Kothari, TMH Pbs.
3. Electric Machines by P.K. Mukherjee &S.Chakravarti, Dhanpat Rai
4. Electrical machines by B. R, Gupta, New age international
.

Course Outcomes

After the completion of the course the student will be able to :

- Infer the operating concepts of single phase and three phase transformer for examining their performance.
- Apply the knowledge of vector groups to analyse three phase transformers under different conditions.
- Interpret the operating concepts and related tests of DC machine for examining it's performance.
- Analyse different industrial and domestic applications of transformer and DC machine.
- Asses the significance & compare different schemes of speed control of DC Motor in industries

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓	✓				✓	✓	✓
2	✓	✓								✓	✓
3	✓	✓	✓	✓	✓				✓	✓	✓
4		✓			✓				✓	✓	✓
5	✓	✓	✓	✓	✓				✓	✓	✓

Electrical Machine-I Lab (EL20323)
B.Tech. (Electrical Engineering) IIIrd Semester

List Of Experiments

1. To perform no load test on DC shunt motor.
2. To perform load test on DC shunt motor.
3. To perform speed control on DC shunt motor by
   a) Armature control method
   b) Field control method
4. To perform load test on DC shunt generator.
5. To study the magnetization characteristics on separately excited DC generator.
6. To perform open circuit test on single phase transformer.
7. To perform short circuit test on single phase transformer.
8. To perform ratio test and polarity test on single phase transformer.
9. To perform back to back test i.e. Sumpner's test.
10. To study the Scott connection for three phase to two phase conversion on transformers.
11. To perform load test on a three phase transformer.

12. To study three point and four point motor starters and observe its impact on the motor staring current.

Course Outcomes (COs):

After the completion of the course the student will be able to :

- Utilize measuring instruments (Ammeter, Voltmeter, Multimeter and Tachometer) for analyzing the operation of transformer and DC motor.
- Examine the steps involved in the speed control of DC Motor.
- Infer the various tests conducted on transformer and DC Motor with regard to their applicability in determining the variables of interest and performance indices
- Examine the working of transformer and DC Motor for different supply and load settings.
- Justify the utility of transformer and DC Motor in industrial settings.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓		✓	✓		✓				✓	✓
2	✓	✓	✓	✓	✓	✓				✓	✓
3		✓	✓	✓		✓				✓	✓
4	✓	✓	✓			✓				✓	✓
5	✓	✓	✓		✓	✓			✓	✓	

Solid State Devices (EL20311)

Objectives:

- To explain the basic concepts of semiconductors, electronics devices and their characteristics.
- To explain working principle and operation of solid state rectifiers, transistors and feedback circuits**.**

Syllabus:

UNIT- I

Diodes characteristics ,equivalent circuit, Junction capacitance of diode and applications as ClippingClamping Clamping circuits, Voltage doublers, special purpose diodes-photodiode, LED, tunnel diode, Varactordiode,pin diode .

UNIT – 2 Diode Applications Rectifiers:

Half wave and full wave bridge rectifier circuit, Design filters for rectifiers. Various parameters of powersupply, Shunt, Series & Zener voltage regulators

UNIT – 3

Input and output characteristics of transistor circuits, various Biasing - Purpose of biasing, dc operatingpoint, dc load line, different biasing techniques – Base bias, Emitter bias, Voltage divider bias, Collectorfeedback bias, Thermal Runaway, Thermal stability. ac load line, graphical analysis, current, voltage & power gain, input and output impedance, analysis using r- parameters and h-parameters,frequencyresponse, cascading.

UNIT – 4

FET & MOSFET- The JFET, pinch off voltage, JFET V-I characteristics, FET small signal model, depletion mode MOSFET, enhancement mode MOSFET, low frequency common source and commondrain amplifiers, FET biasing, FET as a voltage variable resistor. The common source and common drain amplifier at high frequencies, MOSFET as a switch, MOSFET driver circuits.

UNIT – 5

Feedback amplifier and oscillators: General Feedback Theory, current and voltage feedback, Effect of negative feedback, condition for oscillation, Wein bridge` and RC phase shift oscillator, Hartley and Colpitts oscillator, crystal oscillator, Tunned diode oscillator.

Text Books:

1. Electronic Devices – Millman&Halkias
2. Electronics Principles – A.P.Malvino

Reference Books:

1. Electronic Circuit Discrete and Integrated – Donald I. Schilling
2. Electronic Devices – David Bell

Course Outcomes:

After the completion of the course the student will be able to :

1. Relate and apply fundamental principle and technology in analog circuits.

2. Characterize diodes based on their characteristics and applicability.
3. Utilize diodes in rectifier circuits, filters and voltage regulators.
4. Infer the operation of transistors in different modes.
5. Design and develop feedback and oscillators circuits.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓						✓	✓
2	✓	✓	✓	✓						✓	✓
3	✓	✓	✓	✓						✓	✓
4	✓	✓	✓	✓						✓	✓
5	✓	✓	✓	✓						✓	✓

Solid State Devices Lab (EL20311)
B.Tech. (Electrical Engineering) IIIrd Semester

LIST OF EXPERIMENTS

1. To draw VI characteristics of P-N Junction diode.
2. To study characteristics of Zener diode.
3. To study output waveform and transfer characteristics of clipper circuit.
4. To study output waveform and transfer characteristics of clamper circuit.
5. To study the Half wave rectifier and calculate Voltage Regulation, Ripple Factor and DC output voltage.
6. To study the Full wave rectifier and calculate Voltage Regulation, Ripple Factor and DC output voltage.
7. To study the Bridge rectifier and calculate Voltage Regulation, Ripple Factor and DC output voltage.
8. To draw input and output characteristics of Transistor in Common Emitter configuration.
9. To study the drain and transfer characteristics of MOSFET.
10. To studythe drain and transfer characteristics of JFET.
11. To study the application of Zener diode as voltage regulator.
12 To Design 5V/12 V regulated DC power supply.

Course Outcomes (COs):

After the completion of the course the student will be able to :

1. Interpret the characteristics of solid state devices i.e. Diode, Zener Diode, Transistors etc.
2. Make use of PN junction diodes in different applications (voltage regulation &rectification).
3. Asses the applicability of Solid State Devices in industrial setting.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓	✓		✓			✓	✓	✓
2	✓	✓	✓	✓		✓				✓	✓
3	✓	✓	✓	✓		✓				✓	✓

Numerical Method and Computer Programming (MA20312)

Objectives:

- To understand and implement taylor series, Newton Raphson, secant method, Gauss Jordan method, Eulers method and interpolation etc for doing numerical analysis in context of electrical engineering issues on programming platform.
- To write and run codings for various logical operations, mathematical operations and solve algebraic equations etc.

Syllabus:

Numerical Methods

Unit1: Numerical solution of algebraic &Transendental Equations.
Approximation errors in computation, round of errors,trunicationerrors; solution of algebraic & transcendental equations using by section method ,Regula falsi method, Newton's raphsons method, Secant method, Birge-vieta method.

Unit2: Numerical solution of simultaneous Linear equations and interpolation-Gauss Elimination method,Gauss Jordan's method , Crouttriangularisation method , Gauss seidal method, Gauss Jacobi's method, Relaxation method ,Newton forward & Backward Interpolation, Newton divided Interpolation Lagrange interpolation, Striling's and Bessel's formula .

Unit 3: Numerical Solution of Ordinary Differential equations and curve fitting

Picard method ,Taylor's series method Euler's method,Euler's modified method,Runge-Kutta method of fourth order.Curve fitting method of least square- straight line , second degree parabolic curve and exponential curve.

Computer Programming

Unit4: Introduction of computer programming in C & C++ Language

Arithmetic expression ,Example of some simple C programme.,Concept ofvariable,programstatement and function calls from the library(print for example)(Data type ,print,char,floatetc),C expressions ,arithmetic operation relation and logic operation assignment statement , C statement, Conditional statements, concept of loop & loop statements. Using these articles (of this unit) programming in C language of different Numerical methods from the above units.

Unit5

Arrays, String,Structure, Unions and File I/O ,one dimensional array and example of iterative programs using arrays, 2-d arrays Use in matrix computations, Concept of subprogramming , fuction example of functions argument passing mainly for the simple variable ,array of pointers , passing arrays are argument ,String, C string library, Structure and unions ,Defining C structure , passing structure as arguments , Program examples File I/O , use of open , scan & print routines, Using this articles (of this unit) programming in C language of different Numerical methods from the above units.

Text Books:

1. Numerical method by B.S.Grewal,Khanna publication..
2. Let us C by YashwantKanetkar .
3. Programming in Ansi C by Balaguruswami TMH.

Reference Books :

1. Numerical method for scientific & engineering computation by M.K. Jain, SRKIyenger and R.K Jain Wiely Eastern.
2. .programming in C++by Balaguruswami,TMH

Course Outcomes:

After the completion of the course the student will be able to :

- Numerically solve many types of problems such as : roots of equation ,linear system of simultaneous equations. Interpolation of values of dependent variables given a set of discrete measurements
- Approximate the differential or integral of unknown functions given a set of discrete measurements from the function.
- Select from alternative method and the one method is most appropriate for specific problem.
- Formulate algorithms to solve problems numerically.

- Understand the limitation of each numerical method, especially the conditions when they fail to converge to a solution.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓								✓
2	✓	✓	✓								✓
3	✓	✓	✓								✓
4	✓	✓	✓								✓
5	✓	✓	✓								✓

Numerical Analysis And Computer Programming Lab (EL20322)
B.TECH. (Electrical Engineering) IIIrd Semester

LIST OF EXPERIMENTS

1. Find the roots of the equation $f(x) = 0$ using Bisection method.
2. Find the real root of the equation $f(x) = 0$ using Regula-Falsi method.
3. Find the real roots of the equation $f(x) = 0$ using Newton-Raphson method.
4. Solve the equation $AX = B$ using Gauss elimination method.
5. Solve the equation $AX = B$ using Gauss-Jordan method.
6. Solve the equation $AX = B$ using Gauss-Seidal iteration method.
7. Fit a parabola, $y = a + bx + cx^2$ using method of least squares.
8. Find the value of $f(x)$ for a given x from the given data using Newton's forward interpolation formula.
9. Find the value of $f(x)$ for a given x from the given data using Lagrange's interpolation formula.
10. Find the value of $f(x)$ for a given function using Runge-Kutta method.

Course Outcomes (COs):

After the completion of the course the student will be able to :

- Develop C language program.
- Implement different numerical methods for finding the roots of equations.
- Implement different numerical methods for fitting the different curves and interpolation.

- Demonstrate the skills of problem solving using different softwares like C and MATLAB.

POs / COs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓			✓	✓				✓	✓
2	✓	✓			✓	✓				✓	✓
3	✓	✓			✓	✓				✓	✓
4	✓	✓			✓	✓				✓	✓

Mathematics III (MA20314)

Objectives:

- To understand the concepts of Fourier series, Laplace transform, Z transform and application of it for solving ordinary differential equation and difference equation.
- To provide knowledge of complex variable analysis and to evaluate complex line integral and real integral.

Syllabus:

Unit 1 Fourier Series
Euler's Formula, Functions having points of discontinuity, Change of interval, Even & Odd functions, Halfrange series, Harmonic analysis.

Unit II Laplace Transform
Definition, Transform of elementary functions, Properties of Laplace transform,Transform of derivatives & integrals, Multiplication by tn, Division by t, Evaluation of integrals, Inverse Laplace Transform, Convolution theorem, Unit step function, Unit impulse function, Periodic function, Application to solution of ordinary differential equations.

Unit III Partial Differential Equation
Formation, Solution by direct integration method, Linear equation of first order, Homogeneous linear equation with constant coefficients, Non-homogeneous linear equations, Method of separation of variables.

Unit IV Complex Variables
Derivative, Cauchy-Riemann equations, Analytic functions, Harmonic functions, Flow problems, Complex integration, Cauchy theorem, Cauchy integral formula, Taylor & Laurent series, Singularity, Residue, Evaluation of real definite integrals.

Unit VZ-Transform
Definition, Properties, Initial value & final value theorems, Inverse Z-transform, Convolution theorem, Partial fraction, Residue method & Applications to solution of difference equations.

TEXT BOOKS: -
1. Higher Engg. Mathematics by Dr. B.S. Grewal– Khanna Publishers.
2. Advanced Engg. Mathematics by Erwin Kreyszig – John Wiley & Sons.

REFERENCE BOOKS: -
1. Advanced Engg.Mathematics by R.K. Jain and S.R.K. Iyengar – Narosa Publishing House.
2. Applied Mathematics by P.N.Wartikar& J.N. Wartikar. Vol- II– Pune VidyarthiGrihaPrakashan, Pune.
3. Applied Mathematics for Engineers & Physicists by Louis A. Pipes

Course Outcomes:

After the completion of the course the student will be able to :

- Analyse fourier series and decompose periodic function into the sum of simple oscillating functions namely sines and cosines.
- Solve problems using complex analysis and apply residue theorem to evaluate real integral.
- Calculate Laplace transform and its inverse and its application in ordinary diffrential equation.
- Calculate Z-transform of some elementary signals, convolution product, formulation of corresponding convolution theorem and its applications to solve difference equations.

COs \ POs	a	b	c	d	e	f	g	h	i	j	k
1	✓	✓	✓								✓
2	✓	✓	✓								✓
3	✓	✓	✓	✓							✓
4	✓	✓	✓								✓