Gurugram University Scheme of Studies and Examination

Bachelor of Technology Semester 3

S.No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Electrical Machine I	3	1	0	3	30	70	100
2	BSC		Mathematical and Computational Techniques	3	1	0	3	30	70	100
3	PCC		Digital Electronics	3	1	0	3	30	70	100
4	PCC		Network Analysis and Synthesis	3	1	0	3	30	70	100
5	PCC		Signals and System	3	0	0	3	30	70	100
6	PCC		Electromagnetic Field Theory	3	0	0	3	30	70	100
7	LC		Electrical Machine I Lab	0	0	2	1	50	50	100
8	LC		Mathematical and Computational Techniques Lab	0	0	2	1	50	50	100
9	LC		Digital Electronics Lab	0	0	2	1	50	50	100
10	LC		Network Analysis and Synthesis Lab	0	0	2	1	50	50	100
11	Non credit		Constitution of India *	2	0	0	-	30	70	100*
Total							**22**			**1000**

***Note:** The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

ELECTRICAL MACHINE-I

Course Code					
Category	**Professional Core Courses**				
Course title	**Electrical Machine-I**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objectives:

1. To learn about Magnetic field, circuits, force and torque.
2. To gain understanding of DC machine.
3. To see operation of DC machine in motoring and generating mode.
4. To understand transformer.

Unit-I

Magnetic fields and magnetic circuits

Review of magnetic circuits - MMF, flux, reluctance, inductance; review of Ampere Law and Biot Savart Law; Visualization of magnetic fields produced by a bar magnet and a current carrying coil - through air and through a combination of iron and air; influence of highly permeable materials on the magnetic flux lines.

Electromagnetic force and torque

B-H curve of magnetic materials; flux-linkage vs current characteristic of magnetic circuits; linear and nonlinear magnetic circuits; energy stored in the magnetic circuit; force as a partial derivative of stored energy with respect to position of a moving element; torque as a partial derivative of stored energy with respect to angular position of a rotating element. Examples - galvanometer coil, relay contact, lifting magnet, rotating element with eccentricity or saliency

Unit-II

DC machines

Basic construction of a DC machine, magnetic structure - stator yoke, stator poles, pole-faces or shoes, air gap and armature core, visualization of magnetic field produced by the field winding excitation with armature winding open, air gap flux density distribution, flux per pole, induced EMF in an armature coil. Armature winding and commutation - Elementary armature coil and commutator, lap and wave windings, construction of commutator, linear commutation Derivation of back EMF equation, armature MMF wave, derivation of torque equation, armature reaction, air gap flux density distribution with armature reaction.

Unit-III

DC machine - motoring and generation

Armature circuit equation for motoring and generation, Types of field excitations - separately excited, shunt and series. Open circuit characteristic of separately excited DC generator, back EMF with armature reaction, voltage build-up in a shunt generator, critical field resistance and critical speed. V-I characteristics and torque-speed characteristics of separately excited, shunt and series motors. Speed control through armature voltage. Losses, load testing and back-to-back testing of DC machines.

Unit-IV

Transformers

Principle, construction and operation of single-phase transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency Testing - open circuit and short circuit tests, polarity test, back-to-back test, separation of hysteresis and eddy current losses Three-phase transformer - construction, types of connection and their comparative features, Parallel operation of single-phase and three phase transformers, Autotransformers - construction, principle, applications and comparison with two winding transformer, Magnetizing current, effect of nonlinear B-H curve of magnetic core material, harmonics in magnetization current, Phase conversion - Scott connection, three-phase to six-phase conversion, Tap-changing transformers - No-load and on-load tap-changing of transformers, Three-winding transformers. Cooling of transformers.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

1. Understand the concepts of magnetic circuits.
2. Basic understanding of electromagnetic force and torque.
3. Understand the operation of dc machines.
4. Analyse the differences in operation of different dc machine configurations.
5. Analyse single phase and three phase transformers circuits.
6. Develop basic knowledge of autotransformer.

Text / References

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 2013.
2. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2004.
3. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
4. P.S. Bimbhra, "Electrical Machinery", Khanna Publishers, 2011.
5. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.

MATHEMATICAL AND COMPUTATIONAL TECHNIQUES

Course Code					
Category	**Basic Science Course**				
Course title	**Mathematical and Computational Techniques**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To provide the numerical methods of solving the non-linear equations, interpolation, differentiation, and integration.
2. This course is an introduction to a broad range of numerical methods for solving mathematical problems that arise in Science and Engineering.
3. To provide solutions of a nonlinear equation.
4. The goal is to provide a basic understanding of the derivation, analysis, and use of these numerical methods

Unit-I

Interpolation by polynomials, error of the interpolating polynomial, piecewise linear and cubic spline interpolation. Numerical integration, Simpson rule, composite rules, error formulae, Gauss quadrature.

Unit-II

Solution of a system of linear equations, implementation of Gaussian elimination and Gauss Seidel methods, partial pivoting, row echelon form, LU factorization, Cholesky's method, ill conditioning, norms.

Unit-III

Solution of a nonlinear equation, bisection and secant methods. Newton-Raphson method, rate of convergence, solution of a system of nonlinear equations. Numerical solution of ordinary differential equations, Euler and Runge-Kutta methods, multistep methods, predictor-corrector methods, order of convergence,

Unit-IV

Finite difference methods, numerical solutions of elliptic, parabolic, and hyperbolic partial differential equations. Eigenvalue problem, power method, QR method, Gershgorin’s theorem. Exposure to software packages like MATLAB.

Course Outcomes:

1. Understand different numerical integration techniques, and numerically solve differential equations.
2. Understand interpolation by polynomials.
3. Perform various matrix computations and solve simultaneous linear equations.
4. Find solution of nonlinear equation.
5. Find roots of a transcendental equation using different methods.
6. Implement different interpolation schemes.

Text/Reference Books:

1. S. D. Conte and Carl de Boor, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.
2. C. E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley, 1981
3. E. Kreyszig, Advanced engineering mathematics (8th Edition), John Wiley (1999).
4. Reena Garg, Advanced Engineering Mathematics, Khanna Book Publishing (2022).
5. K. E. Atkinson, An Introduction to Numerical Analysis (2nd edition), Wiley-India, 1989
6. R. Agor, Elements of Mathematical Analysis, Khanna Publishing House, 2015.
7. Erwin Kreyzig, Advanced Engineering, Mathematics

DIGITAL ELECTRONICS

Course Code					
Category	**Professional Core Courses**				
Course title	**Digital Electronics**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To provide a comprehensive introduction to digital logic design leading to the ability to understand binary codes, binary arithmetic and Boolean algebra and its relevance to digital logic design.
2. To study number system and codes.
3. To design and analyze combinational circuits and synchronous sequential logic circuits.
4. To familiarize students with basics of digital logic families.

Unit-I

Number system and codes: Binary, octal, hexadecimal and decimal Number systems and their inter conversion, BCD numbers (8421-2421), gray code, excess–3 code, cyclic code, code conversion, ASCII, EBCDIC codes. Binary addition and subtraction, signed and unsigned binary numbers, 1's and 2's complement representation.

Unit-II

Boolean Algebra: Basic logic circuits: Logic gates (AND, OR, NOT, NAND, NOR, Ex-OR, Ex NOR and their truth tables,), Universal Gates, Laws of Boolean algebra, De-Morgan's theorem, Min term, Max term, POS, SOP, K Map, Simplification by Boolean theorems, don't care condition

Logic Families: Introduction to digital logic family such as RTL, DTL, TTL, ECL, CMOS, IIR, HTL etc., their comparative study, Basic circuit, performance characteristics, Wired logic, open collector output etc.

Unit-III

Combinational Logic: The Half adder, the full adder, subtractor circuit. Multiplexer demultiplexer, decoder, BCD to seven segment decoders, encoders.

Flip flop and Timing circuit: set-reset laches, D-flipflop, R-S flip-flop, J-K Flip-flop, Master slave Flip flop, edge triggered flip-flop, T flip-flop.

Unit-IV

Registers and Counters: Synchronous/Asynchronous counter operation, Up/down synchronous counter, application of counter, Serial in/Serial out shift register, Serial in/Serial out shift register, Serial in/parallel out shift register, parallel in/ parallel out shift register, parallel in/Serial out shift register, Bi-directional register.

Course outcomes:

1. To present a problem oriented introductory knowledge of Digital circuits and its applications.
2. Learn Number system and codes.
3. Study Boolean algebra and theorems
4. To focus on the study of electronic circuits
5. Design and analyze combinational circuits.
6. Design and analyze synchronous sequential logic circuits.

Text/Reference Books:

1. R.P. Jain, "Modern digital Electronics", Tata McGraw Hill.
2. Digital Fundamentals by Morris and Mano, PHI Publication
3. Fundamental of digital circuits by A. ANANDKUMAR, PHI Publication

NETWORK ANALYSIS AND SYNTHESIS

Course Code					
Category	**Professional Core Courses**				
Course title	**Network Analysis and Synthesis**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To give students knowledge of AC theorems
2. To make the students understand concepts of two port networks, and network synthesis.
3. To give the students a fair knowledge on the Laplace transforms
4. To understand filters.

Unit-I

Node and mesh analysis, matrix approach of network containing voltage & current sources and reactance's, source transformation and duality.

Network theorems: Superposition, reciprocity, Thevenin's, Norton's, Maximum power transfer, compensation and Tallegen's theorem as applied to A.C. circuits.

Unit-II

Trigonometric and exponential Fourier series: Discrete spectra and symmetry of waveform, steady state response of a network to non-sinusoidal periodic inputs, power factor, effective values, Fourier transform and continuous spectra, three phase unbalanced circuit and power calculation.

Unit-III

Laplace transforms and properties: Partial fractions, singularity functions, waveform synthesis, analysis of RC, RL, and RLC networks with and without initial conditions with Laplace transforms evaluation of initial conditions.

Unit-IV

Transient behavior, concept of complex frequency, driving points and transfer functions poles and zeros of immittance function, their properties, sinusoidal response from pole-zero locations, convolution theorem and two four port network and interconnections, behaviour of series and parallel resonant circuits, introduction to band pass, low pass, high pass and band reject filters.

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

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Understand Trigonometric and exponential Fourier series.
4. Apply Laplace transform for steady state and transient analysis.
5. Determine different network functions.
6. Appreciate the frequency domain techniques.

Text/Reference Books

1. Franklin F. Kuo, "Network Analysis and Synthesis," Wiley India Education, 2nd Ed., 2006.
2. Van, Valkenburg, "Network analysis," Pearson, 2019.
3. Sudhakar, A., Shyammohan, S. P., "Circuits and Network," Tata McGraw-Hill New Delhi, 1994.
4. A William Hayt, "Engineering Circuit Analysis," 8th Edition, McGraw-Hill Education.
5. A. Anand Kumar, "Network Analysis and Synthesis," PHI publication, 2019.

SIGNALS AND SYSTEMS

Course Code					
Category	**Professional Core Courses**				
Course title	**Signals and Systems**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To bring the Continuous-time and Discrete-time concepts.
2. To understand types of signals and systems.
3. To impart knowledge about representation, properties and applications of systems and signals.
4. To impart knowledge about transforms and their applications to signals and systems.

Unit-I

Introduction to signals and systems- Signals and systems as seen in everyday life, and in various branches of engineering and science electrical, mechanical, hydraulic, thermal, biomedical signals and systems as examples. Extracting the common essence and requirements of signal and system Formalizing signals- energy and power signals, signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. Formalizing systems- system properties: linearity: additivity and homogeneity, shift invariance, causality, stability, realizability.

Unit-II

Continuous time and discrete time Linear shift-invariant (LSI) systems in detail-the impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of linear shift invariant systems. System representation through differential equations and difference equations. Periodic and semi-periodic inputs to an LSI system, the notion of a frequency response and its relation to the impulse response, Fourier series representation, the Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality.

Unit-III

The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The idea of signal space and Orthogonal bases of signals. Properties of DTFT and DFT.

The Sampling Theorem and its implications- Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold, and so on. Aliasing and its effects. Relation between continuous and discrete time systems

Unit-IV

The Laplace Transform for continuous time signals and systems- the notion of eigen functions of LSI systems, a basis of eigen functions, region of convergence, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. Generalization of Parseval's Theorem.

Advanced topics: time-frequency representation and the uncertainty principle, Short-time Fourier Transforms and wavelet transforms.

Course outcomes:

1. Identify the sources of signals, and systems in real life.
2. Characterize different types of signals and systems.
3. Represent continuous-time and discrete-time systems in different mathematical forms.
4. Analyse system behaviour using time and frequency domain techniques.
5. Analyze Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT).
6. Characterize Laplace transform

Text/Reference books:

1. R. Anand, Signals and Systems, Khanna Publishing House, 2019.
2. A.V. Oppenheim, A.S. Willsky and I.T. Young,"Signals and Systems", Prentice Hall, 1983.
3. R.F. Ziemer, W.H. Tranter and D.R. Fannin, "Signals and Systems - Continuous and Discrete", 4th edition, Prentice Hall, 1998.
4. Papoulis, "Circuits and Systems: A Modern Approach", HRW, 1980.
5. B.P. Lathi, "Signal Processing and Linear Systems", Oxford University Press, c1998.
6. Douglas K. Lindner, "Introduction to Signals and Systems", Mc-Graw Hill International Edition: c1999.

ELECTROMAGNETIC FIELD THEORY

Course Code					
Category	**Professional Core Courses**				
Course title	**Electromagnetic Field Theory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the basic mathematical concepts related to electromagnetic vector fields.
2. To impart knowledge on the concepts of electrostatics, electric potential, energy density and their applications.
3. To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
4. To impart knowledge on the concepts of Faraday ‘s law, induced emf and Maxwell ‘s equations.
5. To impart knowledge on the concepts of Concepts of electromagnetic waves and Transmission lines.

Unit-I

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant, Characteristic impedance and reflection coefficient, Impedance Transformation, Loss-less and Low Loss Transmission line and VSWR, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines, Impedance Matching, Lossy transmission line, Problems on Transmission line, Types of transmission line.

Unit-II

Maxwell’s Equations- Basics of Vectors, Vector calculus, Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface.

Uniform Plane Wave- Uniform plane wave, Propagation of wave, Wave polarization, Pioncere's Sphere, Wave propagation in conducting medium, Wave propagation and phase velocity, Power flow and Poynting vector, Surface current and power loss in a conductor Plane Waves at a Media Interface- Plane wave in arbitrary direction,

Unit-III

Plane wave at dielectric interface, Reflection and refraction at media interface, Total internal reflection, Polarization at media interface, Reflection from a conducting boundary.

Waveguides- Parallel plane waveguide, Wave propagation in parallel plane waveguide, Analysis of waveguide general approach,

Unit-IV

Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization and Attenuation in waveguide, Attenuation in waveguide continued.

Radiation- Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz, dipole, thin linear antenna, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna, Fourier transform relation between current and radiation pattern.

Course outcomes:

1. Appreciate the importance of transmission lines and analyse transmission line problems.
2. Solve Maxwell’s equations to understand propagation of electromagnetic waves.
3. Analyse plane wave at dielectric interface.
4. Understand waveguides.
5. Analyse electromagnetic wave propagation in rectangular metallic waveguides and resonators.
6. Understand antenna characteristics, and design linear antennas and their arrays.

Text/Reference Books:

1. R.K. Shevgaonkar, „Electromagnetic Waves, Tata McGraw Hill India, 2005
2. R.L. Yadav, Electromagnetic Fields and Waves, Khanna Book Publishing, 2021
3. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
4. Narayana Rao, N: Engineering Electromagnetics, 3rd ed., Prentice Hall, 1997.
5. David Cheng, Electromagnetics, Prentice Hall

ELECTRICAL MACHINE I LAB

Course Code					
Category	**Laboratory Courses**				
Course title	**Electrical Machine I Lab**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

LIST OF EXPERIMENTS

1. To study conversion of 3 Phase to six phase using 3 single phase transformers.
2. To study three phase rectifiers and supply configuration in 3 phase.
3. To perform Sumpner's Back-to-back test on 1-phase transformers.
4. To study Parallel operation of two 1-phase transformers.
5. To perform load test on DC shunt generator.
6. To study Speed control of DC shunt motor.
7. To study Swinburne’s test of DC shunt motor.
8. To study Hopkinson’s test of DC shunt M/Cs.
9. To study Ward Leonard method of speed control.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab Outcomes:

At the end of this lab, students will demonstrate the ability to

1. Understand the concepts of magnetic circuits.
2. Basic understanding of electromagnetic force and torque.
3. Understand the operation of dc machines.
4. Analyse the differences in operation of different dc machine configurations.
5. Analyse single phase and three phase transformers circuits.
6. Develop basic knowledge of autotransformer.

MATHEMATICAL AND COMPUTATIONAL TECHNIQUES LABORATORY

Course Code					
Category	**Laboratory Courses**				
Course title	**Mathematical and Computational Techniques Laboratory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

The course is intended to introduce simulation software like MATLAB, Scilab and other relevant software and study to learn virtual circuit and their response.

LIST OF EXPERIMENTS

1. Study of Introduction to MATLAB.
2. Study of basic matrix operations.
3. Program for curve fitting by least – square approximations.
4. Program for scan conversion of a straight line, a circle, an ellipse, a rectangle and an arc.
5. Program To solve linear equation by using Gauss - Seidal iteration method.
6. Program for finding roots of f(x)=0 by Newton Raphson method.
7. Program for finding roots of f(x)=0 by bisection method.
8. Program for solving numerical integration by Simpson's 1/3 rule.
9. Program for solving numerical integration by trapezoidal rule.
10. Program for solving ordinary differential equation by Euler's method.
11. Program for solving ordinary differential equation by Runge Kutta method.
12. To find the numerical solution of Laplace equation.

Lab Outcomes:

On completion of the course, students will be able to:

1. Understand appropriate numerical methods to solve algebraic and transcendental equations.
2. Implement appropriate numerical methods to approximate a function.
3. Implement appropriate numerical methods to solve a differential equation.
4. Implement appropriate numerical methods to evaluate a derivative at a value.
5. Implement appropriate numerical methods to solve a linear system of equations.
6. Implement various numerical methods for finding root(s).

DIGITAL ELECTRONICS LABORATORY

Course Code					
Category	**Laboratory Courses**				
Course title	**Digital Electronics Laboratory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

LIST OF EXPERIMENTS

1. To study of TTL gates – AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. To design and realize a given function using K-maps and verify its performance.
3. To verify the operation of multiplexer and Demultiplexer.
4. To verify the operation of comparator.
5. To verify the truth tables of S-R, J-K, T and D type flip flops.
6. To study FLIP-FLOP conversion.
7. To verify the operation of bi-directional shift register.
8. To design and verify the operation of 3-bit synchronous counter.
9. To design and verify the operation of synchronous UP/DOWN decade counter using
10. J K flip-flops and drive a seven-segment display using the same.
11. To design and verify the operation of asynchronous UP/DOWN decade counter using
12. J K flip-flops and drive a seven-segment display using the same.
13. To design a 4-bit shift register and verify its operation.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab outcomes:

At the end of this lab, student will be able to

1. To present a problem oriented introductory knowledge of Digital circuits and its applications.
2. Learn Number system and codes.
3. Study Boolean algebra and theorems
4. To focus on the study of electronic circuits
5. Design and analyze combinational circuits.
6. Design and analyze synchronous sequential logic circuits.

NETWORK ANALYSIS AND SYNTHESIS LABORATORY

Course Code					
Category	**Laboratory Courses**				
Course title	**Network Analysis and Synthesis Laboratory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

(i) Group of students for practical should be 15 to 20 in number.

LIST OF EXPERIMENTS:

1. Introduction of circuit creation and simulation software like MATLAB etc.
2. Study of Transient response of RC, RL circuit.
3. To find the resonance frequency, Band width of RLC series circuit.
4. To calculate and verify "Z" and “Y” parameters and "ABCD" parameters of a two-port network.
5. To determine equivalent parameter of parallel-series, cascading and parallel connections of two port network.
6. To calculate and verify Compensation theorem and Tellegen’s theorem.
7. To synthesize a network of a given network function and verify its response.
8. To calculate and verify Maximum power transfer and Reciprocity theorem.

Note: Use appropriate Software or simulation tool for experiments.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab Outcomes:

At the end of this lab, students will demonstrate the ability to:

1. Understand basics electrical circuits with nodal and mesh analysis.
2. Appreciate electrical network theorems.
3. Understand Trigonometric and exponential Fourier series.
4. Apply Laplace transform for steady state and transient analysis.
5. Determine different network functions.
6. Appreciate the frequency domain techniques.

CONSTITUTION OF INDIA

Course Code					
Category	**Non-Credit**				
Course title	**Constitution of India**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: III**
	2	**0**	**0**	**0**	
Class Work	30				
Exam	70				
Total	100				
Duration of Exam	3Hrs				

Note: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

COURSE OBJECTIVE:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.
4. To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.

UNIT - I

Philosophy of Indian Constitution: Salient features of Indian Constitution, Preamble, and Nature of Indian Constitution, Procedure for amendment of the Constitution.

UNIT - II

Federal structure and distribution of legislative and financial powers between the Union and the States

UNIT - III

Organs of Governance: President – Qualification and Powers of the President, Governor- Qualification and Powers of Governor, Parliament: Composition, Qualifications and Disqualifications, Judiciary: Appointment, Tenure and Removal of Judges.

UNIT - IV

Fundamental Rights: Origin and development of Fundamental rights, Need for fundamental rights. Introduction to Rights to equality, right to freedom, right against exploitation, Right to freedom of religion, Cultural and Education rights and Fundamental duties.

COURSE OUTCOMES:

At the end of this course, students will demonstrate the ability to

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to a revolution in India.
3. Exercise his fundamental rights in proper sense at the same time identifies his responsibilities in national building.
4. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution.
5. Discuss the passage of the Hindu Code Bill of 1956.
6. Analyse the Indian political system, the powers and functions of the Union, State and Local Governments in detail.

TEXT AND REFERENCE BOOKS:

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S.N. Busi, Dr. B.R. Ambedkar framing of Indian Constitution, latest Edition
3. M.P. Jain, Indian Constitution Law, Lexis Nexis, latest edition
4. D.D. Basu, Introduction to Constitution of India, Lexis Nexis, latest edition.

Gurugram University Scheme of Studies and Examination

Bachelor of Technology Semester 4

S.No.	Category	Course Code	Course Title	Hours per week			Credits	Marks for Sessional	Marks for End Term Examination	Total
				L	T	P				
1	PCC		Transmission and Distribution	3	1	0	3	30	70	100
2	PCC		Electrical Machine II	3	1	0	3	30	70	100
3	PCC		Power Electronics	3	1	0	3	30	70	100
4	PCC		Electronic Measurement and Instrumentation	3	0	0	3	30	70	100
5	PCC		Electric Engineering Materials	3	0	0	3	30	70	100
6	BSC		Probability Theory and Stochastic Processes	3	1	0	3	30	70	100
7	LC		Transmission and Distribution Lab	0	0	2	1	50	50	100
8	LC		Electrical Machine II Lab	0	0	2	1	50	50	100
9	LC		Power Electronics Lab	0	0	2	1	50	50	100
10	LC		Electronic Measurement and Instrumentation Lab	0	0	2	1	50	50	100
11	Non credit		Scientific and Technical Writing Skills*	2	0	0	-	30	70	100*
Total							**22**			**1000**

***Note:** The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

NOTE: At the end of 4th semester each student has to undergo Practical Training of 4/6 weeks in an Industry/Institute/ Professional Organization/Research Laboratory/ training centre etc. and submit typed report along with a certificate from the organization and its evaluation shall be carried out in the 5th Semester.

TRANSMISSION AND DISTRIBUTION

Course Code					
Category	**Professional Core Courses**				
Course title	**Transmission and Distribution**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the basic laws of Transmission and Distribution
2. To impart knowledge on the Structure and present-Day Scenario of a power system.
3. To impart knowledge on the concepts of transmission and distribution line parameters.
4. To impart knowledge on the concepts of mechanical design of transmission line.
5. To impart knowledge on the performance of transmission line.

Unit-I

INTRODUCTION: Evolution of Power Systems and Present-Day Scenario. Structure of a power system, Bulk Power Grids and Micro-grids, indoor and outdoor substations, equipment for substations, layout, auxiliary supply.
DISTRIBUTION SYSTEMS: Radial, ring mains and network distribution system, comparison of various types of ac and dc systems.

Unit-II

TRANSMISSION LINES: Calculation of line parameters, Ferranti effect, proximity effect.
PERFORMANCE OF LINES: models of short, medium and long transmission lines, performance of transmission lines, circle diagram, capacity of synchronous condenser, tuned lines, voltage control.

Unit-III

MECHANICAL DESIGN: Sag and stress calculations, effect of ice and wind, dampers.
INSULATORS: Types, insulating materials, voltage distribution over insulator string, equalizer ring.

Unit-IV

CABLES: Types of LV and HV cables, grading of cables, capacitance, ratings.
CORONA: Phenomenon, critical voltage, power loss, reduction in losses, radio-interference,
HVDC transmission – types of links, advantages and limitations.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the basic laws of Transmission and Distribution
2. Knowledge about the Structure and present-Day Scenario of a power system.
3. Analyses of transmission and distribution line parameters.
4. Understand mechanical design of transmission line with skin effect and proximity effect.
5. Understand the various cables and insulators gradings as well as ratings.
6. To know the performance of transmission line.

Text/Ref. Books:

1. Power System Engg: I. J. Nagrath and D. P. Kothari (TMH)
2. Electrical Power Systems: C. L. Wadhwa (New Age International Pvt Ltd)
3. Grainger and W. D. Stevenson, “Power System Analysis”, McGraw Hill Education, 1994.
4. Elements of power system analysis: W. D. Stevenson (MGH)
5. Electric Power System: B. M. Weedy, John Wiley & Sons.
6. Transmission & Distribution of Electrical Engineering: H. Cotton.
7. Transmission & Distribution of Electrical Engineering: Westing House & Oxford Univ. Press, New Delhi.

ELECTRICAL MACHINES-II

Course Code					
Category	**Professional Core Courses**				
Course title	**Electrical Machines II**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the basic concepts of rotating magnetic fields.
2. To impart knowledge on the operation of ac machines.
3. To impart knowledge on the performance characteristics of ac machines
4. To impart knowledge on speed and torque characteristics of ac machine.
5. To impart knowledge on the motoring, generating and braking mode of ac machines.

Unit-I

Poly-phase Induction Motor: Constructional features, Principal of operation, production of rotating magnetic field, induction motor action, torque production, testing, development of equivalent circuit, performance characteristics, circle diagram, starting methods, double cage and deep bar motors.

Unit-II

Poly-phase Induction Motor: Methods of speed control - stator voltage control, stator resistance control, frequency control, rotor resistance control, slip power recovery control Induction Generator: Principle of operation, types and applications. Single Phase Induction motors: Double revolving field theory, cross field theory, different types of single-phase induction motors, circuit model of single-phase induction motor.

Unit-III

Synchronous Generator: Principle, construction of cylindrical rotor and salient pole machines, winding, EMF equation, Armature reaction, testing, model of the machine, regulation – synchronous reactance method, Potier triangle method. Output power equation, power angle curve.

Unit-IV

Three Phase Synchronous Generators: Transient and sub-transient reactance, synchronization, parallel operation.
Synchronous Motor: Principles of synchronous motor, power angle curve, V-curve, starting, damper winding, synchronous condenser, applications.

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

1. Understand the concepts of rotating magnetic fields.
2. Overview of construction of ac machines.
3. Understand the operation of ac machines.
4. Analyse performance characteristics of ac machines.
5. Impart knowledge on speed and torque characteristics of ac machine.
6. Prepare the students to have a basic knowledge about motoring, generating and braking mode of ac machines

Text/ reference books:

1. Principle of Electrical Machines, V K Mehta, Rohit Mehta, S Chand
2. Electric Machines, Ashfaq Hussain, Dhanpat Rai
3. Electric Machines: I.J.Nagrath and D.P. Kothari, TMH, New Delhi.
4. Generalized theory of Electrical Machines: P.S. Bhimbra(Khanna Pub.)
5. Electric Machinery, Fitzgerald and Kingsley, MGH.

POWER ELECTRONICS

Course Code					
Category	**Professional Core Courses**				
Course title	**Power Electronics**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the basic of power switching device.
2. To impart knowledge on the concepts of Rectifiers and regulators.
3. To impart knowledge on the concepts of converters.
4. To impart knowledge on the concepts of inverter.
5. To impart knowledge on the concepts of cycloconverter.

Unit-I

Power switching devices

Diode, Thyristor, MOSFET, IGBT: I-V Characteristics; Protections, series and parallel connections, Firing circuit for thyristor; Voltage and current commutation of a thyristor; pulse transformer and opto-coupler.

AC REGULATORS: Types of regulators, equation of load current, calculation of extinction angle, output voltage equation, harmonics in load voltage.

Unit-II

Thyristor rectifiers

Single-phase half-wave and full-wave rectifiers, Single-phase full-bridge thyristor rectifier with R- load and highly inductive load; Three phase full-bridge thyristor rectifier with R-load and highly inductive load; Input and output wave shape and power factor.

DC-DC buck converter

Elementary chopper with an active switch and diode, concepts of duty ratio and average voltage, power circuit of a buck converter, analysis and waveforms at steady state, duty ratio control of output voltage.

Unit-III

DC-DC boost converter:

Power circuit of a boost converter, analysis and waveforms at steady state, relation between duty ratio and average output voltage.

Single-phase voltage source inverter:

Power circuit of single-phase voltage source inverter, switch states and instantaneous output voltage, square wave operation of the inverter, concept of average voltage over a switching cycle, bipolar sinusoidal modulation and unipolar sinusoidal modulation, modulation index and output voltage

Unit-IV

Three-phase voltage source inverter

Power circuit of a three-phase voltage source inverter, switch states, instantaneous output voltages, average output voltages over a sub cycle, three-phase sinusoidal modulation.

Cycloconverters:

Basic principle of frequency conversion, types of cycloconverter, non-circulating and circulating types of cycloconverters

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

1. Understand the differences between signal level and power level devices.
2. Understand working of AC regulators.
3. Analyse controlled rectifier circuits.
4. Analyse the operation of DC-DC choppers.
5. Analyse the operation of voltage source inverters.

6. Analyse cycloconverters.

Text/References Books: -

1. M. H. Rashid, “Power electronics: circuits, devices, and applications”, Pearson Education India, 2009.
2. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
3. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2007.
4. L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

Course Code					
Category	**Professional Core Courses**				
Course title	**Electronic Measurement and Instrumentation**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce Electronics Instruments and Measurement providing an in-depth understanding of Measurement errors.
2. Digital Storage Oscilloscope, Function Generator and Analyzer, Display devices, Data acquisition systems and transducers.
3. To address the underlying concepts and methods behind Electronics measurements.
4. To introduce signal conditioning.

Unit-I

OSCILLOSCOPE: Block diagram, study of various stages in brief, high frequency CRO considerations. Sampling and storage oscilloscope.

GENERATION and ANALYSIS OF WAVEFORMS: Block diagram of pulse generators, signal generators, function generators wave analysers, distortion analysers, spectrum analyser, Harmonic analyser, introduction to power analyser.

Unit-II

ELECTRONIC INSTRUMENTS: Instruments for measurement of voltage, current and other circuit parameters, Q meters, R.F. Power measurements, introduction to digital meters.

FREQUENCY and TIME MEASUREMENT: Study of decade counting Assembly (DCA), frequency measurements, period measurements, Universal counter, Introduction to digital meters.

Unit-III

DISPLAY DEVICES: Nixie tubes, LED's LCD's, discharge devices.

TRANSDUCERS: Classification, Transducers of types: RLC photocell, thermocouples etc. basic schemes of measurement of displacement, velocity, acceleration, strain, pressure, liquid level and temperature.

Unit-IV

INTRODUCTION TO SIGNAL CONDITIONING:

DC signal conditioning system, AC signal conditioning system, data acquisition and conversion system

Course Outcome:

1. Analyze the performance characteristics of each instrument
2. Illustrate basic meters such as voltmeters and ammeters.
3. Explain about different types of signal analyzers.
4. Explain the basic features of oscilloscope and different types of oscilloscopes
5. Identify the various parameters that are measurable in electronic instrumentation.
6. Employ appropriate instruments to measure given sets of parameters.

Text book:

1. A course in Electrical & Electronics Measurements & Instrumentation: A. K. Sawhney; Dhanpat Rai & Sons.

Reference books.

1. Electronics Instrumentation & Measurement Techniques: Cooper; PHI.

ELECTRICAL ENGINEERING MATERIALS

Course Code					
Category	**Professional Core Courses**				
Course title	**Electrical Engineering Materials**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**0**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To provide the Information of metal.
2. This course is an introduction to dielectric properties of material
3. This course is an introduction to magnetic properties of material
4. The goal is to provide a basic understanding of semiconductors.

Unit-I

Conductivity of Metal: Introduction, factors affecting the resistivity of electrical materials, motion of an electron in an electric field, Equation of motion of an electron, current carried by electrons, mobility, thermionic emission, photo electric emission, field emission, effect of temperature on electrical conductivity of metals, electrical conducting materials, thermal properties, thermal conductivity of metals, thermoelectric effects.

Unit-II

Dielectric Properties: Introduction, effect of a dielectric on the behavior of a capacitor, polarization, the dielectric constant of monatomic gases, dielectric losses, significance of the loss tangent, frequency and temperature dependence of the dielectric constant, dielectric properties of polymeric system, ionic conductivity in insulators, insulating materials, ferroelectricity, piezoelectricity

Unit-III

Magnetic properties of Materials: Introduction, Classification of magnetic materials, diamagnetism, paramagnetism, ferromagnetism, magnetization curve, the hysteresis loop, factors affecting permeability and hysteresis loss, common magnetic materials, magnetic resonance.

Unit-IV

Semiconductors: energy band in solids, conductors, semiconductors and insulators, types of semiconductors, Intrinsic semiconductors, impurity type semiconductor, diffusion, the Einstein relation, hall effect, thermal conductivity of semiconductors, electrical conductivity of doped materials.

Course outcome:

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

1. Learn the basics of metal.
2. Learn the basics of conductivity.
3. Realize the dielectric properties of materials.
4. Explain the importance of magnetic properties.
5. Explain the behavior of conductivity of metals and
6. Classify semiconductor material.

Text book:

1. Bhadra Prasad Pokharel and Nava Raj Karki, "Electrical Engineering Materials", Sigma offset Press, Kamaladi, Kathmandu, Nepal,2004.
2. R.C. Jaeger," Introduction to Microelectronic Fabrication- Volume IV", Addison Wesley publishing Company, Inc., 1988.
3. Kasap.S.O, Principles of electrical engineering materials and devices, McGraw Hill, NewYork,2000.
4. R. A. Colcaser and S. Diehl-Nagle," Materials and Devices for Electrical Engineers and Physicists, McGraw-Hill, New York, 1985.

Reference books

1. C.S.Indulkar and S. Thiruvengadam, S., “An Introduction to Electrical Engineering”
2. Kenneth G. Budinski,, “Engineering Materials: Prentice Hall of India, New Delhi

PROBABILITY THEORY AND STOCHASTIC PROCESSES

Course Code					
Category	**Basic Science Courses**				
Course title	**Probability Theory and Stochastic Processes**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	3	**1**	**0**	**3**	
Class Work	30 Marks				
Exam	70 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Note: The examiner will set nine questions in total. Question one will be compulsory. Question one will have seven parts of 2 marks each from all units, and the remaining eight questions of 14 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, the first being compulsory and selecting one from each unit.

Course Objective: The objectives of this course are as under:

1. To introduce the probability theory and random processes and illustrate these concepts with engineering applications.
2. To introduce random variables.
3. The course introduces the concept of Stochastic Processes.
4. To understand regression analysis.

Unit-I

Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions

Unit-II

Joint distributions, functions of one and two random variables, moments of random variables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

Unit-III

Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem. Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

Unit-IV

Regression analysis (linear and non-linear), Confidence intervals, Hypothesis testing, Error analysis

Course Outcomes:

1. Develop understanding of basics of probability theory.
2. Understand random variables.
3. Identify different distribution functions and their relevance.
4. Apply the concepts of probability theory to different problems.
5. Extract parameters of a stochastic process and use them for process characterization.
6. Apply regression analysis.

Text/Reference Books:

1. H. Stark and J. Woods, `Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press

TRANSMISSION AND DISTRIBUTION LABORATORY

Course Code					
Category	**Laboratory Courses**				
Course title	**Transmission and Distribution Laboratory**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	0	**0**	**2**	**1**	
Class Work	50 Marks				
Exam	50 Marks				
Total	100 Marks				
Duration of Exam	3Hrs				

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

LIST OF EXPERIMENTS:

1. To study the Power System blocks in MATLAB.
2. To design short and long transmission line using MATLAB.
3. To study and calculate the transmission line parameters.
4. To study the corona loss in power distribution system.
5. To study the proximity and skin effect.
6. To find ABCD parameters of a model of transmission line.
7. To study performance of a transmission line under no load condition and under load at different power factors.
8. To observe the Ferranti effect in a model of transmission line.
9. To study performance characteristics of typical DC distribution system in radial and ring main configuration.
10. 10.To study mechanical design of transmission line.

Lab Outcomes:

At the end of the lab, students will demonstrate the ability to:

1. Understand the basic laws of Transmission and Distribution
2. Knowledge about the Structure and present-Day Scenario of a power system.
3. Analyses of transmission and distribution line parameters.
4. Understand mechanical design of transmission line with skin effect and proximity effect.
5. Understand the various cables and insulators gradings as well as ratings.
6. To know the performance of transmission line.

ELECTRICAL MACHINE II LABORATORY

Course Code						
Category	**Laboratory Courses**					
Course title	**Electrical Machine II Laboratory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**	
	0	**0**	**2**	**1**		
Class Work	50 Marks					
Exam	50 Marks					
Total	100 Marks					
Duration of Exam	3Hrs					

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

LIST OF EXPERIMENTS:

1. To perform the open circuit test and block rotor test on 3 phase induction motor and draw the circle diagram.
2. To study the speed control of induction motor by rotor resistance control.
3. To conduct the load test to determine the performance characteristics of the I.M.
4. To compute the torque v/s speed characteristics for various stator voltages.
5. To perform the open circuit test and block rotor test on single-phase induction motor and determine equivalent circuit parameters.
6. To perform O.C. test on synchronous generator and determine the full load regulation of a three phase synchronous generator by synchronous impedance method.
7. To Study and Measure Synchronous Impedance and Short circuit ratio of Synchronous Generator .
8. Study of Power (Load) sharing between two Three Phase alternators in parallel operation Condition.
9. To plot V- Curve of synchronous motor.
10. Synchronization of two Three Phase Alternators by
    a) Synchroscope Method
    b) Three dark lamp Method
    c) Two bright one dark lamp Method
11. Determination of sequence impedances of synchronous machine for various stator voltages.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab Outcomes:

At the end of this lab, students will demonstrate the ability to:

1. Understand the concepts of rotating magnetic fields.
2. Overview of construction of ac machines.
3. Understand the operation of ac machines.
4. Analyse performance characteristics of ac machines.
5. Impart knowledge on speed and torque characteristics of ac machine.

POWER ELECTRONICS LABORATORY

Course Code						
Category	**Laboratory Courses**					
Course title	**Power Electronics Laboratory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**	
	0	**0**	**2**	**1**		
Class Work	50 Marks					
Exam	50 Marks					
Total	100 Marks					
Duration of Exam	3Hrs					

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus

LIST OF EXPERIMENTS

1. To Study Static Characteristics of Power Diode and Thyristor and to study reverse recovery of Power Diode and Thyristor.
2. To Study Characteristics of IGBT and MOSFET.
3. To study R, RC and UJT firing Circuit.
4. To Study of Pulse transformer and optocoupler technique
5. To Study of SCR Communication Technique Class, A-E.
6. To Study of AC voltage Regulator.
7. To control speed of small motor using Single Phase Half wave and Full wave fully controlled Converter
8. To control speed of a small DC motor using MOSFET based Chopper with output voltage control technique
9. To Study of Mc Murray - Bed ford Half and Full Bridge Inverter
10. To control speed of small AC induction motor using Single Phase non circulating type bridge by frequency conversion.
11. To Study single phase cycloconverter.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab Outcomes:

At the end of this lab, students will demonstrate the ability to;

1. Understand the differences between signal level and power level devices.
2. Understand working of AC regulators.
3. Analyse controlled rectifier circuits.
4. Analyse the operation of DC-DC choppers.
5. Analyse the operation of voltage source inverters.
6. Analyse cycloconverters/.

ELECTRONIC MEASUREMENT AND INSTRUMENTATION LABORATORY

Course Code						
Category	**Laboratory Courses**					
Course title	**Electronic Measurement and Instrumentation Laboratory**					
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**	
	0	**0**	**2**	**1**		
Class Work	50 Marks					
Exam	50 Marks					
Total	100 Marks					
Duration of Exam	3Hrs					

Notes:

(i) At least 10 experiments are to be performed by students in the semester.

(ii) At least 7 experiments should be performed from the list, remaining three experiments may either be performed from the above list or designed and set by the concerned institution as per the scope of the syllabus.

(iii) Group of students for practical should be 15 to 20 in number.

LIST OF EXPERIMENTS

1. Study blocks wise construction of an analog oscilloscope and Function generator.
2. Study blocks wise construction of a Multimeter and frequency counter.
3. Study Measurement of different components and parameters like Q of a coil etc using LCRQ meter.
4. Study of distortion factor meter and determination of the % distortion of the given oscillator
5. Determine output characteristics of a LVDT and Measure displacement using LVDT
6. Study characteristics of temperature transducer like Thermocouple, Thermistor and RTD with implementation of a small project using signal conditioning circuits like instrumentation amplifier.
7. Measurement of Strain using Strain Guage.
8. To study differential pressure transducer and signal conditioning of output signal.
9. Measurement of level using capacitive transducer.
10. Study of Distance measurement using ultrasonic transducer.

Note:

1. Each laboratory group shall not be more than about 20 students.
2. To allow fair opportunity of practical hands-on experience to each student, each experiment may either done by each student individually or in group of not more than 3-4 students. Larger groups be strictly discouraged/disallowed.

Lab Outcome:

At the end of this lab, students will demonstrate the ability to;

1. Analyze the performance characteristics of each instrument
2. Illustrate basic meters such as voltmeters and ammeters.
3. Explain about different types of signal analyzers.
4. Explain the basic features of oscilloscope and different types of oscilloscopes
5. Identify the various parameters that are measurable in electronic instrumentation.
6. Employ appropriate instruments to measure given sets of parameters.

SCIENTIFIC AND TECHNICAL WRITING SKILLS

Course Code					
Category	**Non-Credit**				
Course title	**Scientific and Technical Writing Skills**				
Scheme	**L**	**T**	**P**	**Credits**	**Semester: IV**
	2	**0**	**0**	**0**	
Class Work	30				
Exam	70				
Total	100				
Duration of Exam	3Hrs				

Note: The examination of the regular students will be conducted by the concerned college/Institute internally. Each student will be required to score a minimum of 40% marks to qualify in the paper. The marks will not be included in determining the percentage of marks obtained for the award of a degree.

The following course content to conduct the activities is prescribed for the Scientific and Technical writing Skills Lab:

1. Activities on Writing Skills - Structure and presentation of different types of writing - letter writing/ Resume writing/ e-correspondence/ Technical report writing/ Portfolio writing - planning for writing - improving one's writing.
2. Activities on Presentation Skills - Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/ projects/ reports/ e-mails/ assignments etc.
3. Activities on Group Discussion and Interview Skills - Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference and video-conferencing and Mock Interviews.

Text references:

1. A Course Book of Advanced Communication Skills (ACS) Lab published by Universities Press, Hyderabad.
2. Technical Communication by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
3. Advanced Communication Skills Laboratory Manual by Sudha Rani, D, Pearson Education 2011.
4. Technical Communication by Paul V. Anderson, 2007. Cengage Learning pvt. Ltd. New Delhi.
5. Business and Professional Communication: Keys for Workplace Excellence, Kelly M. Quintanilla & Shawn T. Wahl. Sage South Asia Edition. Sage Publications, 2011.
6. The Basics of Communication: A Relational Prespective, Stev Duck & David T. Mc Mahan. Sage South Asia Edition. Sage Publications, 2012.
7. English Vocabulary in Use series, Cambridge University Press 2008.
8. Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.
9. Handbook for Technical Communication by David A. McMurrey & Joanne Buckley, 2012. Cengage Learning.
10. Communication Skills by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
11. Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.
12. Job Hunting by Colm Downes, Cambridge University Press 2008.
13. Master Public Speaking by Anne Nicholls, JAICO Publishing House, 2006.
14. English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc graw Hill 2009.
15. Books on TOFEL/ GRE/ GMAT/ CAT/ IELTS by Barron's/ DELTA/ Cambridge University Press.
16. International English for Call Contres by Barry Tomalin and Suhashini Thomas, Macmillan Publishers, 2009.

Mini Project: As a part of Internal Evaluation

1. Seminar/ Professional Presentation
2. A Report on the same has to be prepared and presented.
    - Teachers may use their discretion to choose topics relevant and suitable to the needs of students.
    - Not more than two students to work on each mini project.
    - Students may be assessed by their performance both in oral presentation and written report.