COURSE STRUCTURE (R19)

&

DETAILED SYLLABUS

(II YEAR)

ELECTRICAL & ELECTRONICS ENGINEERING

For
B.Tech., Four Year Degree Course
(Applicable for the batches admitted from 2019-20)

LENDI INSTITUTE OF ENGINEERING AND TECHNOLOGY
An Autonomous Institution
Approved by AICTE & Permanently Affiliated to JNTUK, Kakinada
Accredited by NAAC with "A" Grade and NBA (ECE, CSE, EEE & ME)
Jonnada (Village), Denkada (Mandal), Vizianagaram Dist – 535 005
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B.Tech II-Year Course Structure – R19 Regulation

II Year – I Semester							
S. No.	**Course code**	**Subjects**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA2103	Complex Variables, Probability and Statistics	BS	3	0	0	3
2	R19EEE-ES2101	Electrical Circuit Analysis-II	ES	3	0	0	3
3	R19EEE-PC2102	Electrical Machines-I	PC	3	0	0	3
4	R19ECE-PC2101	Electronic Devices and Circuits	PC	3	0	0	3
5	R19EEE-PC2103	Electro Magnetic Fields	PC	3	0	0	3
6	R19BSH-HM2101	Managerial Economics & Financial Analysis	HM	3	0	0	3
7	R19MEC-PC2108	Thermal and Hydro Prime Movers Lab	PC	0	0	3	1.5
8	R19EEE-PC2104	Electrical Circuits Laboratory	ES	0	0	3	1.5
9	R19BSH-MC2104	Professional Ethics and Human values	MC	2	0	0	0
10	R19BSH-MC2103	English for Competitive Exams	MC	2	0	0	0
Total				**22**	**0**	**6**	**21**

II Year – II Semester							
S. No.	**Course code**	**Subjects**	**Category**	**L**	**T**	**P**	**Credits**
1	R19EEE –PC2201	Electrical Measurements and Instrumentation	PC	3	0	0	3
2	R19EEE-PC2202	Electrical Machines-II	PC	3	0	0	3
3	R19ECE-PC2206	Digital Electronics	PC	3	0	0	3
4	R19EEE-PC2203	Control Systems	PC	3	0	0	3
5	R19EEE-PC2204	Power System-I	PC	3	0	0	3
6	R19ECE-PC2207	Signals and Systems	PC	3	0	0	3
7	R19EEE-PC2205	Electrical Machines-I Lab	PC	0	0	3	1.5
8	R19ECE-PC2208	Electronics Devices & Circuits Lab	PC	0	0	3	1.5
9	R19BSH-MC2202	Essence of Indian Traditional Knowledge	MC	3	0	0	0
10	R19BSH-MC2203	English for job seekers	MC	3	0	0	0
Total				**24**	**0**	**6**	**21**
Internship during summer vacation							
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)				**3**	**1**	**0**	**4**

II Year –I Semester Syllabus

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MA2103	Complex Variables, Probability and Statistics	3:0:0	3

Course Objectives:

- To familiarize the learners with concepts of complex variables.
- To impart knowledge in basic concepts and few techniques in probability and statistics in relation to the engineering applications.

Course Outcomes: At the end of this course, students will be able to

1. Examine the analyticity of complex functions (L4)
2. Evaluate complex integration using Cauchy's theorems and Cauchy's residue theorem (L3)
3. Compute probabilities, theoretical frequencies using discrete and continuous probability distributions for real data (L3)
4. Apply the concept of hypothesis to test large samples (L3)
5. Apply statistical inferential methods to small samples (L3)

UNIT I: Complex Variables and Analytic Functions

Functions of a complex variable, continuity, differentiation, analytic functions, Cauchy-Riemann equations, Milne-Thompson method, harmonic functions, harmonic conjugate.

Applications: Flow problems.

UNIT II: Complex Integration (All theorems without proofs)

Contour integrals, Cauchy theorem, Cauchy integral formula, Taylor's series, Laurent's series, zeros of analytic functions, singularities, residues, Cauchy residue theorem.

Applications: Evaluation of integrals of the type (a) Improper real integrals $\int_0^{2\pi} f(\cos\theta, \sin\theta)d\theta$ (b) $\int_{-\infty}^{\infty} f(x)dx$ (c) $\int_{-\infty}^{\infty} e^{imx} f(x)dx$.

UNIT III: Probability

Probability, probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem.

The Random Variable: Random variable concept, distribution function, density function, Binomial distribution, Poisson distribution, Normal(Gaussian) distribution.

Unit IV: Estimation and Testing of Hypothesis, large sample tests:

Estimation and Testing of Hypothesis: Introduction to Sampling, parameters, statistics, sampling distribution, point and interval estimation, formulation of null hypothesis, alternative hypothesis, the critical and acceptance regions, level of significance, two types of errors.

Large sample tests: Test for single proportion, difference of proportions, test for single mean and difference of means, confidence interval for parameters in one sample and two sample problems.

Unit V: Small Sample Tests

Student t-distribution (single mean, two means and paired t-test), testing of equality of variances (F-test), $\chi 2$ - test for single variance, $\chi 2$ - test for goodness of fit, ANOVA.

Textbooks:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44/e, 2017.
2. Veerarajan T., Probability, Statistics and Random Processes, 3rd edition, Tata McGraw-Hill, New Delhi, 2008.

References:

1. Erwin kreyszig, Advanced Engineering Mathematics, 10/e, John Wiley & Sons, 2011.
2. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7/e, Mc-Graw Hill, 2004.
3. N.P. Bali and Manish Goyal, A textbook of Engineering Mathematics, Laxmi Publications, 2008.
4. Murray R. Spiegel,Seymour Lipschutz, John J. Schiller , Dennis Spellman,Schaum's Outline of Complex Variables, 2ed (Schaum's Outlines) 2nd Edition.
5. Ronald E. Walpole, Raymond H. Myers, Sharon L. Myers, Keying E. Ye, Probability and Statistics for Engineers and Scientists, 9th Edition, Pearson.
6. Miller and Freunds, Probability and Statistics for Engineers, 7/e, Pearson, 2008.
7. S. C. Guptha and V. K. Kapoor, Fundamentals of Mathematical Statistics, 11/e, Sultan Chand, and Sons Publications, 2012.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	-	-	-	-	1	-	-	1	-	2
CO2	3	3	2	1	-	-	-	-	1	-	-	1	-	2
CO3	3	3	2	1	-	-	-	-	1	-	-	1	-	2
CO4	3	3	2	1	-	-	-	-	1	-	-	1	-	2
CO5	3	3	2	1	-	-	-	-	1	-	-	1	-	2
CO*	3	3	2	1	-	-	-	-	1	-	-	1	-	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-ES2101	Electrical Circuit Analysis-II	3:0:0	3

Course Objectives:

- To study the concept of balanced circuits.
- To study the concept of unbalanced three-phase circuits.
- To study the transient behavior of electrical networks with DC, pulse and AC excitations.
- To study the performance of a network based on input and output excitation/response.
- To know the realization of electrical network function into electrical equivalent passive elements.

Course Outcomes: At the end of this course, students will be able to

1. Solve three- phase circuits under balanced conditions (L3)
2. Solve three- phase circuits under unbalanced conditions (L3)
3. Apply the transient and steady state behavior of RL, RC & RLC circuits in time and Frequency domain (L3)
4. Determine the parameters for different types of two-port network (L3)
5. Analyze electrical equivalent network for a given transfer function (L4)

UNIT-I

Balanced Three-phase circuits: Phase sequence- star and delta connection - relation between line and phase voltages and currents in balanced systems - analysis of balanced three phase circuits - measurement of active and reactive power in balanced three phase systems.

UNIT-II

Unbalanced Three phase circuits: Analysis of three phase unbalanced circuits: Loop method, neutral shifting method and Star-Delta transformation technique, two wattmeter methods for measurement of three phase power, measurement of reactive power by using single wattmeter method.

UNIT-III

Transient Analysis of DC and AC circuits

DC Transient: Behavior of circuit elements under switching condition and their representation, evaluation of initial and final conditions in series and parallel R-L, R-C, R-L-C circuits and solution of first and second order differential equations for DC- excitation.

AC Transient: Transient response in series R-L, R-C, R-L-C circuits for AC- excitation. Analysis of electrical circuits using Laplace transform for standard inputs.

UNIT-IV

Two Port Networks: Two port network parameters: Z, Y, ABCD and hybrid parameters and their relations, Cascaded networks - poles and zeros of network functions.

UNIT-V

Network synthesis: Positive real function, basic synthesis procedure -LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.

Textbooks:

1. Fundamentals of Electrical Circuits by Charles K.Alexander and Mathew N.O.Sadiku, McGraw Hill Education (India).
2. Ravish R. Singh "Network Analysis and Synthesis", McGraw Hill Education, 2013.

Reference Books:

1. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.
2. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley, Mc Graw Hill Company, 6th edition
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Networks and Systems by D. Roy Choudhury, New Age International publishers
5. Electric Circuits by David A. Bell, Oxford publications
6. Circuit Theory (Analysis and Synthesis) by A.Chakrabarthi, DhanpatRai&Co.

Web Links:

1. https://nptel.ac.in/courses/108/104/108104139
2. https://www.electrical4u.com/electrical-engineering-articles/circuit-theory

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	-	2	-	-	2	-	-	3	3	3
CO2	3	2	3	2	-	2	-	-	2	-	-	3	3	3
CO3	3	2	2	1	-	2	-	-	2	-	-	3	3	3
CO4	3	2	2	1	-	2	-	-	2	-	-	3	2	3
CO5	3	2	3	2	-	2	-	-	2	-	-	3	2	2
CO*	3	2	3	2	-	2	-	-	2	-	-	3	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course title	Hrs./week L: T: P	Credits
R19EEE-PC2102	Electrical Machines–I (DC Machines and Transformers)	3:0:0	3

Course Objectives:

- To make the students to explain the principles of electromagnetic energy conversion
- To make the students to learn construction and operation of DC Machines
- To make the students to conduct tests on DC Machines to determine performance by direct and indirect methods
- To discuss the performance of single phase & three phase Transformers
- To make the students understand the parallel operation of single-phase Transformers

Course Outcomes: At the end of this course, students will be able to

1. Apply the basic principles of electromagnetic induction and energy conversion mechanisms in electrical machines (L3)
2. Analyze the characteristics and performance of different types of DC generators (L4)
3. Analyze the performance characteristics of different types of DC motors including torque, speed and efficiency (L4)
4. Apply the knowledge of equivalent circuit and phasor diagrams to determine the performance of single-phase Transformer (L3)
5. Illustrate the construction and working principles of an autotransformer and a three-phase transformer (L2)

UNIT-I

Electromechanical energy conversion: Principle of electromechanical energy conversion-forces and torque in magnetic field systems, energy balance in magnetic circuits, magnetic force, co-energy in singly excited and multi excited magnetic field system.

UNIT-II

DC Generators: Principle of operation, constructional details, armature windings and its types, EMF equation, wave shape of induced emf, armature reaction, demagnetizing and cross magnetizing ampere turns, compensating winding, commutation, methods of improving commutation, interpoles, OCC and load characteristics of different types of DC Generators.

Parallel operation of DC Generators: DC Shunt and DC series Generators in parallel, equalizing connections- applications of DC Generators.

UNIT-III

DC Motors: Principle of operation, significance of back emf, torque equations and power developed by armature, speed control of DC motors, starting methods of DC motors, operation and design of 3-point and 4-point starters, load characteristics of DC motors, losses and efficiency in DC machine, condition for maximum efficiency.

Testing of DC Machines: Brake test, Swinburne's test, Hopkinson's test, Field's test, Retardation test, Separation of core losses-applications of DC motors.

UNIT-IV

Single Phase Transformer

Construction and principle of operation, equivalent circuit, phasor diagrams, testing - polarity test, open circuit and short circuit tests, voltage regulation, losses and efficiency, back-to-back test, separation of core losses, parallel operation of single-phase transformers, applications of single-phase transformer.

UNIT-V

Autotransformer

Construction and working of auto transformer, comparison with two winding transformers, applications of autotransformer.

Three-Phase Transformer

Construction, types of connections and their comparative features, Scott connection, applications of Scott connection.

Textbooks:

1. I. J. Nagrath and D. P. Kothari, “Electric Machines”, McGraw Hill Education, 2010.
2. P. S. Bimbhra, “Electrical Machinery”, Khanna Publishers, 2011

Reference Books:

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. Theory and performance electrical machines by J.B.Gupta, S.K.Kataria & Sons

Web Links:

1. https://www.electrical4u.com
2. https://www.electronics-tutorials.ws
3. https://www.emworks.com

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CO1	3	2	2	2	-	-	-	-	2	-	-	2	3	3
CO2	3	2	2	2	-	-	-	-	2	-	-	2	3	3
CO3	3	2	2	2	-	-	-	-	2	-	-	2	3	3
CO4	3	2	2	2	-	-	-	-	2	-	-	2	3	3
CO5	3	2	2	2	-	-	-	-	2	-	-	2	3	3
CO*	3	2	2	2	-	-	-	-	2	-	-	2	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course title	Hrs./week L: T: P	Credits
R19ECE-PC2101	Electronic Devices and Circuits (Common to ECE and EEE)	3:0:0	3

Course Objectives:

- To study the physical phenomena such as conduction, transport mechanism and V-I characteristics of different diodes.
- To learn and understand the application of diodes as rectifiers with their operation and characteristics are discussed.
- To understand the switching characteristics of diode and its application in non linear wave shaping circuits.
- To acquire knowledge about the principle of working and operation of Bipolar Junction Transistor and Field Effect Transistor and their characteristics.
- To learn and understand the purpose of transistor biasing and its significance.

Course Outcomes: At the end of this course, students will be able to

1. Illustrate the working principles and characteristics of various diodes (L2)
2. Analyze rectifiers using diodes with and without filters (L4)
3. Analyze the responses of non linear wave shaping circuits for different signal (L4)
4. Apply the Transistors as an Amplifier in different configurations (L3)
5. Identify the stability parameters of a bipolar junction transistor in different biasing methods (L3)

UNIT- I: Junction Diode Characteristics

Review of semiconductor physics: Fermi Dirac function, Continuity equation

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Diodes- Zener Diode, Breakdown mechanisms, and its applications, Tunnel Diode, LED.

UNIT- II: Rectifiers and Filters

Basic Rectifier setup, half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms, Filters, Inductor filter(Series inductor), Capacitor filter (Stunt inductor) $\pi Filter$, comparison of various filter circuits in terms of ripple factors.

UNIT – III: Non-Linear Wave Shaping

Diode Clippers, , Clipping at two independent levels, Transfer Characteristics of Clippers, Clamping Operation, Clamping Circuits using diodes with different inputs, Clamping circuit theorem,

UNIT- IV: Transistor Characteristics

BJT: Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, Ebers-Moll model of a transistor, punch through/ reach through, Photo transistor, typical transistor junction voltage values.

Special transistors: UJT, SCR operations

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- V: Transistor Biasing and Thermal Stabilization

Need for biasing, operating point, load line analysis, BJT biasing- methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in VBE, Ic, and β, Stability factors, (S, S' , S''), Bias compensation, Thermal runaway, Thermal stability.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc-Graw Hill, Second Edition.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuits- J. B. Gupta, Katson Books, Kataria, 5th Thoroughly Reviced Edition.
4. Electronic Devices and Circuits, David A. Bell, Oxford Higher Education, 5th Edition.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

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CO1	3	2	2	1	-	-	-	-	2	-	-	1	1	2
CO2	3	3	2	2	-	-	-	-	2	-	-	1	2	2
CO3	3	3	2	1	2	-	-	-	2	-	-	1	2	2
CO4	3	3	1	2	-	-	-	-	2	-	-	1	2	2
CO5	3	3	2	2	-	-	-	-	2	-	-	1	2	2
CO*	3	3	2	2	2	-	-	-	2	-	-	1	2	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2103	Electro Magnetic Fields	3:0:0	3

Course Objectives:

- To discuss about the electric field intensity using coulombs law, gauss law and electric potentials for different types of charge distributions.
- To evaluate the capacitance of different configurations, understand the concept of conduction and convection current densities.
- To discuss the applications of Biot Savart's law, Ampere's Circuital law, Maxwell's second, third equations of static magnetic fields.
- To elaborate Lorentz force equation, enumerate magnetic force, self and mutual inductances in various configurations and its energy stored.
- To discuss about the time varying fields, Maxwell's equations – integral form, derivative form, Maxwell's fourth equation for the induced EMF and concept of Poynting theorem.

Course Outcomes: At the end of this course, students will be able to

1. Apply the concepts of Coulomb's law, Gauss's law, and their applications in electrostatics for different charge distributions (L3)
2. Apply the concepts of electric dipole to solve potential, electric field intensity, torque and capacitance for different configurations of capacitances (L3)
3. Analyze magnetostatic fields for simple configurations using Biot Savart's Law, Ampere's circuital law, magnetic dipole, dipole moments and its torque (L4)
4. Analyze the magnetic forces, and evaluate self and mutual inductances in magnetostatics (L4)
5. Apply Maxwell's equations in both integral and differential forms to address practical problems involving time-varying electromagnetic fields (L3)

UNIT-I

Electrostatics: Introduction to vector algebra, coordinate systems, Coulomb's law - electric field intensity due to line, surface and volume charges, work done on point charge - electric potential due to point charges, line charges and volume charges - potential gradient - Gauss's law (Maxwell's first equation) and its applications - Laplace's equation and Poisson's equations - numerical problems

UNIT- II

Conductors, Capacitance and Dielectrics: Electric dipole - dipole moment – potential, electric field intensity and torque due to electric dipole - behavior of conductors - boundary conditions - capacitance and its calculation in parallel plate, spherical, co-axial capacitors - energy stored, energy density in a static electric field – current density – conduction, convection current densities – ohm's law in point form – equation of continuity – numerical problems.

UNIT-III

Magneto Statics: Static magnetic fields – Biot Savart's law, magnetic field intensity due to a straight, circular, solenoid current carrying wire – Maxwell's second equation. ampere's circuital law and its applications, magnetic field intensity due to an infinite sheet of current, long current carrying filament – point form of Ampere's circuital law – Maxwell's third equation – numerical problems.

UNIT-IV: Force in Magnetic fields , Self and Mutual Inductances

Lorentz force equation - force on current element - straight and long current carrying conductor in a magnetic field - force between two straight and parallel current carrying conductors – magnetic dipole, dipole moment and its torque in a magnetic field – numerical problems.

Neumann's formulae - determination of self-inductance of a solenoid, toroid, mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored in a magnetic field – numerical problems.

UNIT-V

Time varying fields: Maxwell's equations – integral form, derivative form, Maxwell's fourth equation, Modified Maxwell's equations for time varying fields, Poynting theorem – Poynting vector and its significance.

Textbooks:

1. Principles of Electromagnetics, 6th Edition, Sadiku, Kulkarni, OXFORD University Press, 2015.
2. Engineering Electromagnetics, William.H.Hayt, Mc.Graw Hill, 2010.

Reference Books:

1. Electromagnetics 5th edition, J.D.Kraus,Mc.Graw – Hill Inc, 1999.
2. Field & Electromagnetic waves – 2nd edition, David K. Cheng.
3. Electromagnetics, Joseph Edminister, Tata McGraw Hill, 2006.

Web Links:

1. https://nptel.ac.in/courses/108/106/108106073
2. https://nptel.ac.in/courses/117/103/117103065
3. https://nptel.ac.in/courses/108/104/108104087

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	-	-	-	2	-	-	2	2	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2	2	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2	2	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2	2	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2	2	2
CO*	3	3	2	2	-	-	-	-	2	-	-	2	2	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-HM2101	Managerial Economics & Financial Analysis	3:0:0	3

Course Objectives:

- Inculcate the basic knowledge with the concepts of Economics & Demand and current business environment.
- Analyze various factors of production with proposed theories in relation to cost - volume profit analysis.
- Identify micro-environment in which markets operate, how price determination is done under different kinds of competitions and know the different forms of Business organization.
- Provide fundamental skills about accounting and explain the process of preparing accounting statements and analysis of financial statements.
- Apply the best investment decisions by means of time value of money.

Course Outcomes: At the end of this course, students will be able to

1. Analyze macro, micro economic concepts useful for business units and determine influences of demand and supply analysis(L4)
2. Understand the production functions , types of costs and solving engineering problems by applying knowledge of economics(L2)
3. Analyze the consciousness about market structures and pricing methods of industries(L4)
4. Identify the business as their own and understand different stages of business cycle (L3)
5. Evaluation of financial statements and their analysis through ratios etc.,(L3)

UNIT – I: Introduction to Managerial Economics

Definition, Nature and scope of Managerial Economics, Demand Analysis- Concept, Determinants , Law of Demand and its exceptions. Elasticity of Demand: Definition, Types, Measurement and Significance of Elasticity of Demand. Demand Forecasting, Methods of Demand Forecasting

Unit Outcomes: The students are able to

- Awareness about basics of managerial economics(L1)
- Knowledge of the concepts of demand, elasticity of demand and methods of demand forecasting(L1)

Application: Analyze the demand of a product by applying methods of the elasticity of demand.

UNIT – II: Production and Cost Analysis

Production Function – Law of variable proportion - Least Cost Combination, Isoquants and Isocosts, MRTS, Cobb-Douglas production function, Laws of Returns, Internal and External Economies of Scale. Cost Analysis: Cost concepts, cost behavior and cost types- Fixed Cost ,Variable Cost Opportunity Cost, Out of Pocket Costs vs. Imputed Costs, Explicit cost Vs

Implicit cost, Breakeven Analysis (BEA) - Determination of Breakeven Point (simple problems), Managerial Significance and limitations of BEA.
Application: Compute contribution, revenue, Cost comparison, Margin of safety for making accurate decisions related to profitability of particular Enterprise.

UNIT – III: Market Structures, Pricing & Business Environment
Market structures: Types of Competition, Features of Perfect Competition, Monopoly and Monopolistic Competition, Price- Output determination in Perfect Competition and Monopoly. Pricing - Objectives and Methods of Pricing – Cost based Pricing, Demand based Pricing, Competition based Pricing, Other Pricing Methods-Forms of Business Organizations and their features- Sole Proprietorship- Partnership – Joint Stock Companies- Business cycles.
Application: Analyze the leaps and bounds faced by the service providers in estimation of pricing in Telecom sector**.**

UNIT – IV: Introduction to Financial Accounting and Analysis Accounting Concepts and Conventions, Double- Entry Bookkeeping, Accounting cycle, Journal, Ledger, and Trial Balance, Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments). Analysis and Interpretation of financial statements.
Application: Prepare financial accounting statements like Trading account, Profit and Loss account, Balance sheet of any organization.

UNIT – V: **Capital and Capital Budgeting**
Capital and its significance, Types and sources of Shot term and Long term Capital, Components of Fixed and Working Capital. Nature and scope of Capital Budgeting, Time value of money, Methods of Capital Budgeting Projects-Payback Method, Accounting Rate of Return (ARR) and Net Present Value Method(NPV), Internal Rate of Return(IRR) (simple problems).
Application: Assess long term investments and funds required in small organization**.**

Textbooks:

1. Aryasri, Managerial Economics and Financial Analysis, TMH, 2012.
2. Varshney&Maheshwari, Managerial Economics, Sultan Chand& Sons, 2014.
3. S.A. Siddiqui and A.S. Siddiqui, Managerial Economics and Financial Analysis, New Age International Publishers, Hyderabad, 2013

Reference Books :

1. Raghunatha Reddy &Narasimhachary, Managerial Economics & Financial Analysis, Scitech, 2009.
2. V. Rajasekarn& R. Lalitha, Financial Accounting, Pearson Education, New Delhi, 2010.
3. Domnick Salvatore, Managerial Economics in a Global Economy, 4th Edition, Cengage, 2009.
4. Subhash Sharma & M. P. Vittal, Financial Accounting for Management, Text & Cases, Machmillan, 2012.

5. S. N. Maheshwari& S. K. Maheshwari, Financial Accounting, Vikas 2012.
6. Truet and Truet, Managerial Economics; Analysis, Problems and Cases, Wiley, 2012.
7. Dwivedi, Managerial Economics, Vikas 2012.
8. M. Kasi Reddy and S.Saraswathi, Managerial Economics and Financial Accounting, PHI, 2012.
9. Erich A. Helfert, Techniques of Financial Analysis, Jalco, 2007.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	1	1	-	-	-	-	1	1	1
CO2	1	1	-	-	-	1	-	-	-	-	1	1	1	1
CO3	-	-	-	-	-	2	2	-	-	-	-	1	1	1
CO4	-	1	-	-	-	1	1	-	-	-	3	1	1	1
CO5	1	1	-	-	-	1	-	-	-	-	2	1	1	1
CO*	1	1	-	-	-	2	1	-	-	-	2	1	1	1

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19MEC-PC2108	Thermal and Hydro Prime Movers Lab	0:0:3	1.5

Course Objectives:

- Understand basics for internal combustion engines
- Performance evaluation methods of various internal combustion engines
- Familiarize with the performance of turbines and pumps
- Gain knowledge in performance testing of hydraulic turbines at constant speed and head
- Gain knowledge in performance testing of hydraulic pumps at different working conditions.
- Analyze experimental results using formulas of work done, discharge power, efficiency, data tables and graphs.

Course Outcomes: At the end of this course, students will be able to

1. Analyse the valve and port timing diagrams of I.C. engines for both 2-stroke and 4-stroke engines(L4)
2. Analyse the performance parameters for both 4-stroke diesel and 2-stroke engines (L4)
3. Calculate the Engine Friction and Power Losses by conducting Morse test, retardation test, and motoring test (L3)
4. Understand the Heat Balance in I.C. Engines (L3)
5. Evaluate the performance of hydraulic machines such as Pelton wheels, Francis turbines, and centrifugal pumps (L5)

Note: To conduct a minimum of 12 experiments by conducting a minimum of six from each section.

SECTION A – THERMAL ENGINEERING LAB

1. I.C. Engines valve / port timing diagrams.
2. I.C. Engines performance test on 4 -stroke Diesel engine.
3. I.C. Engines performance test on 2-stroke petrol engine.
4. Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine
5. Determination of FHP by retardation and motoring test on IC engine
6. I.C. Engines heat balance on Diesel engine.
7. Economical speed test of an IC engine
8. Study of boilers

SECTION B – HYDRAULIC MACHINES LAB

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Single Stage Centrifugal Pump.

2. Performance Test on Reciprocating Pump.
3. Calibration of Venturimeter.
4. Calibration of Orifice meter.
5. Determination of loss of head due to sudden contraction in a pipeline.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	2	-	2	3	1	-	2	3	2
CO2	3	2	-	-	-	2	-	2	3	1	-	2	3	2
CO3	3	2	-	-	-	2	2	2	3	1	1	2	3	2
CO4	3	2	-	-	-	2	-	2	3	1	-	2	3	2
CO5	3	2	-	-	-	2	2	2	3	1	1	2	3	2
CO*	3	2	-	-	-	2	2	2	3	1	1	2	3	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2104	Electrical Circuit Laboratory	0:0:3	1.5

Course Objectives:

- To verify the network theorems.
- To analyze the concepts of resonance and magnetic circuits.
- To evaluate two port networks parameters.
- To measure the powers of three phase network.
- To determine the parameters of a choke coil.

Course Outcomes: At the end of this course, students will be able to

1. Understand the concepts of network theorems, node and mesh networks, series and parallel resonance and Locus diagram (L2)
2. Apply various theorems to compare practical results obtained with theoretical calculations (L3)
3. Determine self, mutual inductances and coefficient of coupling values, parameters of choke coil.
4. Analyze different circuit characteristics with the help of fundamental laws and various configurations (L4)
5. Analyze the two port networks (L4)

List of the Laboratory Experiments:

1) Verification of Thevenin's and Norton's Theorems
2) Verification of Superposition and Maximum Power Transfer Theorems
3) Verification of Compensation Theorem
4) Verification of Reciprocity and Milliman's Theorems
5) Series and Parallel Resonance
6) Determination of Self, Mutual Inductances and Coefficient of Coupling
7) Determination of Z and Y Parameters
8) Determination of Transmission and Hybrid Parameters
9) Measurement the Parameters of a Choke Coil
10) Measurement of Three-Phase Power by Two Wattmeter Method for Unbalanced loads

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	-	2	2	2	3	2	1	2	3	3
CO2	3	3	2	1	-	-	-	2	3	-	-	2	3	3
CO3	1	3	3	2	-	-	-	-	3	-	-	2	2	3
CO4	3	2	3	2	-	2	2	2	3	2	1	1	3	3
CO5	1	2	3	2	-	2	-	-	1	2	-	1	2	3
CO*	3	3	3	2	-	2	2	2	3	2	1	2	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MC2104	Professional Ethics and Human Values	2:0:0	0

Course Objectives:

- Create awareness on Engineering Ethics and Human Values.(L2)
- Instill Moral, Social Values and Loyalty(L3)
- Respect the rights of others. (L2)
- Create awareness on assessment of safety and risk(L2)

Course Outcomes: At the end of this course, students will be able to

1. Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field (L2)
2. Develop the multiple ethical interests at stake in a real-world situation or practice (L3)
3. Assess their own ethical values and the social context of problems (L3)
4. Analyze ethical concerns in research and intellectual contexts, including academic integrity (L4)
5. Equip knowledge about global ethical issues (L2)

Unit I: Human Values

Morals, Values and Ethics-Integrity-Work Ethic-Service learning – Civic Virtue – Respect for others –Living Peacefully –Caring –Sharing –Honesty -Courage-Cooperation– Commitment – Empathy –Self Confidence Character –Spirituality.

Application: Inculcate and applying the morals and values in the societal environment.

Unit II: Engineering Ethics

Senses of 'Engineering Ethics-Variety of moral issued –Types of inquiry –Moral dilemmas – Moral autonomy –Kohlberg's theory-Gilligan's theory-Consensus and controversy –Models of professional roles-Theories about right action-Self-interest -Customs and religion –Uses of Ethical theories –Valuing time –Cooperation –Commitment.

Application: Ethical concern with respect to technology has often focused on the user phase.

Unit III: Engineering as Social Experimentation

Engineering as Social Experimentation –Framing the problem –Determining the facts –Codes of Ethics –Clarifying Concepts –Application issues –Common Ground -General Principles – Utilitarian thinking respect for persons

Application: In all stages of converting a new engineering concept into a design like refers the activity, process or practice of making experiments.

Unit IV: Engineers Responsibility for Safety and Risk

Safety and risk –Assessment of safety and risk –Risk benefit analysis and reducing risk-Safety and the Engineer-Designing for the safety.

Application: Collect the information of any two industrial organizations and what type of safety measures they are following.

Unit V: Global Issues

Globalization –Cross culture issues-Environmental Ethics –Computer Ethics –Computers as the instrument of Unethical behavior –Computers as the object of Unethical acts –Autonomous Computers-Computer codes of Ethics –Weapons Development -Ethics and Research –Analyzing Ethical Problems in research.

Applications: Operate in a global context, relate to a societal context, and demonstrate respect for other cultures.

Textbooks:

1. "Engineering Ethics includes Human Values" byM.Govindarajan, S.Natarajananad, V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India Edition, 2009.
3. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger –Tata McGraw-Hill–2003.
4. "Professional Ethics and Morals" by Prof.A.R.Aryasri, DharanikotaSuyodhana-Maruthi Publications.
5. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran-LaxmiPublications.
6. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
7. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	2	-	2	-	-	-	2	-	1
CO2	-	-	-	-	-	2	-	2	2	-	-	2	-	1
CO3	-	-	-	-	-	1	2	3	-	-	-	1	-	1
CO4	-	-	-	-	-	1	2	3	-	-	-	1	-	1
CO5	-	-	-	-	-	2	1	3	-	-	-	1	-	1
CO*	-	-	-	-	-	2	2	3	2	-	-	2	-	1

** For Entire Course, CO vs. PO-PSO Mapping*

Subject Code	Subject Name	L	T	P	C
R19 BSH-MC2103	English for Competitive Exams	2	0	0	0

Course Objectives

- Aims to help learners develop their English language skills, particularly those planning to appear for Competitive Exams that test their English Language abilities.
- Gains the power of expression through rich Vocabulary.
- Imparts critical reading strategies for comprehension of complex texts
- Provides training and opportunities to develop fluency in English through participation in formal group discussions and Self Introductions.
- Demonstrates good writing skills for effective Paragraph Writing, Essay Writing and formal correspondence through Emails.
- Encourages use of a wide range of grammatical structures, Phrases, Clauses and Idioms in speech and writing.

Course Outcomes: At the end of this course, students will be able to

1. Identify Parts of Speech and use them flawlessly, write Emails in formal correspondence effectively, participate confidently by introducing oneself in any formal discussion. (L2)
2. Attain Language Proficiency & Accuracy through Contextualized Vocabulary, Verb forms, Tense and subject verb agreement, produce coherent expressions for professional writing, introduce themselves unhesitatingly with Task-Based Activities Tingly with Task-Based Activities (L3)
3. Develop the fluency and accuracy to write Technical Reports and Emails for professional communication by using appropriate vocabulary and participate confidently in any formal discussion (L3)
4. Assimilate lifelong reading habit to comprehend a passage for its gist. Avoid the errors in both Speech & Writing and write Letters and Emails for official communication (L2)
5. Realise the technical communicative competence and attainment of grammatically correct structures for formal communication (L2)

Unit 1

Vocabulary: How to talk about actions. **Grammar: U**sing and Identifying Parts of Speech accurately **. Writing:** Paragraph Writing and formal correspondence through Emails**. Speaking:** Background to Group discussions & Self-introductions.

Unit 2

Vocabulary: How to talk about various speech habits. **Grammar**: Learning Verb forms, Tenses and Subject-verb agreement and using them accurately in both Speaking and Writing contexts. **Writing :**Essay Writing and formal correspondence through Emails. **Speaking:** Four major areas-Subject Knowledge, Oral Communication Skills, Leadership Skills and Team Management-of GD; Real time GDs for Evaluation.

Unit 3

Vocabulary: How to insult your enemies**. Grammar:** Sentence Analysis & Synthesis - Voice, Degrees of Comparison, Reported Speech and Types & Forms of sentences. **Writing:** Report writing and Emails for formal correspondence**. Speaking:** Roles in structured GDs; real time GDs for practicing the above roles.

Unit 4

Vocabulary: How to flatter your friends**. Grammar**: Common errors and Correction of Sentences **Reading:** Reading Comprehension passages through Skimming and Scanning and understanding the gist or the specific purpose of them. **Writing:** Letter writing and Emails. **Speaking:** Advantages of GDs for hiring process ; real time GDs for evaluating.

Unit 5

Vocabulary & Grammar: High-frequency words for all competitive exams, Clause, Phrase & Idioms**. Reading:** Reading for Comprehending **Writing:** Business Letters and Emails **Speaking:** Group Discussions for Evaluation

Reference Books

1. Bailey, Stephen. *Academic writing: A handbook for international students*. Routledge, 2014.
2. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
3. Skilful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational.
4. Hewings, Martin. *Cambridge Academic English (B2)*. CUP, 2012. (Student Book, Teacher Resource Book, CD & DVD)
5. Word Power Made Easy by Norman Lewis.

ASSESSMENT

The learners will demonstrate their knowledge and abilities through completion of the following required assessments while or at the end of this course. —2 Quizzes, 1 Professional Certificate, 3 Activities on LSRW skills.

Quiz:

Quiz is conducted on Grammar & Vocabulary. Each Quiz consists of 50 questions and will be scaled down to 5 Marks. Two quizzes are conducted. One after the 3rd unit, the other, after the last unit. Duration of any quiz is 1hr 30 Min only.These Quizzes are Computer Based
Tests (CBT)

Professional Certificate:

An International Language Assessment Certificate secured on B1 of Common European Framework for Reference (CEFR) scale.

Activities on LSRW skills:

Interviews:

The candidate has to interview one celebrity of his/her own choice.
The recorded 5-7 min video of the candidate should be uploaded on the ELCS LABLendi Youtube Channel with the help of concerned English Teacher

The Evaluation Parameters:

Quality of the Questionnaire(3M)
Body Language & Confidence of the candidate(5M)
Youtube likes & Comments(2M)

E-mails:

Each student is required to submit 5 independently written Emails during the course. Specific requirements for each one are accessed on the following Link:
https://docs.google.com/document/d/1IXuzjjmfiOLI23t8xlbLwNefRzIIXi9aOi3XkSHIK_Q/edit?usp=sharing

Listen to Speak:

Students are expected to watch and listen to any one of the 10 given educational video and audio clips to express their point of view. After watching, they will have the opportunity to share their points of view about some of the everyday issues that they can relate to. They have to explain and justify their reasoning to a team of three peers to explore their verbal expressions and their points of view before an External Examiner.

The following is the link to access those clippings:
https://docs.google.com/document/d/1tFuQ_43AVAHKJGVs9AeOODHJTnQMoydqcodSgE NaZ3o/edit?usp=drivesdk
Details of Peer Evaluation & Assessment Parameters are available on the following Link:
https://docs.google.com/document/d/16l_PUzaOONnjpvMYVzE3XAYUBNhqMK9PbdDOP GIef_8/edit?usp=sharing

Grading:

Assessment Model	**Points**
Quiz-1	**10**
Quiz-2	**10**
Professional Certificate with B1 or above or Activity of Interview	**10**
E-Mails	**10**
Listen to Speak Activity	**10**
Total	**50**

Pass Criterion:

1. Student has to Secure 30 Marks to pass this examination
2. Student who is having a certificate of any International standard of English he/she has to secure a Minimum 20 Marks in this examination (Certificate+20 Marks) to pass the summative exam.
3. Student who is not having a certificate has to clear the exam with 30 marks mandatorily.
4. Clearing all categories is mandatory. Need to get 60% each category.
5. 20M +Certificate=Successful or 30M+No certificate=Successful

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	1	-	1	2	-	2	-	2	3	-	2	-	3
CO2	-	-	-	-	2	-	2	-	3	3	-	3	-	3
CO3	-	2	-	-	2	-	2	-	3	3	-	3	-	3
CO4	-	2	-	-	2	-	2	-	3	3	-	3	-	3
CO5	-	3	-	3	2	-	-	2	-	3	-	3	-	3
CO*	-	2	-	2	2	-	2	2	2	3	-	3	-	3

** For Entire Course, CO vs. PO-PSO Mapping*

II Year –II Semester Syllabus

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE -PC2201	Electrical Measurements and Instrumentation	3:0:0	3

Course objectives:

- To study the principle of operation and working of different types of instruments, Measurement of voltage and current.
- To study the working principle of different types of instruments for measurement of power, energy.
- To understand the principle of operation and working of DC and AC Potentiometers.
- To understand the principle of operation and working of various types of bridges for measurement of parameters –Resistance, Inductance and Capacitance.
- To learn various Transducers and Display devices.

Course outcomes: At the end of this course, students will be able to

1. Choose the right type of instrument for measurement of voltage and current for AC and DC circuits (L2)
2. Explain the principle of operation and working of different types of instruments (L2)
3. Apply principles of potentiometer to calibrate ammeters, voltmeters, and wattmeters accurately (L3)
4. Analyze the performance of AC and DC bridges for measuring electrical parameters (L4)
5. Analyze the performance of different types of digital meters in measuring electrical quantities (L4)

UNIT I

Measuring Instruments: Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – classification of torques –deflection, controlling, damping torques – Moving coil(MC), Moving iron(MI), Electrodynamometer and Electrostatic – ammeter, voltmeter.

UNIT-II

Measurement of Electrical and Magnetic Quantities

Principle and operation – Single and three phase watt meters and energy meters – Ballistic galvanometer – Equation of motion – Flux meter – Determination of B-H curve and measurements of iron loss by using bridge method- Instrument transformers.

UNIT-III

Potentiometers

DC Potentiometers: Principle and operation of D.C. Crompton's potentiometer – Standardization– Measurement of unknown resistance, current and voltage- applications.
AC Potentiometers: Types of AC potentiometers –standardization – applications.

UNIT-IV
AC and DC Bridges
DC bridges:
Sensitivity of Wheat stone's bridge – Carey Foster's bridge– Kelvin's double bridge for measuring low resistance- measurement of high resistance – Megger.

AC bridges:
Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge- Measurement of capacitance and loss angle – Desauty bridge –Schering bridge, numerical problems.

UNIT-V
Transducers and Digital Meters
Transducers: Concept and Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, Hall effect, optical and digital transducers.
Digital Meters: Digital Voltmeter–Successive approximation, ramp and integrating type - Digital frequency meter–Digital multimeter–Digital Tachometer. Measurement of phase difference – Frequency – Hysteresis loop using lissajious patterns in CRO.

Textbooks:

1. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements & Instrumentation' DhanpatRai and Co 2004.
2. J. B. Gupta, 'A Course in Electronic and Electrical Measurements', S. K. Kataria& Sons, Delhi, 2003.
3. Doebelin E.O. and Manik D.N., Measurement Systems – Applications and Design, Special Indian Edition, Tata McGraw Hill Education Pvt. Ltd., 2007.
4. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw Hill, II Edition 2004.

Reference Books:

1. D.V.S. Moorthy, 'Transducers and Instrumentation', Prentice Hall of India Pvt Ltd, 2007.
2. A.J. Bouwens, 'Digital Instrumentation', Tata McGraw Hill, 1997.
3. Martin Reissland, 'Electrical Measurements', New Age International (P) Ltd., Delhi, 2001.
4. Alan. S. Morris, Principles of Measurements and Instrumentation, 2nd Edition, Prentice Hall of India, 2003.

Web Links:
1. https://nptel.ac.in/courses/108/105/108105153

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	2	3	-	2	-	-	2	-	-	2	2	3
CO2	3	3	2	2	-	2	-	-	2	-	-	2	2	3
CO3	3	3	2	2	-	1	-	-	1	-	-	2	3	2
CO4	3	3	2	2	-	2	-	-	2	-	-	1	2	3
CO5	3	3	1	2	-	1	-	-	1	-	-	2	2	3
CO*	3	3	2	2	-	2	-	-	2	-	-	2	2	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2202	Electrical Machines – II	3:0:0	3

Course Objectives:

- To understand the principle of operation and performance of three-phase induction motor.
- To analyze the relation between torque vs slip characteristics and performance of induction motor.
- To discuss the principle of operation and voltage regulation of synchronous generators.
- To understand the operation and performance of synchronous motor.
- To discuss the concept of double revolving field theory for single phase induction motor.

Course Outcomes: At the end of this course, students will be able to

1. Examine the operating principles and performance characteristics of three-phase induction motors (L4)
2. Analyze the speed control methods, testing procedures, and performance characteristics of three-phase induction motors (L4)
3. Analyze the performance and synchronization of a synchronous generator (L4)
4. Analyze the performance characteristics of a synchronous motor (L4)
5. Explain the principle of operation of single-phase induction motors (L2)

UNIT-I

Three Phase Induction Motors

Principle of operation, constructional details, production of rotating magnetic field, slip, effect of rotor EMF, rotor frequency, rotor current and power factor at standstill and running conditions - rotor power input, rotor copper loss, mechanical power developed and their interrelationships, equivalent circuit, phasor diagram.

UNIT-II

Characteristics, Starting and Testing Methods of Three Phase Induction Motors

Torque equation, expressions for maximum torque and starting torque, torque-slip characteristics, applications of three phase induction motor- harmonics, effects of crawling and cogging, speed control of induction motor with v/f method, no load and blocked rotor tests, methods of starting, starting torque and starting current calculations, induction generator operation (qualitative treatment only).

UNIT–III

Construction, Operation and Voltage Regulation of Synchronous Generator

Constructional features of non-salient and salient pole type, armature windings, distributed and concentrated windings, distribution and pitch factors, EMF equation, voltage regulation by synchronous impedance method, MMF method and Potier triangle method, phasor diagrams, two reaction theory of salient pole machine.

Parallel operation of Synchronous Generators: Synchronization, synchronization methods, two bright and one dark lamp, synchroscope method , parallel operation-with single alternator and infinite bus, load sharing, numerical problems.

UNIT–IV

Synchronous Motor – Operation, Starting and Performance

Principle of operation, variation of current and power factor with excitation, synchronous condenser, power equation, hunting and its suppression, methods of starting, applications of synchronous motor.

UNIT – V

Single Phase Induction Motors

Single phase induction motors, constructional features and equivalent circuit, no load and block rotor tests, problem of starting, double revolving field theory, starting methods, application of single phase induction motor.

Textbooks:

1. P.S.Bimbhra, "Electrical Machinery", Khanna Publishers,2011.
2. I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 2010.
3. Stephen J. Chapman, Electric Machinery and Power System Fundamentals, McGraw-Hill Education, 2001.
4. Bhag S. Guru, Huseyin R.Hiziroglu, Electric Machinery and Transformers, Oxford University Press, 2012.

Reference Books:

1. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M. G. Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A. S. Leinsdorf, "Alternating current machines", McGraw Hill Education, 1984.
4. P. C. Sen, "Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

Web Links:

1. www.electrical4u.com
2. www.electricaleaasy.com
3. www.learnengineering.org

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	-	-	-	-	1	-	-	2	3	3
CO2	3	3	1	2	-	-	-	-	3	-	-	2	3	3
CO3	3	3	2	3	-	-	-	-	3	-	-	2	3	3
CO4	3	3	2	2	-	-	-	-	2	-	-	2	3	3
CO5	3	3	3	3	-	-	-	-	2	-	-	2	3	3
CO*	3	3	2	2	-	-	-	-	2	-	-	2	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC2206	Digital Electronics (Common to ECE and EEE)	3:0:0	3

Course objectives:

- To study different number system based on radix and error coding techniques
- Theorems and functions of Boolean algebra and behavior of logic gates to optimize logic gates for digital circuits using various techniques.
- To understand concepts of combinational circuits and their realization.
- To understand and design of sequential logic circuits
- To Implement the PLDs and Synchronous sequential circuits.

Course Outcomes: At the end of this course, students will be able to

1. Understand different number systems, arithmetic operations on binary numbers, complements, and Error correcting and detecting codes (L2)
2. Apply Boolean laws, k-map & Q-M methods to minimize switching functions (L3)
3. Develop different combinational logic circuits such as Adders, Sub tractors, Comparators, Encoders, Decoders, Multiplexers and De-multiplexers (L3)
4. Develop various synchronous and asynchronous sequential logic circuits using Flip-Flops (L3)
5. Develop different types of Programmable Logic Devices and realize functions using PLDs (L3)

Unit 1

Number Systems and Codes: Representation of numbers of different radix, conversation from one radix to another radix, r-1's compliments and r's compliments of signed members. Arithmetic addition, Subtraction of Binary Numbers complements, Gray code ,4 bit codes; BCD, Excess-3, 2421, 8421 code etc. Error detection & correction codes: parity checking, even parity, odd parity, hamming code.

Applications

1. Binary systems are widely used for electronic gates in electricity circuits and digital encoding.
2. Detect the error in digital transmission and to correct them
3. Gates are used to build square wave oscillators, as temperature heaters, parity generation and checking circuits.

Unit 2

Boolean Algebra & Logic Gates: Boolean theorems, Boolean operations, Boolean functions, principle of complementation & duality, De-Morgan theorems. Logic operations; Basic logic operations -NOT, OR, AND, Universal Logic operations, EX-OR, EXNOR

operations. Min-terms and Max-terms, Standard SOP and POS forms, NAND-NAND and NOR-NOR realizations, Realization of three level logic circuits.

Minimization of Boolean Functions: Minimization and realization of switching functions using Boolean theorems, K-Map (up to 6 variables) and tabular method (Quine-McCluskey method) with only four variables and single function. Karnaugh map, don't-care conditions.

Applications

1. Boolean functions are used in designing Integrated circuits.
2. Karnaugh Maps are used for easy generation of error correcting codes.

Unit 3

Combinational Logic Circuits: Design of Half adder, full adder, half subtractor, full subtractor, applications of full adders; 4-bit adder-subtractor circuit, BCD adder circuit, Excess 3 adder circuit and carry look-a-head adder circuit, Design code converts using Karnaugh method and draw the complete circuit diagrams. Design of encoder, decoder, Multiplexer and De-multiplexers, Implementation of higher order circuits using lower order circuits. Realization of Boolean functions using decoders and multiplexers. Design of priority encoder, 4-bit digital comparator and seven segment decoder.

Applications

1. Combination logic is used in circuits to perform Boolean algebra on input signals and on stored data.
2. Combinational circuits are used in ALU's, data routing applications like home alarm, car parking slot systems etc.

Unit 4

Sequential Circuits: Classification of sequential circuits (synchronous and asynchronous) , operation of NAND & NOR Latches and Flip-flops ; truth tables and excitation tables of RS flip-flop, JK flip-flop, T flip-flop, D flip-flop with reset and clear terminals. Conversion from one flip-flop to another flip-flop, Master-slave flips flops.

Registers and Counters: Registers, Shift registers, Buffer register, control buffer register, bi-directional shift register, universal shift, register, Design of ripple counters, synchronous counters, Modulus-n Counter, Ring counter, Johnson counter, Up-Down counter.

Applications:

1. Flip flops are used in multi vibrators, triggering circuits, frequency divider circuits, data
   storage and data transfer circuits.
2. Counters are used in Frequency counters, Digital clocks, Time measurement, A to D Converters, Digital triangular wave generator.

Unit 5

Programmable Logic Devices (PLDs): PROM, Programmable Array Logic (PAL) and Programmable Logic Array (PLA), Realization of switching functions using PLDs. Programming table.

Analysis and Design of Synchronous Sequential Circuits: Finite state machine, State diagram, State Table, Reduction of State Tables, State Equations, Analysis of clocked

sequential circuits Mealy to Moore conversion and vice-versa, Realization of sequence generator , Design of Clocked Sequential Circuit to detect the given sequence (with overlapping or without overlapping).

Applications: 1. Programmable Logic devices provide specific functions, including device-to-device interfacing, data communication, signal processing, data display, and timing and control operations

Textbooks:

1. M. Morris Mano and Michael D. Ciletti, Digital Design, 4th Edition, Pearson Education, 2013.
2. R. P. Jain, "Modern Digital Electronics", McGraw Hill Education (India Private Limited), 4th edition, 2012.

References:

1. Switching and Finite Automata Theory, Z. Kohavi, Tata McGraw Hill.
2. Wakerly J.F. "Digital Design: Principles and Practices," Pearson India, 2008, 4th Edition.
3. Charles H Roth (Jr), Larry L. Kinney, "Fundamentals of Logic Design", Cengage Learning India Edition, 5th Edition, 2010.
4. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	2	-	-	1	2	3
CO2	3	2	2	2	2	-	-	-	2	-	-	1	2	3
CO3	3	3	2	3	2	-	-	-	2	-	-	1	2	3
CO4	3	3	2	2	2	-	-	-	2	-	-	1	2	3
CO5	3	3	2	2	2	-	-	-	2	-	-	1	2	3
CO*	3	3	2	2	2	-	-	-	2	-	-	1	2	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2203	Control Systems (Common to EEE and ECE)	3:0:0	3

Course Objectives:

- To learn the fundamental concepts of control systems and write down the transfer functions for different types of electrical and mechanical systems.
- To study the characteristics and time response analysis for first and second order systems.
- To explain the absolute stability and relative stability of control system by RH criterion and Root locus techniques.
- To demonstrate the analysis of the system response in frequency domain using bode, polar and Nyquist plots.
- To introduce state variable analysis, concepts of controllability and observability.

Course Outcomes: At the end of this course, students will be able to

1. Develop the transfer function of physical systems using block diagram algebra and signal flow graphs (L3)
2. Apply the concepts of time response analysis on first and second order systems (L3)
3. Analyze the absolute stability and relative stability of control system by RH criterion and root locus techniques (L4)
4. Apply various frequency domain techniques to assess the system performance and stability (L3)
5. Analyze State space models of linear time invariant systems (L4)

UNIT-I

Mathematical Modeling of Control System

Classification of control systems, open loop and closed loop control systems and their differences-feedback characteristics, transfer function of linear systems, differential equations of electrical and mechanical systems, transfer function of AC and DC servo motors, synchro transmitter and receiver, block diagram algebra, representation by signal flow graph, reduction using mason's gain formula.

UNIT-II

Time Response Analysis

Standard test signals, time response of first order systems, characteristic equation of feedback control systems, transient response of second order systems, time domain specifications, steady state response, steady state errors and error constants, effects of proportional derivative and proportional integral systems.

UNIT-III: Stability Analysis

Concept of stability, absolute and relative stability analysis, Routh's stability criterion and its limitations.

Root locus Technique- Root locus concept, construction of root loci, effects of adding poles and zeros to open loop transfer function [G(s) H(s)] on the root loci.

UNIT–IV

Frequency Response Analysis: Frequency domain specifications -relationship between time and frequency response, bode diagrams, transfer function from the bode diagrams, phase margin and gain margin, stability analysis from bode plots, polar plots and nyquist plots, lag, lead, lag-lead and lead-lag compensators.

UNIT-V

State Space Analysis: Concepts of state, state variables and state model, derivation of state models from block diagrams, diagonalization, solving the time invariant state equations, state transition matrix and it's properties, concepts of controllability and observability.

Textbooks:

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International Limited Publishers, 2nd edition.
2. Automatic control system – B.C.Kuo , john wiley and son's 8th edition, 2003.

Reference Books:

1. Modern control engineering – K.Ogata , prentice Hall of India Pvt. Ltd., 5th Edition.
2. Control system – N.K.Sinha, New Age International (p) Limited Publishers, 3rd Edition, 1998.
3. A.Nagoor kani, "Control Systems", RBA Publications, 2nd Edition, 2006.
4. Control systems- A.Anand kumar, PHI learning pvt.ltd., 2nd Edition.
5. Control systems – K.Alice mary, P.Ramana.
6. M. Gopal, "Control Systems: Principles and Design", McGraw Hill Education, 1997.

Web Links:

1. https://nptel.ac.in/courses/108101037

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	-	-	-	-	2	-	-	1	2	3
CO2	3	3	2	2	-	-	-	-	2	-	-	2	2	3
CO3	3	3	2	3	-	-	-	-	2	-	-	2	2	3
CO4	3	3	3	3	-	-	-	-	2	-	-	2	3	3
CO5	3	3	3	3	-	-	-	-	2	-	-	2	3	3
CO*	3	3	2	3	-	-	-	-	2	-	-	2	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2204	Power Systems – I	3:0:0	3

Course Objectives:

- To study the principle and operation of conventional and nonconventional power generating stations
- To estimate the cost of generation and learn about various tariff methods
- To learn the computation of the parameters of a Transmission line
- To understand the Classification of transmission lines and various factors affecting the performance of Transmission lines
- To study the construction and operation of Air and Gas Insulated substations.

Course Outcomes: At the end of this course, students will be able to

1. Describe the operation of conventional and non-conventional power stations. (L2)
2. Analyse the factors like load demand, diversity, capacity, utilization, and plant use factors (L4)
3. Apply the concepts of conductors and calculate the resistance, inductance values for both single-phase and three-phase systems (L3)
4. Analyse the modelling, and representation techniques for different types of transmission lines (L4)
5. Describe the construction and operation of Air and Gas Insulated substations (L2)

UNIT-I: Generating Power Stations

Conventional Power Generating Stations: Block diagram of thermal power station (TPS), brief description of TPS components. Block diagram of hydro power station, Selection of site, description of main components, Nuclear fission and chain reaction, principle of operation of nuclear reactor, description of components.

Non- Conventional Power Generating Stations: Principles of solar radiation, solar energy collectors. Role and potential of wind energy options, horizontal and vertical axis windmills-applications.

UNIT -II

Economic Aspects of Power Generation: Load curve, load duration and integrated load duration curves-load demand, diversity, capacity, utilization and plant use factors, numerical problems, costs of generation and their division into fixed, semi-fixed and running costs.

Tariff methods: desirable characteristics of a tariff method- flat rate, block-rate, two-part, three –part, and power factor tariff methods, numerical problems, applications.

UNIT-III

Transmission Line Parameters: Types of conductors, calculation of resistance for solid conductors, calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, calculation of capacitance for 2-wire and 3-wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical-single and three phase circuits-single and double circuit lines, numerical problems.

UNIT-IV

Modeling of Transmission Lines: Classification of transmission lines, models and their representations, nominal-T, nominal- π and A, B, C, D constants, mathematical solutions to estimate regulation and efficiency of all types of lines, long transmission line-rigorous solution, evaluation of A, B, C, D constants, interpretation of the long line equations, surge impedance and surge impedance loading (SIL), wave length and velocity of propagation, skin effect, Ferranti effect, proximity effect charging current, numerical problems, applications.

UNIT – V

Substations: Classification of substations, air insulated substations - indoor and outdoor substations, substations bus bar arrangements in the sub-stations: simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers, main and transfer bus bar system with relevant diagrams, gas insulated substations (GIS) – advantages of GIS, single line diagram of gas insulated substations, comparison of air insulated substations and gas insulated substations.

Textbooks:

1. Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, DhanpatRai& Co. Pvt. Ltd., 1999.
2. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
3. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.

Reference Books:

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems By V.K Mehta And Rohit Mehta S.Chand & Company Ltd., New Delhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kastha & S. Banerjee – Oxford University Press, 2013.

Web Links:

1. https://nptel.ac.in/courses/108/102/108102047
2. https://nptel.ac.in/courses/108/105/108105058
3. https://www.electricaleasy.com/p/power-system.html

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	-	-	-	-	1	-	-	1	2	2
CO2	3	3	-	-	-	-	-	-	2	-	-	2	2	2
CO3	3	1	-	-	-	-	-	-	2	-	-	2	1	2
CO4	3	3	2	-	-	-	-	-	2	-	-	1	2	2
CO5	3	3	-	-	-	-	-	-	2	-	-	2	2	2
CO*	3	3	2	-	-	-	-	-	2	-	-	2	2	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC2207	Signals and Systems (Common to ECE and EEE)	3:0:0	3

Course Objectives:

- Explain the basic properties of signals and systems and identify the systems based on their properties
- Develop expertise in time domain and frequency domain approaches to the analysis of continuous and discrete systems through Fourier series and Fourier transform tools.
- Analyze the process of sampling and the effect of under sampling.
- Development of mathematical skills to solve problems involving convolution and correlation.
- Apply the Laplace transform as mathematical tool to convert time domain signals into s-domain signals.
- Analyze DT systems & their realization using Z-transform.

Course Outcomes: At the end of this course, student will be able to

1. Analyze the signal characteristics, operations on signals, system properties, and Fourier series applications (L4)
2. Apply Fourier transforms for spectral analysis and the sampling theorem for signal reconstruction (L3)
3. Analyze linear time-invariant systems using convolution and correlation concepts (L4)
4. Analyze continuous-time signals using Laplace transform to obtain their pole-zero plot with ROC and characterize LTI systems (L4)
5. Analyze discrete-time signals using Z-transform to obtain their pole-zero plot with ROC and LTI system characterization (L4)

UNIT- I: Introduction to Signals & Systems and Fourier Series

Definition of Signals and Systems, Classification of Signals, Basic continuous and discrete time signals (Exponential, Complex Exponential, Sinusoidal, impulse, step, signum, ramp, rectangular, triangular and sinc), basic operations on continuous and discrete time signals, Classification of Systems, Trigonometric Fourier series and Exponential Fourier series representation of continuous time periodic signals, Complex Fourier spectrum, Dirichlet's conditions, properties of Fourier series.

Applications:

1. Time division multiplexing, Radar signal analysis, Electromyography (EMG) signals analysis in clinical/biomedical applications, aircraft control surfaces such as the rudder or ailerons, Motion of the planets, the periodic behaviour of the earth's climate and Multipath fading analysis.
2. Telecommunications, Automatic control systems, encoder/decoder, audio systems, Economic data, Biology and Medical image processing.

3. Frequency-selective & Frequency-shaping filtering in audio systems, Signal processing, Forensics, Acoustics, Oceanography, Sonar, Optics, Number theory, Heat distribution mapping and light simplification, Radiation measurements.

UNIT –II: Fourier Transform and Sampling Theorem

Development of the Fourier transform representation of an aperiodic signal, Inverse Fourier transform, Fourier transform of standard signals, Fourier transforms involving impulse function and Signum function, Fourier transform of periodic signals, properties of Fourier transforms. Sampling theorem, signal reconstruction, aliasing, introduction to band pass sampling.

Applications:

1. Frequency-domain filtering, Solution of partial differential equations, Signal processing, Frequency division multiplexing, Amplitude modulation
2. Pulse code modulation, Analog-to-digital converter (ADC), Digital audio in telephony
3. Digital audio CDs, digital wireless microphones, DVD-audio

UNIT-III: Analysis of Linear Time Invariant Systems

Linear system, Response of a linear system, linear time-invariant (LTI) system, linear time variant (LTV) system, impulse response, Transfer function of LTI system. Properties of linear time-invariant systems, Filter characteristics of linear systems. Distortion less transmission through a system, Signal bandwidth, System bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, Relationship between bandwidth and rise time. Energy and Power Spectral Densities

Cross-correlation and auto-correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between autocorrelation function and energy/power spectral density function. Relationship between convolution and correlation.

Applications:

1. Tele communication and Radio receivers
2. Frequency-selective & Frequency-shaping filtering in audio systems.
3. Radar signal detection, fractal patterns, Measuring fast signal decay.

UNIT – IV: Laplace Transforms

Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's, Relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis, Analysis and characterization of LTI systems using Laplace – transforms.

Applications:

1. Solution of partial differential equations
2. Transient and steady-state analysis of mechanical, electrical and electronic circuits
3. System modelling in control systems and stability analysis

UNIT –V: Z–Transforms

Concept of Z- Transform of a discrete sequence. Distinction between Fourier and Z transforms. Region of convergence for the Z-Transform, constraints on ROC for various classes of signals, Inverse Z-transform, properties of Z-transforms, Analysis and characterization of LTI systems using Z – transforms.

Applications:

1. Solution of partial differential equations
2. Analysis of linear discrete system
3. Digital filter designing.

Textbooks:

1. Signals, Systems & Communications - B.P. Lathi, BS Publications, 2003.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawab, PHI, 2nd Edn.
3. Signals & Systems- Anand Kumar PHI 3rd Edn

Reference Books:

1. Signals & Systems - Simon Haykin and Van Veen, Wiley, 2nd Edition.
2. Principles of Linear Systems and Signals – BP Lathi, Oxford University Press, 2015
3. Fundamentals of Signals and Systems- Michel J. Robert, MGH International Edition,2008.
4. Signals and Systems – T K Rawat , Oxford University press, 2011

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	2	1	2	-	-	2	-	-	2	3	3
CO2	3	3	2	1	-	-	-	-	2	-	-	2	3	3
CO3	3	2	3	2	-	-	-	-	2	-	-	2	2	3
CO4	3	3	2	1	-	-	-	-	2	-	-	1	1	3
CO5	3	3	2	2	-	-	-	-	2	-	-	1	3	3
CO*	3	3	2	2	1	2			2			2	3	3

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2205	Electrical Machines –I Lab	0:0:3	1.5

Course Objectives:

- To plot the magnetizing characteristics of DC Shunt Generator and understand the mechanism of Self-Excitation.
- To control the speed of the DC Motors.
- To determine and pre-determine the Efficiency of DC Machines.
- To determine the Efficiency, Regulation of Single Phase Transformer and assess their performance.

Course Outcomes: At the end of this course, students will be able to

1. Analyze the principles and operational characteristics of DC Generators (L4)
2. Analyze the performance of DC Motors with direct and indirect loading (L4)
3. Describe the various speed control techniques of dc shunt motor (L2)
4. Evaluate the performance of Single-Phase Transformers (L5)
5. Analyze three phase to two phase transformation (L4)

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of self excited DC Shunt Generator. Determination of Critical Field Resistance and Critical Speed.
2. Brake test on DC shunt motor. Determination of performance curves.
3. Hopkinson's Test on DC Shunt Machines & Determination of Efficiency of DC Shunt Machines.
4. Swinburne's Test and Predetermination of Efficiencies as DC Generator and DC Motor.
5. Speed Control of DC shunt motor by Field and armature Control.
6. Retardation Test on DC Shunt Motor. Determination of losses at Rated Speed.
7. Separation of Losses in DC Shunts Motor.
8. OC & SC Test on Single Phase Transformer.
9. Sumpner's Test on Single Phase Transformer.
10. Scott Connection of Transformers.
11. Parallel Operation of Single Phase Transformers.
12. Separation of Core Losses of a Single Phase Transformer.
13. Heat Run Test on a Bank of 3 Nos. of Single Phase Delta Connected Transformers

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	-	2	2	2	3	2	1	2	3	2
CO2	3	3	2	2	-	2	2	2	3	2	1	2	3	2
CO3	3	3	2	2	-	2	2	2	3	2	1	2	3	2
CO4	3	3	2	2	-	2	2	2	3	2	1	2	3	2
CO5	3	3	2	2	-	2	2	2	3	2	1	2	3	2
CO*	3	3	2	2	-	2	2	2	3	2	1	2	3	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC2208	Electronic Devices & Circuits Lab	0:0:3	1.5

Course Objectives:

- Familiarize the functional behaviour of different diodes, BJTs and FETs.
- Demonstrate the characteristic features of BJT, FET
- Observe the response of linear wave –shaping circuits with square-wave input for different time constants
- Demonstrate the Non-Linear wave shaping circuits such as clippers, clampers and switching characteristics of transistor
- Demonstrate the working of various amplifiers based on different biasing techniques.
- Simulate the Simple electronic circuits using spice software.

Course Outcomes: At the end of this course, students will be able to

1. Illustrate the working principles and characteristics of various diodes (L2)
2. Analyze rectifiers using diodes with and without filters (L4)
3. Analyze the responses of non linear wave shaping circuits for different signal (L4)
4. Apply the Transistors as an Amplifier in different configurations (L3)
5. Identify the stability parameters of a bipolar junction transistor in different biasing methods (L2)

Part – A

1. PN Diode operation. P-N Junction Diode Characteristics Part A: Germanium Diode (Forward bias& Reverse bias) Part B: Silicon Diode (Forward Bias only)
2. Zener Diode Characteristics Part A: V-I Characteristics Part B: Zener Diode as Voltage Regulator
3. Rectifiers (without and with-filter) Part A: Half-wave Rectifier Part B: Full-wave Rectifier
4. Linear Wave Shaping (LPF, HPF)
5. Non-Linear Wave Shaping Clippers
6. Non-Linear Wave Shaping Clampers
7. BJT Characteristics (CE Configuration) Part A: Input Characteristics Part B: Output Characteristics.
8. FET Characteristics (CS Configuration) Part A: Drain Characteristics Part B: Transfer Characteristics
9. Transistor as a Switch
10. UJT Characteristics
11. BJT-CE Amplifier
12. Emitter Follower-CC Amplifiers
13. FET Amplifier (Common Source Amplifier)

Part – B

Simulate any 4 experiments using spice software

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	-	-	3	2	-	2	3	2	1	2	1	1
CO2	3	3	2	-	3	2	2	2	3	2	1	2	2	2
CO3	3	3	2	-	3	2	-	2	3	2	1	2	1	2
CO4	3	3	1	-	3	2	-	2	3	2	1	2	1	2
CO5	3	3	2	-	3	2	-	2	3	2	1	2	2	2
CO*	3	3	2	-	3	2	2	2	3	2	1	2	3	2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MC2202	Essence of Indian Traditional Knowledge	3:0:0	0

Course Objectives:

- Facilitate the students with the concepts of Indian traditional knowledge and to make them understand the importance of roots of knowledge system (L2)
- Importing basic principle of thought process reasoning and inference sustainability of Indian traditional knowledge system (L2)
- Comprehend the legal framework, traditional knowledge, biological diversity act 2002 and geographical indication act 2003 (L3)
- Focus on traditional knowledge and intellectual property mechanism
- Analyze traditional knowledge in various sectors (L3)

Course Outcomes: At the end of this course, students will be able to

1. Compare physical and social contexts of traditional knowledge. (L2)
2. Interpret the role of government in harnessing (To protect natural resources) Traditional Knowledge (L2)
3. Analyze plant variant protections and evaluate farmers right act (L4)
4. Evaluate strategies to increase the protection of traditional knowledge and Intellectual Property Rights. (L3)
5. Compare traditional knowledge in different sectors. (L4)

Unit-I:

Introduction to Traditional Knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge

Applications: Compare and contrast the traditional knowledge with western knowledge.

Unit-II:

Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

Applications: Identify and implementation of traditional knowledge in present scenario.

Unit-III:

Legal framework and Traditional knowledge in Food: A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PVPFR Act);B:The Biological Diversity Act 2002

and Rules 2004, the protection of traditional knowledge bill, 2016. Importance of food – Styles of food-traditional food- Modern Food- Factors influencing food choice- Economic and Physical Determinants- Uniqueness of Culture in Food.

Applications: Establish an effective system for the protection of plant varieties and observe nutrition levels of traditional and modern food items

Unit-IV:

Traditional knowledge and intellectual property: Systems of traditional knowledge protection- Legal concepts for the protection of traditional knowledge- Certain non IPR mechanisms of traditional knowledge protection- Patents and traditional knowledge- Strategies to increase protection of traditional knowledge- global legal FORA for increasing protection of Indian Traditional Knowledge.

Applications: Case study to recognize legal concepts, protection of culture and Indian traditional knowledge.

Unit-V:

Traditional Knowledge in Different Sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture,

Applications: Generate the report on Traditional and current methods of cultivation and observe yield levels

Reference Books:

1. Traditional Knowledge System in India, by AmitJha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002
4. "Knowledge Traditions and Practices of India" KapilKapoor, Michel Danino

COURSE OUTCOMES VS POs & PSOs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1):

CO No.	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	1	1	1	-	-	-	1		1
CO2	-	-	-	-	-	1	2	3	-	-	-	1		1
CO3	-	-	-	-	-	2	1	3	-	-	-	2		2
CO4	-	-	-	-	-	2	2	3	-	-	-	2		2
CO5	-	-	-	-	-	2	2	3	-	-		2		2
CO*	-	-	-	-	-	2	2	3	-	-		2		2

** For Entire Course, CO vs. PO-PSO Mapping*

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MC2203	English for Jobseekers	3:0:0	0

Course Objectives:

- Encourage use of a wide range of grammatical structures and vocabulary in speech and writing
- Demonstrate good writing skills for effective paraphrasing, argumentative essays and formal correspondence
- Provide training and opportunities to develop fluency in English through participation in formal group discussions and presentations using audio-visual aids
- Knowing the best practices at the workplace to perform well in the interview.
- Encouraging smart self-learning, communication skills which focus on employability.

Course Outcomes: At the end of this course, students will be able to

1. Understand the grammatical forms of English and the use of these forms in specific communicative and career context (L2)
2. Use a wide range of reading comprehension strategies appropriate to texts, to retrieve information (L3)
3. Strengthen their ability to write paragraphs, essays, emails and summaries (L2)
4. Improve their speaking ability in English both in terms of fluency and comprehensibility by participating in Group discussion and oral assignments (L3)
5. Prepare their own resume and answer interview related questions unhesitatingly with acceptable soft skills (L3)

Unit 1

Preparing for Written Assessment

Grammar: Articles: Know how to use different types of Articles**,** use articles appropriately in context Identify errors in the use of articles, **Prepositions**: Learn to use prepositions in context, Identifying errors in the use of prepositions, Look at the different functions of Prepositions, **Tenses**:understand the different form of tense used in sentences, know the various purposes of using different Tense forms, Use appropriate tense forms of verbs in context, Identify the errors in the use of tense forms, **Concord**: Know how to identify Subject-Verb-Agreement in sentences, Use SVA appropriately in Context, identify the errors in the use of SVA, **Voices**:Know when to use Active or Passive Voice, Convert Active sentences to Passive ones,Relative Clause: Know what relative pronouns are, know when to use relative clauses,know the functions of Relative Clauses.

Soft Skills: Leadership:Introduction to Leadership, Leadership Power, Leadership Styles, Leadership in Administration. **Interpersonal Relations**:Introduction to Interpersonal Relations, Analysis of different ego states, Analysis of Transactions, Analysis of Strokes, Analysis of Life position

Unit 2

Reading Comprehension:

Purposes & Strategies of Reading:know the general purpose of Reading,assess your skills of reading ,develop reading Strategies **Skimming for details**:Skim through a variety of passages, understand how skimming will orient you to the text, **Identifying main Ideas**:Identify the main ideas in the give text,Look for supporting statements in a passage, understand how the writer supports main ideas with details **Scanning for information:**Scan passages for factual information, understand how scanning can help find certain answers quickly,know how to look for factual answers,**drawing inferences:**Understand how to draw inferences,infer meanings while reading passages, **vocabulary**:Learn strategies to understand difficult words used in the passage,Apply strategies of reading to understand a variety of passages,**practise tests**

Soft Skills:Communication: Introduction to Communication, Flow of Communication, Listening, Barriers of Communication, How to overcome barriers of communication. **Stress Management**:Introduction to Stress, Causes of Stress, Impact Stress, Managing Stress

Unit 3

Writing paragraphs & Essays

Features of Good Writing: understand what makes a piece of writing good, Analyze & discuss some samples of good & bad writing, **Gathering Ideas**: Discuss various techniques for gathering ideas before you start writing, practice some of the techniques that can be used in the Prewriting stage ,**Purposes of Writing:** understand the importance of purpose of writing, explore various purpose of writing, choose content & language based on the purpose **Writing for Specific audience:** study ways of tailoring content to suit a target audience, analyze text to deduce the target audience, discuss how language is used to suit the target audience **organizing ideas:** understand the importance of organising ideas in a text, Learn the different ways of organising ideas,practice organising ideas while writing **Writing an introduction:** Know the importance of a good introduction, understand the different ways in which writers catch the attention of readers, **Developing supporting ideas:** Learn how to develop your ideas in a paragraph, discuss a variety of supporting ideas, **Writing a conclusion:** Learn the different parts of a conclusion, Practice writing an effective conclusion **Using linkers:** Learn the different types of Linkers or cohesive devices, Discuss why it is important to use connectors in writing, **Choosing the right words:** Discuss why writers make a careful choice of language, Learn how to select language to make the intended impact, **Writing film & book reviews:** Learn the different categories of books & films, Know the elements which go into analyzing books & films, Write your own film & book reviews **Common errors in writing, editing & proofreading**: Practice correcting errors in basic sentence structure, Learn to proof-read & edit your draft before writing the final version

Soft Skills: Group Dynamics and Team Building: Importance of groups in organization, Interactions in group, Group Decision Taking, Team Building, Interaction with the Team, how to build a good team?

Unit 4

Preparing for oral Assignment

Group Discussion: Group Discussions as a tool for selection, skills for GD, Leadership & Problem-Solving Skills, Types of GD, Group Dynamics, Roles & Functions: Beginning, Presenting, Elaborating, Roles & Functions: Clarifying, Synthesizing & Challenging, Roles & Functions: Agreeing, Disagreeing & Summarizing., Etiquette: Body Language & Time Management, GD Activities

Soft Skills: Conflict Management: Introduction to Conflict, Causes of Conflict, Managing Conflict **Time Management:** Time as a Resource, Identify Important Time Wasters, Individual Time Management Styles, Techniques for better Time Management.

Unit 5

Interview Skills

Purpose of interviews: Know what recruiters looking for during Interviews, Become familiar with the process of career search, understand your skills, interests, achievements and attitude better **Preparing a Resume:** Understand what a job application is, know the details to be included in a CV, know how to lay out details of a CV & prepare CV on your own **Writing a Cover Letter:** study the information which is included in a cover letter. learn how to organize information in a cover letter ,**Before and at the interview:** learn how to prepare for an interview, learn how to behave during the interview, discuss what the interviewer might assess you on **Answering FAQs about yourself & your families:** Learn how to answer questions about yourself & family, Learn how to identify & talk about your strengths and Weaknesses **Answering FAQs about Likes & Dislikes:** Learn to choose interests which will be relevant to your Interview. learn to speak about your likes & Dislikes **Answering FAQs about Justifying your candidature:** Know what you need to say to answer a question about yourself, Be able to answer questions about your suitability for a job **Answering FAQs about Priorities, Attitudes & Biases:** Understand what your priorities will be in a job & learn to talk about them, learn to correct understanding of your attitude, biases & prejudice, if any, towards others, know positive qualities that are valued at work **Answering FAQs about Professional goals:** Become aware of the things you need to keep in mind while choosing a job, Set goals for your professional growth & plan how to achieve them **Public Speaking: Planning, Practice & Delivery:** Plan one minute speeches on simple topics, understand how to capture the audience's attention, be able to create strong closing statements.

Soft Skill Motivation: Introduction to Motivation, Relevance and types of Motivation, Motivating subordinates, Analysis of Motivation

ASSESSMENT

The learners will demonstrate their knowledge and abilities through completion of the following required assessments while or at the end of this course. —1 Quiz, 1 GD, 2 Activities on Interview Readiness and Soft skills, 1 Personal Interview

Quiz: (10M)

Quiz is conducted on Grammar, Vocabulary and Reading Comprehension. The Quiz consists of 50 questions and will be scaled down to 10 Marks. Duration of the quiz is 1hr 30 Min only and it is Computer Based Test (CBT)

GD:(10 M)

1. Each student has to perform 5 Group Discussions during the course which fetches them 5 Marks.
2. The Final Assessment through one formal GD by the External Examiner is for 10 marks that are scaled down to 5 marks .

The GD will be assessed on the following criteria :

1. Content (3M)
2. Body Language(2M)
3. Group dynamics & Leadership Skills (3M)
4. Communication Skills (2M)

Activities on Interview Readiness:(10M)

The external Examiner assess on Interview readiness

1) **Tell something about Yourself (5M)**
   Assessment Parameters:
   - Initiation
   - Confidence level
   - Body Language
   - Attention Grabbing
2) **JAM (5M):**Student will be given a topic on-Spot and will be assessed by the External examiner on
   - Flow of Speech (2M)
   - Accuracy and Language (2M)
   - Confidence (1M)

Soft Skills:(10M)

Student will be Assessed on

- Presentation of his/her Readiness of Interview (Grooming) with Prepared Resume (5M)
- Aptitude based question/Case study/Behavior based Question (5M)

Resume:(10 M)

Each student is required to submit 3 independently written Resumes during the course. Specific requirements for each one is accessed on the following Link: https://docs.google.com/document/d/1W15961dOEnIxlnMm9BKyO8L9WIa7nPbEfgR-9DT_m Rg/edit?usp=sharing

Grading:

Assessment Model	Points
Quiz	**10**
Resume	**10**
GD	**10**
Soft Skills Activity	**10**
Personal Interview	**10**
Total	**50**

Pass Criterion:

1. Student has to Secure 30 Marks to pass this examination
2. Student who is having an achievement certificate of any National or International Level Quiz/Psychometric Analysis, he/she has to secure a Minimum 20 Marks in this examination (Certificate+20 Marks) to pass the summative exam.
3. Clearing all categories is mandatory. Need to get 60% in each category
4. 20M +Certificate=Successful or 30M+No certificate=Successful

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CO4	-	-	-	-	3	3	-	2	3	3	-	2	-	3
CO5	-	-	-	-	3	3	-	-	2	3	-	2	-	3
CO*	-	-	-	-	3	3	-	2	2	3	-	2	-	3

** For Entire Course, CO vs. PO-PSO Mapping*