COURSE STRUCTURE(R19)
AND
DETAILED SYLLABUS
(II YEAR)

ELECTRICAL & ELCTRONICS 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 (CSE, EEE & ME)
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

B. Tech II-Year Course Structure –R19

II Year – I SEMESTER							
S. No.	**Course code**	**Subjects**	**Category**	**L**	**T**	**P**	**Credits**
1	R19BSH-MA2102	Complex Variables, Probability and Statistics	BS	3	0	0	3
2	R19EEE-ES2101	Electrical Circuit Analysis – II	ES	3	0	0	3
3	R19EEE-PC2101	Electrical Machines-I	PC	3	0	0	3
4	R19ECE-PC21**	Electronic Devices and Circuits	PC	3	0	0	3
5	R19EEE-PC2102	Electro Magnetic Fields	PC	3	0	0	3
6	R19BSH-HM21**	Managerial Economics & Financial Analysis	HM	3	0	0	3
7	R19ME-PC2108	Thermal and Hydro Prime Movers Lab	PC	0	0	3	1.5
8	R19EEE-ES2102	Electrical Circuits Laboratory	ES	0	0	3	1.5
9	R19BSH-MC21**	Professional Ethics and Human values	MC	2	0	0	0
10	R19BSH-SDC2101	English for Competitive Exams	SDC	2	0	0	0
11	R19EEE-MC2101	MOOCS-1	MC	0	0	0	0
Total				**24**	**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-PC22**	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-PC22**	Signals and Systems	PC	3	0	0	3
7	R19EEE-PC2205	Electrical Machines Lab – I	PC	0	0	3	1.5
8	R19ECE-PC22**	Electronics Devices & Circuits Lab	PC	0	0	3	1.5
9	R19BSH-MC22**	Essence of Indian Traditional Knowledge	MC	3	0	0	0
10	R19BSH-SD2201	English for job seekers	SD	3	0	0	0
12	R19EEE-SI2201	Summer Internship	SI	0	0	0	0
Total				**24**	**0**	**6**	**21**

L-Lecture, T-Tutorial, P-Practical, C-Credits

II Year –I Semester Syllabus

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MA2102	**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. (L3)
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 test to 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 Outcomes: The students are able to

- examine continuity and differentiability for complex functions. (L2)
- determine the analyticity using Cauchy-Riemann equations to complex functions. (L3)
- find the analytic function using Milne-Thompson method. (L3)

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 Outcomes: The students are able to

- evaluate the Taylor and Laurent expansions of simple functions (L2)
- determine the nature of the singularities of an analytic function. (L2)
- find the residues of an analytic function. (L2)
- apply Cauchy residue theorem to evaluate improper real integrals. (L3)

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 Outcomes: The students are able to

- evaluate the probabilities of events on various random experiments. (L3)

- apply Baye's theorem to real time problems related to conditional probabilities (L3)
- differentiate the properties in discrete and continuous probability distribution. (L2)
- apply Binomial and Poisson distributions for real data to compute probabilities, theoretical frequencies. (L3)
- interpret the properties of normal distribution and its applications. (L2)

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 Outcomes: The students are able to

- explain the concept of estimation, interval estimation and confidence intervals. (L2)
- apply the concept of hypothesis testing for large samples. (L3)

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.

Unit Outcomes: The students are able to

- apply the concept of testing hypothesis for small samples to draw the inferences. (L3)
- estimate the goodness of fit (L3)

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 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. Explain the parameters for different types of two-port network (L2)
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 Outcomes: The students are able to

- Classify the relation between line and phase components of star and delta connected balanced systems (L2)
- Solve three- phase circuits under balanced Condition (L3)

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 Outcomes: The students are able to

- Solve three- phase circuits under unbalanced Condition (L3)
- Make use of wattmeter's to measure three phase power of the three phase circuits (L3)

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 Outcomes: The students are able to

- Summarize initial and final conditions of circuit elements (L3)
- Identify the transient response of electrical networks for different types of excitations

(L3)

- Apply the Laplace transform for steady state and transient analysis (L3)

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 Outcomes: The students are able to

- Find parameters for different types of network (L1)
- Explain the concepts of Two-port Network parameters (L2)
- Analyze the stability of network functions using poles and zeros (L4)

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.

Unit Outcomes: The students are able to

- Analyze electrical equivalent network for a given network function (L4)
- Simplify the network using passive elements (L4)

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 Code	Course title	Hrs./week L: T: P	Credits
R19EEE-PC2101	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. Understand the concept of electromagnetic energy conversion(L2)
2. Analyze the conditions required of Self Excitation of DC Generators and Parallel Operation of DC Generators (L4)
3. Recognize the operation of DC Motor and starting & speed control techniques (L2)
4. Explain the operation & Performance of single phase Transformer (L2)
5. Analyze the construction of different Types of Three Phase Transformers & Autotransformers(L4)

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 Outcomes: The students are able to

- Understand the concept of energy, co-energy(L2)
- Appreciate the principles of electromagnetic energy conversion(L2)

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 Outcomes: The students are able to

- Understand the reasons for the drop in terminal voltage when a DC Generator is loaded (L2)
- Analyze the conditions required to operate a DC Generator as a self-excited Generator (L4)

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 Outcomes: The students are able to

- Analyze the Characteristics of DC Motor and its Performance (L4)
- Explain the performance of DC Machine from results of Direct and Indirect Tests (L2)

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 Outcomes: The students are able to

- Calculate the Parameters of Equivalent Circuit to Predetermine Efficiency and Voltage Regulation of Transformer (L3)
- Test the Transformer for determining performance (L3)
- Explain the conditions required Parallel Operation of Transformers (L2)

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.

Unit Outcomes: The students are able to

- Understand the construction and working of Auto Transformer(L2)
- Distinguish between different types of connections of 3-Phase Transformer with respect to phasor diagram and connections (L3)

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

Course Code	Course title	Hrs./week L: T: P	Credits
R19ECE-PC21**	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. Understand the formation of p-n junction and how it can be used as a p-n junction diode in different modes of operation (L2)
2. Understand the basic applications of Diodes as rectifier with and without filters (L2).
3. Implement the nonlinear wave shaping circuits using diodes (L3)
4. Understand the construction, principle of operation of BJT and FET and compare their V-I characteristics in different configurations (L2).
5. Examine the various stability parameters of a Bipolar Junction Transistor in different biasing methods (L4)

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.

Applications:

1. 1.Detection signals in digital networks.
2. Lighting systems in various display boards
3. As switches in logic circuits
4. Diodes in Voltage Multiplier Circuits
5. Diodes in Reverse Current Protection based on their PIV.
6. Diodes in Voltage Spike Suppression

Unit Outcomes: The students are able to

- Understand the construction and operation of diode and special type of diodes (L2).
- Draw characteristics of diode in different configurations (L1).
- Understand the energy Band variations through energy band spectrum (L2).

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) π Filter, comparison of various filter circuits in terms of ripple factors.

Applications:

1. Power supplies for radio, television and computer equipment
2. Rectifying voltage like turning Ac and Dc.
3. Isolating signals from a supply.
4. Used to controlling the size the signal based on circuit requirement.

Unit Outcomes: The students are able to

- Understand the construction and operation of diode application (L2).
- Understand the working procedure of different rectifiers with and without filters (L1).
- Find the efficiency of rectifier (L2).

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,

Applications:

1. Noise elimination in TV receivers.
2. In the case of generating new waveforms and/or shaping the existing older waveforms.
3. Clippers can be used as freewheeling diodes in protecting the transistors from transient effects by connecting the diodes in parallel with the inductive load.
4. In the separation of synchronizing signals existing from the composite color picture signals.
5. Frequently used in FM transmitters for removing the excess ripples in the signals above a certain noise level.
6. Clampers are widely used in test equipment and other sonar systems.
7. For improving the reverse recovery time, clampers are used.

Unit Outcomes: The students are able to

- Explain the basic concepts of Non- linear wave shaping circuits (L2).
- Plot the response of different Clipper and Clamper circuits using Diodes & Transistors (L1).

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.

Applications:

1. Amplifiers and oscillators1.
2. Transistors are used in digital and analog circuits as a switch.
3. Uses in signal amplifier devices
4. Cellular phones would be one of the most widely used applications of transistors. Every cell phone uses a transistor amplifier.
5. Uses in power regulator and controllers
6. In modern electronics IC uses in almost every electronics application.
7. Transistors are used in building some of the integrated circuits (IC).
8. FET uses in analog switches, sample and hold circuits.

Unit Outcomes: The students are able to

- Understand the construction and operation of BJT and FET (L2).
- Draw the input and output characteristics of BJT and FET in different configurations (L1).
- Compare the BJT, FET and MOSFET with respect to their parameters (L2).

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.

Applications:

1. Gain controller devices in communication systems.
2. Thermal stability for practical circuits.
3. Can do load line analysis for classify the power amplifiers.
4. Based on biasing techniques can calculate distortion in amplifiers.

Unit Outcomes: The students are able to

- Explain the need of the BJT and FET biasing (L2).
- Know how to do the load line analysis of transistor (L1).
- Compare different biasing techniques (L2).
- Understand the need of Thermal Stability (L2).

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2102	Electromagnetic 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. Understand the concepts of Coulomb's law, Gauss's law and their applications in electrostatics (L2)
2. Analyze conduction, convention current densities, capacitance and energy stored in dielectrics (L4)
3. Evaluate magneto static fields for simple configurations using Ampere's circuital law, magnetic forces, torque, magnetic dipole and dipole moment (L5)
4. Analyze the magnetic potential, self and mutual inductances in magnetostatics (L4)
5. Understand the time varying electromagnetic fields (L2)

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 Outcomes: The students are able to

- Determine electric field intensity and potentials using Coulomb's law and Gauss's law (L5)
- Understand Laplace's, Poisson's equations and their applications (L2)

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 Outcomes: The students are able to

- Evaluate the capacitance and energy stored in electrostatics (L5)
- Understand the concepts of electric dipole, conduction and convection current densities, energy density (L2)

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 Outcomes: The students are able to

- Apply the concepts of magnetic field intensity using Biot-Savart law, Ampere law (L3)
- Evaluate magnetic field intensity due to an infinite sheet of current and a long filament carrying conductor in different loops (L5)

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 Outcomes: The students are able to

- Determine magnetic forces and torque produced by current carrying elements in magnetic field (L5)
- Understand the concepts of energy stored in the magnetic field (L2)

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.

Unit Outcomes: The students are able to

- Understand time varying fields, Maxwell's fourth equation of electromagnetic induction. (L2)
- Illustrate Maxwell's equations in different forms, Poynting vector, Poynting theorem. (L2)

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-HM21**	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. Equipped with the knowledge of fundamentals of economics, estimating the Demand for a product, Capable of analysing Elasticity & Forecasting methods (L2)
2. Apply production concepts, assess the costs and Determine Break Even Point (BEP) of an enterprise for managerial decision making (L4)
3. Identify the influence and price determination of various markets structures and knowledge of the forms of business organization and Business cycles (L4)
4. Analyze and interpret the process & principles of accounting & apply financial statements for appropriate decisions to run the business profitably (L4)
5. Analyze how to invest adequate amount of capital in order to get maximum return from selected business activity (L4)

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.

Unit Outcomes: The students are able to

- Examine various issues involved in production decision analysis (L1)

- Construct how production function is carried out to achieve least cost combination of inputs(L3)

Apply Break – Even Analysis and its importance in managerial decision making(L4)
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.
Unit Outcomes: The students are able to

- Identify the various market structures like Monopoly, Monopolistic competition (L4)
- Determine the appropriate pricing strategies to be applied in each market(L2)
- Compare the suitability of various organizational and ownership structures like sole trading, partnership (L2)

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.
Unit Outcomes: The students are able to

- Knowledge about the framework for accounting process(L1)
- Analyze financial accounting decisions. .(L3)

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).
Unit Outcomes: The students are able to

- Analyze how capital budgeting decisions are carried out(L4)
- Knowledge of the concepts and various methods of capital budgeting(L1)
- Apply traditional or modern methods of Capital budgeting in business decision making(L3)

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.

Weblinks:

1. Managerial economics and Financial analysis notes
2. https://www.smartzworld.com/notes/managerial-economics-and-financial-analysis-mefa/
3. Production and cost analysis- https://slideplayer.com/slide/5708722/
4. Accounting analysis-
https://www.readyratios.com/reference/accounting/accounting_analysis.html

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. Construct valve and port timing diagrams. (L3)
2. Evaluate performance test on 4 -stroke Diesel engine and petrol engine. (L5)
3. Determine FHP by conducting morse and motoring tests on 4 -stroke petrol engine and prepare heat balance sheet and perform speed test of an IC engine . (L5)
4. Determine the efficiencies of pelton and francis turbines and single stage and multistage centrifugal pumps. (L5)
5. Determine coefficient discharge of venturi and orifice meters and impact of jet on vanes and also determine of loss of head due to sudden contraction . (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.
6. Performance Test on Reciprocating Pump.
7. Calibration of Venturimeter.
8. Calibration of Orifice meter.
9. Determination of loss of head due to sudden contraction in a pipeline.

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-ES2102	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. Verify network theorems (L5)
2. Analyze the concepts of resonance and magnetic circuits (L4)
3. Examine two port networks parameters (L4)
4. Evaluate the powers in three phase network (L5)
5. Determine the parameters of choke coil (L5)

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MC21**	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(L4)
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(L5)
4. Analyze ethical concerns in research and intellectual contexts, including academic integrity. (L4)
5. Equip knowledge about global ethical issues. (L3)

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.

Unit Outcomes: The students are able to

1. Knowledge about morals, values & work ethics. (L3)
2. Develop to respect others, commitment and civic virtue. (L3)
3. Equip with how to live peacefully(L3)

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.

Unit Outcomes: The students are able to

- Study about ethical responsibilities and time management to the engineers. (L2)
- Create awareness about the customs and religions. (L2)
- Knowledge about the different professional roles. (L3)

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

Unit Outcomes: The students are able to

- Demonstrate knowledge to become a social experimenter. (L2)
- Provide depth knowledge on framing of the problem and determining the facts. (L2)
- Study depth knowledge on codes of ethics. (L3)
- Develop utilitarian thinking(L3)

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.

Unit Outcomes: The students are able to

1. Create awareness about safety & risk . (L2)
2. Design Engineer's practices for providing safety. (L3)
3. Provide knowledge on risk benefit analysis. (L3)

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.

Unit Outcomes: The students are able to

- Develop knowledge about global issues. (L3)
- Create awareness on computer and environmental ethics. (L2)
- Analyze ethical problems in research. (L4)
- Give a picture on weapons development. (L3)

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

Subject Code	Subject Name	L	T	P	C
R19 BSH-SDC2101	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. Enable students to identify Parts of Speech and use them flawlessly, write Emails in formal correspondence effectively, participate confidently by introducing oneself in any formal discussion.
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.
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.
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.
5. Realize the technical communicative competence and attainment of grammatically correct structures for formal communication.

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 Outcomes: The students are able to

- Acquire vocabulary and use it contextually(L2)
- identify parts of speech and use them flawlessly in both Speech and Writing (L3)
- write paragraphs and Emails in formal correspondence effectively (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

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 Outcomes: The students are able to

- Acquire vocabulary and use it contextually (L2)
- use Verb forms, Tense and subject verb agreement for effective speaking and

writing (L3)

- produce coherent expressions for professional writing (L4)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

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 Outcomes: The students are able to

- Acquire vocabulary and use it contextually(L2)
- identify the complexity in the structure of a sentence (L2)
- write technical reports and emails for professional communication (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

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 Outcomes: The students are able to

- Acquire vocabulary and use it contextually(L2)
- comprehend a passage and know its gist(L3)
- avoid the errors in both Speech and Writing (L2)
- write letters and emails for official communication(L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

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

Unit Outcomes: The students are able to

- Acquire vocabulary and use it contextually(L2)
- use grammatically correct structures for formal communication (L3)
- write Business Letters effectively (L3)
- participate confidently in any formal discussion and introduce themselves unhesitatingly (L3)

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

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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 (L1)
2. Understand the principle of operation and working of different types of instruments (L2)
3. Calibrate ammeter, voltmeter, and wattmeter by using potentiometer (L5)
4. Select suitable bridge for measurement of electrical parameters (L3)
5. Identify different types of transducers and understand the operation and working of various of digital devices (L3)

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 outcomes: The students are able to

- Understand the static and dynamic characteristics of instruments (L2)
- Choose the right type of instrument for measurement of voltage and current for AC and DC (L1)

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 outcomes: The students are able to

- Measure single phase and three phase power and energy (L5)
- Understand the operation of instrument transformer (L2)

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 outcomes: The students are able to

- Find the unknown parameters using potentiometer (L1)
- Understand the principle of operation and standardization of potentiometers (L2)
- Calibrate the measuring instruments (L5)

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 outcomes: The students are able to

- Select suitable bridge for measurement of electrical parameters (L3)
- Calculate the quality factor (L1)

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.

Unit outcomes: The students are able to

- Select suitable transducers for converting physical quantity to electrical quantity. (L3)
- Understand the concepts various transducers (L2)
- Use digital instruments in electrical measurements (L3)

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
2. https://www.electrical4u.com/electrical-engineering-articles/measurement

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. Analyze principle and operation of three phase induction motors (L4)
2. Discuss the performance characteristics of three phase induction motor (L3)
3. Analyze performance characteristics of synchronous generator (L4)
4. Discuss the performance characteristics of synchronous motor (L3)
5. Understand 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 Outcomes: The students are able to

- Understand the construction and principle of operation of three phase induction motor (L2)
- Analyze the effect of rotor EMF, rotor frequency at standstill and running conditions (L4)

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 Outcomes: The students are able to

- Analyze the performance characteristics of induction motor (L4)
- Discuss the methods of starting, braking and speed control of induction motors (L3)

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 Outcomes: The students are able to

- Analyze the construction-operation-voltage regulation of synchronous generators (L4)
- Understand synchronization of synchronous generators (L2)
- estimate the load sharing of synchronous generator (L5)

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 Outcomes: The students are able to

- Understand the principle of operation of synchronous motor (L2)
- Analyze the performance characteristics of synchronous motor (L4)

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.

Unit Outcomes: The students are able to

- Understand the principle of operation of single phase induction motor (L2)
- Analyze the performance characteristics of single phase induction motor (L4)

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC22**	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 various number systems, error detecting and correcting binary codes (L2)
2. Apply Boolean laws, k-map & Q-M methods to minimize switching functions (L3)
3. Analyze the procedure to design combinational logic circuits (L4)
4. Analyze the procedure to design sequential logic circuits (L4)
5. Design of PLDs and synchronous sequential circuits (L6)

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 Outcomes: The students are able to

- Summarize advantages of using different number systems (L2)
- Explain usefulness of different coding schemes (L2)

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 Outcomes: The students are able to

- Apply basic laws & De Morgan's theorems to simplify Boolean expressions (L3)
- Compare K- Map & Q-M methods of minimizing logic functions (L5)

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 Outcomes: The students are able to

- Apply Boolean algebra for describing combinational digital circuits (L3)
- Analyze standard combinational circuits such as adders, subtractors, multipliers, comparators etc. (L4)
- Implement logic functions with decoders and multiplexers (L3)

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 Outcomes: The students are able to

- Describe behaviour of Flip-Flops and Latches (L2)
- Construct complex digital systems using components such as registers and counters (L3)

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

Unit Outcomes: The students are able to

- Compare different types of Programmable Logic Devices (L5)
- Design synchronous sequential circuits using flip flops (L5)
- Compare Moore and Mealy machine models (L2)

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 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 outcomes: The students are able to

- Explain the open loop and closed loop systems (L2)
- Calculate the transfer function of a given system by using block diagram algebra and signal flow graph method (L3)

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 outcomes: The students are able to

- Understand the time response of first order and second order systems (L2)
- Derive the different time domain specifications for second order systems (L2)
- Determine time response specifications and steady state error for the second order system (L3)

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 Outcomes: The students are able to

- Find the stability of the given system by Routh's stability criterion (L1)
- Identify whether the system is stable or not by using root locus technique (L3)

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 outcomes: The students are able to

- Identify the stability of linear time invariant systems using frequency response methods (L3)
- Derive the different frequency domain specifications for second order systems (L2)
- Find the gain and phase margin from bode diagrams and Nyquist plots for understanding their implications in terms of stability (L2)
- Explain the concept of compensators (L2)

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.

Unit outcomes: The students are able to

- Analyze State space models of linear time invariant systems (L4)
- Determine state space model for the given system (L3)
- Understand the concepts of controllability and Observability (L2)

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
2. https://www.electrical4u.com/electrical-engineering-articles/control-system
3. https://www.tutorialspoint.com/control_systems/control_systems_quick_guide.htm

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. Explain the layouts of conventional and non-conventional power stations (L2)
2. Calculate the consumer tariffs and the load capacity of the plant (L3)
3. Compute the transmission line parameters (L5)
4. Estimate the performance of transmission lines (L5)
5. Explain 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 outcomes: The students are able to

- Understand the components of Thermal , Hydro and Nuclear power stations (L2).
- Analyze the principle of operation of Thermal, Hydro and Nuclear power stations (L4).
- Understand the operation of solar and wind power plants (L2).

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 outcomes: The students are able to

- Understand the concepts of factors relating to Loads (L2).
- Analyze the economic aspects of power system operation and different tariff methods used in power systems (L4).

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 outcomes: The students are able to

- Design the transmission line parameters for single and double circuit lines (L3)
- Design the transmission line parameters for three phase, single and double circuit lines (L3)

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 outcomes: The students are able to

- Analyze the transmission lines and represent them by suitable equivalent circuits (L4)
- Understand the concept of surge impedance loading, wavelength, and velocity of propagation (L2)

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.

Unit outcomes: The students are able to

- Understand the principle and operation of Air insulated substations (L2)
- Understand the principle and operation Gas insulated substations (L2)

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
4. http://www.electrical4u.com

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC22**	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 and system properties (L4).
2. Apply the Fourier series and Fourier transform to obtain the spectral characteristics of continuous time periodic and aperiodic signals (L3).
3. Determine the Nyquist rates of low pass and band pass signals by using sampling theorem (L3).
4. Analyze the linear time invariant systems by applying the concepts of convolution and correlation (L4).
5. Use Laplace transform and Z - transform to obtain pole-zero plot with ROC for continuous time discrete time signals (L3).

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 outcomes: The students are able to

- Define basic continuous and discrete time signals mathematically and sketch the signals that involve simple modification of the independent/dependent variable (L2).

- Familiar with commonly used signals such as the unit step, ramp, impulse function, sinusoidal signals and complex exponentials (L1).
- Classify signals as continuous-time Vs. discrete-time, periodic Vs. non-periodic, energy signal Vs. power signal, odd Vs. even etc (L4).
- Calculate the various characteristics of a signal such as even part, odd part, energy, power and period etc., (L3).
- Construct or represent any arbitrary signal by using basic signals such as impulse and step signals (L3).
- Test a given system for a linearity, causality, stability, time invariance, inevitability and memory properties (L3).
- Analyze the systems according their properties (L4).
- Determine the Fourier series coefficients for any periodic signal and plot the frequency spectrum of that periodic signal (L3).

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 outcomes: The students are able to

- Apply Fourier transform to obtain frequency spectrum of periodic and aperiodic signals (L3)
- Apply properties of the Fourier transform including linearity, shift, symmetry, scaling, modulation and convolution etc., in communication and filtering applications (L3)
- Determine the continuous-time signal corresponding to their transforms by applying Inverse Fourier transform (L3).
- Illustrate the effect of sampling of a continuous time signal for various sampling rates (L3).
- Determine the Nyquist sampling rate for a continuous-time signal by applying sampling theorem (L3).
- Explain the importance of sampling theorem for both low pass and band pass signals (L2).

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 outcomes: The students are able to

- Determine the impulse response/transfer function of a given LTI system (L3)
- Find the response of a given LTI system for any input signal (L3)
- Explain the filter characteristics of linear systems for example LPF, HPF and BPF (L2).
- Analyze the LTI systems according their properties (L4).
- Find the energy/power of a signal by applying correlation properties and Parseval's theorem (L3)

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 outcomes: The students are able to

- Determine the Laplace transform and the associated region of convergence and pole-zero plot for a continuous time signal (L3).
- Apply Inverse Laplace transform to obtain the signal in the time domain by using partial fraction expansion method and some specific constraints on the ROC (L3).
- Find the Laplace transform of certain signals which are synthesized in the form of other basic waveforms (L3).
- Use the Laplace transform as an analytical tool in the analysis and study of LTI systems which are represented by linear constant -coefficient differential equations (L4).
- Apply Laplace transform properties to find the Laplace transform and the associated region of convergence and pole-zero plot for a continuous time signal if that signal is represented as (i) linear combination of other signals (ii) time shifted of other signal (iii) time scaling of other signal, (iv) convolution of other signals (v) Differentiation of other signal (vi) Integration of other signal (vii) multiplication of other signals (ix) other signal which is multiplied with time (x) other signal which is multiplied with exponential signal etc. (L3).

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.

Unit outcomes: The students are able to

- Determine the Z - transform and the associated region of convergence and pole-zero plot for a discrete time sequence (L3).
- Distinguish between Fourier and Z transforms (L2).
- Apply Inverse Z - transform to obtain the sequence in the time domain by using partial fraction expansion method, long division method and some specific constraints on the ROC (L3).
- Use the Z - transform as an analytical tool in the analysis and study of LSI systems which are represented by linear constant -coefficient difference equations (L4).
- Apply Z – transform properties to find the Z – transform and the associated region of convergence and pole-zero plot for a discrete time sequence if that sequence is represented as (i) linear combination of other sequences (ii) time shifted of other sequence (iii) time reversal of other signal, (iv) convolution of other signals (v) Accumulation of other signals (vi) time expansion of other signal etc. (L3).

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19EEE-PC2205	Electrical Machines –I Laboratory	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. Determine the performance of DC Shunt Generator (L5)
2. Determine the performance of DC Shunt Motor (L5)
3. Understand the Speed Control Techniques of DC Shunt Motor (L2)
4. Evaluate the performance of single-phase Transformers (L5)
5. Achieve 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 Code	Course Title	Hrs./Week L: T: P	Credits
R19ECE-PC22**	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. Understand the switching characteristics of Diodes and Transistors applications (L1).
2. Analyze the working principle of BJT and FET in different configurations (L4).
3. Analyze the response of linear wave shaping circuits for different signals (L4).
4. Sketch the response of nonlinear wave shaping circuits using nonlinear elements (L3).
5. Identify the various stability parameters of a Bipolar Junction Transistor, Field Effect Transistor in different biasing methods (L3).

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 Code	Course Title	Hrs./Week L: T: P	Credits
R19BSH-MC21**	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. Knowledge about the concept of traditional knowledge and analyze social context (L2)
2. Apply significance of traditional knowledge protection (L3)
3. Analyze various enactments related to the protection of plant varieties (L4)
4. Evaluate desired concepts of Intellectual property to protect the traditional knowledge(L4)
5. Compare the traditional knowledge in various 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

Unit Outcomes: The students are able to

- Recognize the social change in traditional knowledge(L4)
- Contrast and compare characteristics importance kinds of traditional knowledge. (L2)
- Analyze physical and social contexts of traditional knowledge. (L4)

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.

Unit Outcomes: The students are able to

- Identify the need of protecting traditional knowledge. (L2)
- Apply significance of TK protection. (L3)
- Analyze the value of TK in global economy. (L3)
- Evaluate the role of government in harnessing Traditional Knowledge. (L4)

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.

Unit Outcomes: The students are able to

- Contrast and compare the Scheduled Tribes and other traditional forest dwellers(L2)
- Analyze plant variant protections and evaluate farmers right act(L4)
- Evaluate food security and protection of TK in the country(L5)

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.

Unit Outcomes: The students are able to

- Evaluate strategies to increase the protection of traditional knowledge and Intellectual Property Rights (L4)
- Apply systems of traditional knowledge protection. (L3)
- Analyze legal concepts for the protection of Traditional Knowledge. (L4)

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,

Unit Outcomes: The students are able to

- Compare traditional knowledge in different sectors. (L2)
- Apply traditional knowledge in engineering. (L3)

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

E-Resources:

1 https://www.utrechtjournal.org/articles/10.5334/ujiel.283/
2 https://en.wikipedia.org/wiki/Traditional_knowledge
3 https://www.scconline.com/blog/post/2018/04/23/protecting-traditional-knowledge-the-india-story-till-date/
4 https://sciencebusiness.net/news/72773/India-leads-the-way-in-protecting-traditional-knowledge

Course Code	Course Title	Hrs./Week L: T: P	Credits
R19 BSH-SDC2201	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
2. use a wide range of reading comprehension strategies appropriate to texts , to retrieve information
3. strengthen their ability to write paragraphs, essays,emails and summaries
4. improve their speaking ability in English both in terms of fluency and comprehensibility by participating in Group discussion and oral assignments
5. prepare their own resume and answer interview related questions unhesitatingly with acceptable soft skills

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 Outcomes: The students are able to

1. Comprehend the factors that influence use of grammar and vocabulary in speech and writing(L3)
2. Produce a range of valid grammatical sentences in the real world situations and professional environment.(L3)
3. develop employability skills through Leadership skills and interpersonal skills (L3)

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 Outcomes: The students are able to

1. assess the reading skill by developing reading strategies (L3)
2. Understand the skimming & scanning techniques orients to identify the theme, purpose and statements.(L2)
3. develop employability skills through communication skills and stress management(L3)

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 Outcomes: The students are able to

1. produce logically coherent argumentative essays (L3)
2. understand the use of passive voice in academic writing (L2)
3. use appropriate vocabulary to express ideas and opinions (L2)
4. develop employability skills through group dynamics and team building (L3)

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 Outcomes: The students are able to

1. participate in group discussions using appropriate conventions and language strategies and develop advanced listening skills for in-depth understanding of academic text(L3)
2. collaborate with a partner to make discussions (L2)
3. develop employability skills through conflict management and time management(L3)

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

Unit Outcomes: The students are able to

1. prepare a CV with a cover letter to seek internship/ job (L2)
2. understand the structure of Interviews and familiar with frequently asked questions while interview and how to respond to it (L3)
3. develop employability skills through motivation and analysis of motivation (L3)

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