Bachelor of Technology

(B Tech)

3rd Semester

Course Structure

2022 Batch

Department of

Electrical Engineering

NIST Institute of Science and Technology Autonomous,
Pallur Hills, Berhampur, 761008, Odisha
www.nist.edu

Third Semester					
Theory					
Sl. No	**Category**	**Subject Code**	**Subject Name**	**L-T-P**	**Credit**
1	BSC	22CM3BS02T	Mathematics-III	3-0-0	3
2	HSMC	22CM3HS01T/ 22CM3HS02T	**Humanities-I** Organizational Behavior/ **Management-I** Engineering Economics and Costing	3-0-0	3
3	ESC	22CM3ES01T	Data Structure Using C	3-0-0	3
4	ESC	22EE3ES01T	Analog Electronics Circuit	3-0-0	3
5	PCC1	22EE3PC01T	DC Machines and Transformer	3-0-0	3
6	PCC2	22EE3PC02T	Circuit Theory	3-0-0	3
7	MC	22CM3MC01T	Environmental Science and Engineering	3-0-0	0
Total Credit (Theory)					18
Practical					
1	ESC	22CM3ES01L	Data Structure using C Laboratory	0-0-2	1
2	ESC	22EE3ES01L	Analog Electronics Circuit Laboratory	0-0-2	1
3	PCC	22EE3PC01L	DC Machines and Transformer Laboratory	0-0-2	1
4	PCC	22EE3PC02L	Circuit Theory Laboratory	0-0-2	1
5	PSI	22CM3PS01L	Summer Internship / Summer Training / MOOC Certification	0-0-2	1
Total Credit (Practical)					5
Total Semester Credit					23

Bachelor of Technology

(B Tech)

3rd Semester

Detailed Syllabus

2022 Batch

Department of

Electrical Engineering

NIST Institute of Science and Technology Autonomous,
Pallur Hills, Berhampur, 761008, Odisha
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Course Code:	Course Name:	L-T-P:	Credit:
22CM3BS02T	Mathematics-III	3-0-0	3

Objectives:

The course should enable the students to:

1. Enrich the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Apply the concept to find numerical differentiation and integration. Solve first order ordinary differential equation.
3. Apply the concept of Numerical analysis to enrich the knowledge of complex numbers, and complex functions.
4. Apply the knowledge of complex analysis to solve various integrations.

Module – I: Root Finding and Interpolation [8 Hours]

Root Finding: Introduction, Root finding by Bisection Method, Newton-Raphson Method, Regula-Falsi Method, Secant method, Fixed point method.

Interpolation: Lagrange, Newton forward and Backward, Divided Difference Method.

Module – II: Numerical Differentiation and Integration [8 Hours]

Differentiation: Derivative using Newton's forward and backward difference formula.

Integration: Trapezoidal Method, Simpson's 1/3rd and 3/8th rules, Gauss-Quadrature 2 -point& 3- point method.

Module – III: Numerical Solution of Ordinary Differential Equation [7 Hours]

First Order Differential equation by Taylor's series Method, Euler's method, Modified Euler's method, Runge-Kutta 4th order, Predicator & Corrector methods (Adams-Bashforth Method of order 4).

Module – IV: Complex Functions, Line Integral [9 Hours]

Complex Functions: Analytic function, C-R equation, Laplace equation, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic function.

Complex Integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of Analytic functions.

Module – V: Power series, Taylor series, Laurent series, Residue [8 Hours]

Sequences, Series, Power series, Functions given by power series, Taylor and Maclaurin series, Laurent series, Singularities and Zeros, Residues, Residue integration method.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, Tenth Edition, Willey.

(Chapter: 13, 14, 15 (15.1 – 15.4), 16 (16.1 – 16.3), 19 (19.1 – 19.3, 19.5), 21 (21.1 -21.2)

Reference Books:

1. M. K. Jain, S. R. K. Iyenger and R. K. Jain, Numerical Methods for Scientific and engineering Computations, New Age International Publication (P) Ltd.
2. B. V. Raman, Higher Engineering Mathematics, Mc-Graw Hills Education.
3. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers.

Course Outcomes:

On completion of this course, students are able to:

1. Use the knowledge of numerical analysis to find the root and interpolating polynomial.
2. Solve various differentiation and integration by numerical methods. Solve the first order ordinary differential equation by the concept of Numerical analysis
3. Increase the knowledge about the complex plane and complex functions
4. Solve various integrations by the help of complex analysis.

Course Code:	Course Name:	L-T-P:	Credit:
22CM3HS01T	**Organisational Behaviour**	**3-0-0**	**3**

Course Objectives:

Developing an understanding of the behaviour of individuals and groups inside organizations by enhancing the skills in appreciating individuals, interpersonal, and group process for increased effectiveness both within and outside of organizations is the goal of any organisation. Through this course students will develop theoretical and practical insights and problem-solving capabilities for effectively managing the organizational processes.

Syllabus

Module-I: Fundamentals of OB (6 Hours)

Introduction: Definition, nature and scope of OB (environmental and organizational context), Relationship between OB and the individual, Impact of IT, globalization and diversity on OB.

Module-II: Foundations of Individual Behaviour (10 Hours)

Personality: Meaning and definition, Determinants of personality, Personality traits, Personality and OB. Perception: Meaning and definition, Perceptual process, Importance of perception in OB. Motivation: Nature and importance, Herzberg's Two Factor Theory, Maslow's Need Hierarchy Theory, Alderfer's ERG Theory. Attitude: Definition, nature and dimensions, Attitude and OB. *Learning: Nature, learning and OB.*

Module-III*: Group Dynamics* of OB-I (8 Hours)

Communication: Types, interactive communication in organizations, barriers to communication, strategies to improve the follow of communication. Stress and Conflict: Meaning and types of stress, Meaning and types of conflict, Effect of stress on individuals, strategies to cope with stress and conflict.

Module-IV *Group Dynamics* of OB-II (6 Hours)

Power and Politics: Meaning and types of power empowerment. Groups Vs. Teams- Nature of groups, dynamics of informal groups, dysfunctions of groups and teams, teams in modern work place.

Module-V Foundations of Organizational Behaviour (6 Hours)

Organizational Culture: Culture and organizational effectiveness. Organizational Change: Types of change, reasons to change, resistance to change. *Organisational Structure and Development: Concepts and process.*

Text Book:

[1] Organizational Behaviour, Robbins, Judge, Sanghi, Pearson.

Reference Books:

[2] Understanding Organizational Behaviour, Parek, Oxford

[3] Organizational Behaviour, Hitt, Miller, Colella, Wiley

[4] Organizational Behaviour, K. Awathappa, HPH.

[5] Organizational Behaviour, VSP Rao, Excel

[6] Understanding Organizational Behaviour, Parek, Oxford

Course Outcomes:

1. Students will understand the essential of maintaining the inter-personal relationships in organisations.
2. Personality factors will be effectively used to understand the communication among groups.
3. The reasons for conflict will be known and prescriptive methods can be devised to enhance higher productivity in organisations.
4. Being an employee in an organisation the importance of organisational change and culture can be known to all.

Course Code:	Course Name:	L-T-P:	Credit:
22CM3HS02T	**Engineering Economics and Costing**	**3-0-0**	**3**

Course Objectives:

At the end of the course the engineering students will be able:

1. To prepare engineering students to understand the basic concepts of Engineering economics and their application.
2. To carry out numerically the effects of changes in demand and supply on price determinations of products and services.
3. To justify or reject alternative projects in the light of changing domestic and global scenario on the eve of technological innovations.
4. To analyse the macroeconomic environment and financial system of the country and its impact on business society and enterprise.

Module-I: (10 Hrs.)

Engineering Economics: Nature and Scope, Basic Problems of an Economy, Micro and Macro Economics; Demand: Meaning of demand, Determinants of demand, Demand function, Law of demand and its exceptions, Elasticity of demand and its measurement, (Simple numerical problems to be solved). Supply: Meaning of Supply, Determinants of Supply, Supply function, Law of Supply and its exception, Elasticity of Supply.

Module-II: (7 Hrs.)

Production: Factors of Production, Production Function; Laws of Returns: Law of Variable Proportions, Law of Returns to Scale, Cost and Revenue Concepts: Short Run Total Costs, Long Run Average Cost Curves, Total Revenue, Average Revenue and Marginal Revenue,

Module-III: (6 Hrs.)

Market Structures: Basic understanding of different Market Structures; Determination of Equilibrium Price under Perfect Market Competition and Monopoly. *Margin of safety and Break Even Analysis*: Linear Approach (Simple numerical problems to be solved).

Module-IV: (10 Hrs.)

Time Value of Money: Interest- Simple and Compound, Nominal and Effective Rate of Interest, Cash flow diagrams, Principles of Economic Equivalence, Evaluation of Engineering Projects: Present, Future and Annual worth Method, Rate of Return Analysis; Cost-Benefit Analysis

Module-V: **(7 Hrs.)**

Inflation: Meaning of Inflation, Types, Causes and Measures to Control Inflation. National Income: Definition, Concepts of National Income and its measurement, Banking: Commercial Bank, Functions of Commercial Bank, Central Bank, Functions of Central Bank.

Text Books:

1. Principles of Economics: Deviga Vengedasalam & Karun agaran Madhavan-Oxford Publication

Reference Books:

1. Engineering Economics and Costing: D.M.Methani & Suresh Chandra Das-Himalaya Publishing House
2. Engineering Economics and Costing: Sasmita Mishra-PH Learning Private Limited
3. R.Panneerselvam, 'Engineering Economics', PHI
4. Riggs,Bedworth and Randhwa, 'Engineering Economics', McGrow Hill Education India
5. Engineering Economics and Costing: Mahendra P. Agasty, Scitech Publications (INDIA) Pvt. Ltd.

Course Code: 22CM3ES01T	Course Name Data Structures using C	L-T-P 3-0-0	Credit : 3

Course Objective:

1. Able to identify the appropriate data structure for given problem.
2. Determine and analyze the time and space complexity of given Linear and Non-Linear data structures Algorithms..
3. Implement operations like searching, insertion, and deletion, traversing mechanism etc. on various datastructures [linear and non linear] and analyzing the complexity of each operation
4. Have practical knowledge on the applications of data structures. Knowledge,.

Module-I: [10 Hrs]

Abstract Data Types – Definition and Representation, ADT of rational number, ADT of Stack, Data Structure and ADT. Stack and its usages: reversing string, matching parentheses, in fix to postfix, decimal to binary number. Queue: linear & circular queue, Deque & Applications. Matrix – sparse and dense. Representation of sparse matrix, Transpose & addition of sparse matrices.

Module-II: [8 Hrs]

Linked list and its representation: using array, using self referential structure. Singly, circular and double linked lists. Operations on linked list – Insertion, Deletion, Traversals. Usages of Linked list– insertion sort, Addition/multiplication of polynomials. Addition/Multiplication of large numbers.

Module-III: [12 Hrs]

Tree: Definition and Terminologies, child and parent nodes, Sub tree, root, leaf node, internal node, height of a tree. Binary, ternary, quad tree. Binary tree traversals. Reconstruction of binary tree from traversals. Binary search tree – inserting a new key, deleting a key, searching a key. AVL tree – inserting a new key into an AVL tree using rotations. B- tree : insertion and deletion using node splitting and merging.

Module-IV: [6 Hrs]

Sorting and Searching: Bubble sort, selection sort quick sort and merge sort. Linear and binary search, Fibonacci search.

Module-V: [6 Hrs]

Basic Graph Algorithm: Graph representation – adjacency matrix and list – pros and cons. Graph traversals – Depth First Search and Breadth First Search.

Text Books:

1. Data Structures: A Pseudocode Approach with C – Gilberg & Forouzan, 2nd Edition, Cengage, Indian Reprint 2016
2. Data Structures and Program Design in C – Kruse, Leung, 2nd Edition, Pearson,2008.

Reference Books:

1. Data Structures Using C - Yedidyah Langsam & Moshe J. Augenstein Aaron M. Tanenbaum, 3rd Edition, Pearson, 2009
2. Algorithms and Data Structures: The basic toolbox, Kurt Mehlhorn and Peter Sanders, Springer, 2010Programming and Data Structures (NPTEL) – (Vodeo lectures by Dr. Naveen Garg, IIT

Course Code:	Course Name:	L-T-P:	Credit:
22EE3ES01T	Analog Electronic Circuits	3-0-0	3

Course Objective

1. Understand the basics of construction, operation and characteristics of different transistors and its biasing techniques.
2. Develop small-signal model to analyze the performance of different amplifier both for low frequency and high frequency operation.
3. Analyze the performance parameters of large signal amplifiers and feedback topologies, extend the concept of feedback in different amplifier and oscillator circuits.

Syllabus

MODULE–I (10 Hours)

Biasing of BJTs: Load lines (AC and DC); Operating Points; Different Biasing Techniques; Bias Stabilization; Bias design Examples.

Biasing of FETs and MOSFETs: Operating point, Load line, Biasing techniques of FETs and design, Bias design: Graphical and analytical Method, Complimentary MOS (Principle of operation).

MODULE–II (12 Hours)

Small Signal Analysis of BJTs: Small-Signal Equivalent-Circuit Models; re model, Small Signal Analysis of CE, CC, CB amplifiers using re model, Hybrid equivalent Model, Graphical determination of hybrid parameter.

Small Signal Analysis of FETs: Small-Signal Equivalent-Circuit Model, Small Signal Analysis of CS, CD, CG Amplifiers.; Source Follower and Cascaded System.

Two port system approach: Effects of RS and RL on CE amplifier operation, Effects of R_{SIG} and R_L on CS Amplifier, Small signal analysis of Cascade and Cascode configurations, Darlington Connection and Current Mirror Circuits.

MODULE–III (6 Hours)

Frequency Response of BJT and FET Amplifiers: General Frequency Considerations, Low and High Frequency Analysis of Single Stage Amplifiers, Square Wave Testing of amplifier.

MODULE–IV (6 Hours)

Operational Amplifier: Ideal Op-Amp, Op-Amp Parameters, Open-loop and Closed-loop Gains, OP-AMP application as weighted summer, Differentiator and Integrator, Instrumentation amplifier

MODULE–V (6 Hours)

Feedback amplifier and Oscillators: Concepts of negative and positive feedback, Four Basic Feedback Topologies, Advantage of Negative feedback, Principle of oscillation, OP-AMP based sinusoidal Oscillator Circuits: Wien Bridge oscillator and R-C Phase shift oscillator; Crystal Oscillators.

Course Outcome

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

1. Analyze and understand the different biasing techniques to have excellent stabilization against internal and external parameter variation.
2. Develop small-signal model to analyze the performance of different amplifier both for low frequency and high frequency operation.
3. Apply the concept of different feedback and feedback topologies in designing various circuits used for amplification and frequency generation.
4. Analyze and design operational amplifier based amplifier and oscillator circuits by understanding its characteristics and configuration details.

Suggested Books

Text Book

[1] Electronic Devices and Circuits theory, R.L. Boylestad and L. Nashelsky, 10th Edition, Pearson Education.

[2] Electronic Circuits: Analysis and Design (SIE), Donald Neamen, Mc-Graw Hills.

Reference Book

[1] Microelectronics Circuits, A. Sedra and K.C Smith, Oxford University press.

[2] Electronic Circuits: Analysis and Design (SIE), Donald Neamen, Mc-Graw Hills.

[3] Milliman's Electronics Devices and Circuits, J. Milliman, C. Halkias, 2nd Edition, TMH.

Digital Learning Resources

1.	Analog Electronic Circuits by Dr. Shouribrata Chatterjee, Department of Electrical Engineering, IIT Delhi https://nptel.ac.in/courses/108/102/108102112/	**NPTEL**
2.	Analog Circuit by Prof. A.N.Chandorkar, Department of Electrical Engineering, IIT Bombay https://nptel.ac.in/courses/117/101/117101106/	**NPTEL**
3.	Analog Electronic Circuits by Prof. Pradip Mandal, Department of Electrical Engineering, IIT Kharagpur https://nptel.ac.in/courses/108/105/108105158/	**NPTEL**
4.	Analog Electronic Circuits by Prof. S.C. Dutta Roy, Department of Electrical Engineering, IIT Delhi https://nptel.ac.in/courses/108/102/108102095/	**NPTEL**

Course Code:	Course Name:	L-T-P	Credit
22EE3PC01T	DC Machines and Transformer	3- 0- 0	3

Course Objectives:

1. To understand basic principle of operation, characteristics and performance of DC Generator.
2. To understand basic principle of operation, characteristics and performance of DC Motor.
3. To understand basic principle of operation, characteristics and performance of single phase transformer.
4. To understand the construction and different circuit connections of three-phase transformer.

Syllabus

Module – I **(10 Hours)**

DC Generator:

General principles of DC machines: Armature Windings (Simplex Lap and Simplex Wave), Expression for EMF Induced and Torque developed in the Armature counter Torque and Counter or Back EMF, Methods of Excitation, Armature Reaction, Methods of Reduction of Armature reaction, Commutation. DC Machine Characteristics: Conditions for Self Excitation, Critical Resistance and Critical Speed. Internal, External and load Characteristics for self and Separately Excited DC Generator.

Module – II **(8 Hours)**

DC Motor:

DC Motor Construction and principle of operation, Characteristic for Speed~ Armature Current, Torque~Armature Current and Speed~ Torque of a DC Shunt, Series and Compound Motor and Comparison. Necessity of a Starter, 3-point starter and 4-point starter, Speed Control of DC Shunt and Series motor, Losses and efficiency calculation.

DC Machines Testing: Direct test, Swinburnes's Test and Hopkinson's Test. Applications of DC Motor, Stepper motor, and DC servo motor.

The Universal series motor: constructional features and Performance characteristics.

Module– III **(8 Hours)**

Single-phase Transformer:

Principle of operation, EMF Equation, Phasor Diagrams at No -Load and Load Conditions of an Ideal transformer and practical transformer, Equivalent Circuit, Determination of Parameters from Tests (Polarity Test, Open Circuit Test and Short Circuit Test, Back to Back test), Per Unit Calculation and its importance, Voltage Regulation, Losses, Efficiency and all day efficiency.

MODULE – IV **(6 Hours)**

Auto-Transformer and Parallel Operation of Transformers:

Auto Transformer: Basic constructional features; VA conducted magnetically and electrically. Comparative study with two winding transformer, Conversion of a two winding transformer into a single winding transformer. Parallel operation of transformers and load sharing.

MODULE– V **(8 Hours)**

Three-Phase Transformer:

Constructional features, as a single unit and as a bank of three single phase transformers. Three-Phase Transformer connections, The per unit system for Three Phase Transformer, Transformer Ratings and Related problems, Two Single-Phase Transformers connected in Open Delta (V-Connection) and their rating. T-Connection (Scott Connection) of Two Single-Phase Transformers. Transformer Three phase Connections: Various Phase Displacements (0^0, 180^0, $+30^0$ and -30^0), Connection Diagrams and Phasor Diagrams of various Vector Groups (Yy0, Dd0, Dz0, Yy6, Dd6, Dz6, Yd1, Dy1, Yz1, Yd11, Dy11, and Yz11).

Text Books

[1] P S Bimbhra – Electrical Machinery –Khanna Publishers.

[2] B.S.Guru & H.R.Hiziroglu-‘Electric Machinery & Transformers’-3rd Ed-Oxford Press, 2014

Reference Books

[1] P.C.Sen-‘Principles of Electric Machines and Power Electronics’-2nd Edition, John Wiley and Sons, Wiley India Reprint, 2014.

[2] A.E.Fitgerland, Charles Kingslay Jr. & Stephen D. Umans -Electric machinery – 6^{th} Edition Mc Graw Hill – Reprint 2015.

[3] D.P. Kothari & I.J. Nagrath - Electric Machines – 4th Edition Mc Graw Hill – Reprint 2015.

[4] Stephen J. Chapman-‘Electric Machinery and Fundamentals’- Mc Graw Hill International Edition, (Fourth Edition), 2015.

[5] M.G.Say-'Alternating Current Machines', English Language Book Society (ELBS)/Longman , 5th Edition, Reprinted 1990.

Course Outcome

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

1. Understand electrical principle, laws, and working of DC generator and motor and losses and also conduct various tests on the DC generator.
2. Understand electrical principle, laws, and working of DC motor, losses and also conduct various tests on the DC Motor.
3. Understand electrical principle, laws, and working of 1 phase transformer and losses and also conduct various tests on the transformer.
4. Understand electrical principle, laws, and working of 3 phase transformer and convert 3 phase transformer to multi phase transformer.

Online Resource Materials:

1	Electrical Machine-I by Dr. D.Kastha, Professor, IIT Kharagpur https://nptel.ac.in/courses/108105017	NPTEL
2	Electrical Machine-I Dr. G. Bhubaneswari, Professor, IIT Delhi https://archive.nptel.ac.in/courses/108/102/108102146/	NPTEL

Course Code:	Course Name:	L-T-P	Credit
22EE3PC02T	Circuit Theory	3- 0- 0	3

Course Objectives:

1. To understand network theorem, Network Topology and Resonance.
2. To analyze transients in Electrical systems using Laplace transforms and harmonic analysis of electrical system by using Fourier series and Fourier Transforms.
3. To evaluate Network parameters of given Electrical network
4. To design basic filter configurations and Construction of electrical network using network synthesis

Module – I **[08 Hours]**

Network Theorems: (AC Circuits only)

Superposition theorem, Reciprocity Theorem, Thevenin's theorem, Norton's Theorem, and Maximum Power transfer theorem, Tellegen's theorem, Millman's theorem, Compensation theorem. Concept of duality, and dual networks.

Network Topology: Definitions of branch, node, tree, planar, non-planar graph, incidence matrix, basic tie set schedule, basic cut set schedule.

Module – II **(8 Hours)**

Series and Parallel Resonance: Series RLC resonance, Parallel RLC resonance, properties of resonating circuit, selectivity, quality factor and bandwidth.

Analysis of Coupled Circuits: Self inductance, Mutual inductance, Coefficient of coupling, analysis of coupled circuits, Dot convention in coupled circuits, Electrical equivalent of magnetically coupled circuits, conductively coupled equivalent circuits.

Module– III **(10 Hours)**

Electrical Circuit Analysis Using Laplace Transforms:

Transient study in RL, RC and RLC networks by Laplace transform method with DC and AC excitation. Response to step, impulse and ramp inputs.

Fourier Series and It's Circuit Applications: Fourier series, Fourier analysis and evaluation of coefficients, Steady state response of network to periodic signals, Average Power and RMS Values, Fourier transform, Fourier transform of some functions, Parsvel's theorem.

Module– IV **(10 Hours)**

Two Port Networks: Relationship of two port networks, Z-parameters, Y- parameters,

Transmission line parameters, h-parameters, Inverse h- parameters, Inverse Transmission line parameters, Relationship between parameter sets, Parallel connection of two port networks, Cascading of two port networks, series connection of two port networks, problem solving including dependent sources also.

MODULE – V **(10 Hours)**

Network functions: Significance of Poles and Zeros, Restriction on location of Poles and Zeros, Time domain behavior from Pole-Zero plots. Realizability concept, Hurwitz property, positive realness, and properties of positive real functions.

Filters: Filters: Classification of filters, Characteristics of ideal filters.

Text Books

[1] Fundamentals of Electric Circuits – Alexander & Sadiku – Tata McGraw Hill, 5th Edition.

[2] W. H. Hayt and J. E. Kemmerly, "Engineering Circuit Analysis", McGraw Hill Education, 2013.

Reference Books

[1] Network Analysis and Synthesis– M E Van Valkenburg – Pearson Education, 3rd Edition.

[2] Theory and problem of electrical circuits, Schaum's Outline Series, TMH – Joseph A. Edminister, MahmoodMaqvi.

[3] Franklin Fa-Kun. Kuo, "Network Analysis & Synthesis",John Wiley & Sons.

Course Outcome

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

1. Apply network theorems for the analysis of ac electrical circuits.
2. Obtain the transient and steady-state response of electrical circuits.
3. Analyze two port circuit behaviors and also analyze the harmonics with their amplitude and frequency spectrum of electrical system.
4. Design the filter circuit and construct the electrical systems by using synthesis methods.

Digital Learning Resources

Program	Category	Course Code	Course Title	L-T-P	Credit
1.	Circuit Theory by Prof. S.C.Dutta Roy, Professor, IIT Delhi https://archive.nptel.ac.in/courses/108/102/108102042/				**NPTEL**
2.	Network Analysis by Prof. Tapas Kumar Bhattacharya, Professor, IIT Kharagpur https://archive.nptel.ac.in/courses/108/105/108105159/				**NPTEL**
3.	Basic Electric Circuits by Dr. Ankush Sharma https://archive.nptel.ac.in/courses/108/104/108104139/				**NPTEL**

Course Code	Course Name:	L-T-P:	Credit:
22CM3MC01T	ENVIRONMENTAL SCIENCE & ENGINEERING	3-0-0	0

COURSE OBJECTIVES [COB]

COB Objectives

1. To provide insight about impact of the humans activities on environment and impact of environment on the humans & its health.
2. To understand the basic problem of anthropogenic environmental pollution
3. To gain comprehensive knowledge about the social problem arising out of industrialization.
4. To familiarize with the environmental ethics and act related to environment

Syllabus

Module – I (10 Hour)

Ecological Concepts and Natural Resources: Ecological perspective and value of environment. Ecosystem: Concept, structure& Function of ecosystem; Energy cycle, Food Chain, & Food Web; Ecological pyramid, types; Biodiversity; Ecological Succession: Type of ecosystem: Forest ecosystem, Grassland ecosystem,Desert ecosystem, Aquatic ecosystem. Geochemical Cycle: Water cycle, Carbon cycle, Oxygen cycle, Nitrogen cycle, etc.,Environmental gradients, Tolerance levels of environment factor,.

Module – II (8 Hour)

Water Pollution:Types, sources and consequences of water pollution; Ground water Contamination, Waste water treatment process: pretreatment, primary treatment, (Sedimentation, equalization and neutralization etc.), secondary treatment (Activated sludge technique and Trickling filter) tertiary treatment methods (Ion exchange, Electro-dialysis, Electrolytic recovery, reverse osmosis, etc.)

Module – III (10 Hour)

Air Pollution : Air pollution and pollutants, criteria pollutants& non-criteria pollutants, Acid deposition, Global climate change- Green House gases, Ozone Layer Depletion,Smog; Industrial Air Emission Control: Flue gas desulphurization, NOx removal,. Methods for control of particulate air pollutants (Mechanical device, Fabric Filtration, scrubber, Electrostatic precipitator), other removal methods like absorption, adsorption, precipitation, etc..

Module – IV **(8 Hour)**

Solid Waste Management Source classification and composition of MSW: properties and separation, storage and transportation, MSW Management, Waste minimization of MSW, Reuse and recycling, Hazardous Waste Management, Hazardous waste and their generation, Transportation and treatment of hazardous waste: Incinerators, Inorganic waste treatment, handling of treatment plant residue. Waste minimization techniques.

Module – V **(4 Hour)**

Noise Pollution:Types, sources and consequences of noise pollution, Physical Properties of sound: sound power, sound intensity and sound pressure levels;, Noise criteria, Noise Standards, Noise measurement, Noise control Methods.

Text Book

1. Gerard Kiely, Environmental Engineering, Tata McGraw Hill, Special Indian Ed, 2007 New Delhi.
2. B.K. Mohapatra, *A Text Book of Environmental Engineering & Safety*, Seven Seas Publication,4th Ed, 2010, Cuttack
3. L. M. Deshmukh, *Industrial Safety Management*, Tata McGraw Hill Publication, 1st Ed, 2010, New Delhi

Reference Books

1. Arcadio P. Sincero & Gergoria A.Sincero,*Environmental Engineering: A Design Approach*, Prentice Hall, 1996, Geogia.
2. M. L. Davis and S. J. Masen, *Principles of Environmental Engineering and Science*, McGraw Hill International Edition, 4th Ed, 2019, United Kingdom
3. Curringham & Saigo, Environmental Science, TMH, 2016, New Delhi
4. M.C. Dash & P.C. Mishra Man and Environment, Macmillan Publishers India Limited, 1st Ed, 2000, New Delhi
5. Gilbert M. Masters & Wendell P. Ela, *An Introduction to Environmental Engineering and Science*, Prentice Hall, 3rd Ed, 2008, United Kingdom.

Digital Learning Resources

Course Name	Environmental Chemistry & Analysis
Course Link	https://nptel.ac.in/courses/122/106/122106030/
Course Instructor	IIT Madras

Course Name	Environmental Engineering
Course Link	https://nptel.ac.in/courses/103/107/103107084/#
Course Instructor	IIT Roorkee

Course Name	Environmental Air Pollution
Course Link	https://nptel.ac.in/courses/105/102/105102089/#
Course Instructor	IIT Delhi

Course Name	Fundamentals of Environmental Pollution and Control
Course Link	https://nptel.ac.in/courses/123/105/123105001/#
Course Instructor	IIT Kharagpur

COURSE OUTCOMES [CO]

On Completion of this Course, the students should be able to:

The purpose of the course is to provide an overview of ecosystem and anthropogenic activities effect on natural sources. It's involves understanding the problem arising out of environmental pollution and its remedies. It's involve various case study to analyze the problem face by human due to population growth.

CO	Outcomes	Levels
1.	Able to understand the concept of environmental pollution and its effect on society	Understand Level 2
2.	Able to understand the root of the water pollution problem and adopted for its remedial.	Analyze and Evaluate: Level 3
3.	Able to understand the other environmental pollution problem and adopted for its remedial.	Analyze and Evaluate: Level 3
4.	Able to understand the problem of population growth and its effect on social issue and environment	Analyze and Evaluate: Level 3

Course Code:	Course Name:	L-T-P:	Credit:
22EE3ES02L	Analog Electronic Circuits Laboratory	0-0-2	1

COURSE OBJECTIVE:

1. To illustrate the students different electronic circuit and their application in practice.

2. To impart knowledge on assessing performance of electronic circuit through monitoring of sensitive design and modeling parameters.

LIST OF EXPERIMENTS:

(At least 10 out of 13 experiments should be done)

1. Determination of cut- off and saturation voltage of a BJT and its application as a switch.

2. Assemble and test of BJT bias circuits: Fixed bias and feedback bias.

3. Design, assemble and test of BJT bias circuits: Voltage divider bias

4. Design, assemble and test of JEET bias circuits: fixed bias and self bias.

5. Design, assemble and test of BJT common-emitter circuit D.C and A.C performance: Voltage gain, input impedance and output impedance with bypassed and un-bypassed emitter resistor.

6. Design, assemble and test of BJT emitter-follower D.C and A.C performance: A.C. voltage gain, input impedance and output impedance.

7. Design, assemble and Test of JFET/MOSFET common-source amplifiers D.C and A.C performance: Voltage gain, input impedance and output impedance.

8. Determination of Bandwidth of a common-emitter amplifier from its frequency response.

9. Determination of Bandwidth of a BJT CE amplifier using Square wave testing.

10. Design and test of Differential amplifier circuits with its DC and AC performance.

11. Design and test of Darlington connection/ current mirror circuits.

12. Graphical determination of h-parameters of a CE amplifier.

13. Design Wien Bridge/R-C phase shift oscillator.

COURSE OUTCOME:

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

1. Test and experiment different types of BJT/JFET based electronic circuit and analyze their operation under different operating conditions.

2. Evaluate possible causes of discrepancy in experimental observations in comparison to theoretical outcome.

3. Practice different types of wiring and instruments connections keeping in mind technical, economical, safety issues.

4. Prepare professional quality textual and graphical presentations of laboratory data and computational results.

Course Code: 22EE3PC01L	Course Name: DC Machines and Transformer Laboratory	L-T-P 0- 0- 2	Credit 1

Course Objective

1. To understand the characteristics of DC generator.
2. To understand the characteristics of DC motor
3. To understand the different types of losses of a single phase transformer.
4. To study the voltage regulation and performance of single phase transformer.
5. To study different three-phase transformer connections and applications.

Syllabus

(At least 8 out of 10 experiments should be done)

1. Determination of critical resistance and critical speed from no load test of a DC shunt generator.
2. Plotting of external and internal characteristics of a DC shunt generator.
3. Speed control of DC shunt motor by armature voltage control and flux control method.
4. Determination of efficiency and losses of a DC shunt motor using Swinburne's method.
5. Determination of efficiency and losses of a DC machines using regenerative or Hopkinson's method.
6. Determination of Efficiency and Voltage Regulation by Open Circuit and Short Circuit test on single phase transformer.
7. Parallel operation of two single phase transformers.
8. Back-to Back test or Sumpner's test on two single phase transformers.
9. Study of open delta and Scott connection of two single phase transformers.
10. Separation of hysteresis and eddy current losses in a transformer

Course Outcomes:

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

1. Acquire hands on experience of conducting various tests on dc generator and obtaining their performance indices using standard analytical method.
2. Acquire hands on experience of conducting various tests on dc motor and obtaining their performance indices using standard analytical method.
3. Acquire hands on experience of conducting various tests on 1-phase transformer.

4. Acquire hands on experience of conducting various tests on 3-phase transformer.

Course Code:	Course Name:	L-T-P	Credit
22EE3PC02L	Circuit Theory Laboratory	0- 0- 2	1

Course Objectives:

1. To understand Resonance and coupled circuits.
2. To study the Steady state and Transient behavior of Electrical Circuits
3. To check the applicability of Network theorems for calculating the Electric circuit response.
4. To evaluate Network parameters of given Electrical network and also understand the basic filter circuit response to design.

Syllabus

(At least 10 out of 13 experiments should be done)

1. Verification of Network Theorems in DC circuits. (Norton's theorem, Reciprocity theorem, Maximum Power transfer theorem, Milliman's theorem & Compensation Theorem).
2. Verification of Network Theorems in AC circuits. (Superposition theorem, Reciprocity theorem, Maximum Power transfer theorem).
3. Study of DC and AC Transients for R-L, R-C & R-L-C circuits using storage oscilloscope.
4. Determination of two port network parameters.
5. Frequency response of Low pass and High Pass Filters.
6. Frequency response of Band pass and Band Elimination Filters.
7. Determination of self inductance, mutual inductance and coupling coefficient of a single phase two winding transformer representing a coupled circuit.
8. Study of resonance in R-L-C series and R-L-C Parallel circuit using oscilloscope.
9. Spectral analysis of a non-sinusoidal waveform.
10. Determination of Response of different DC circuits using MATLB Simulink/ PSpice.
11. Determine the frequency response of Series RLC and Parallel RLC circuit Using MATLAB Simulink.

12. Determination self inductance, Mutual inductance , of Coupled coils and their response using MATLB Simulink
13. Evaluation of Two – port Network parameters using MATLAB Simulink/PSpice

Course Outcomes:

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

1. Apply network theorems for the analysis of electrical circuits.
2. Obtain the Steady state and transient response of electrical circuits
3. Obtain frequency repose of the electrical circuits.
4. Analyze two port circuit behavior, Filter circuits.