

**INDIAN INSTITUTE OF TECHNOLOGY KHARAGPUR**

**SYLLABUS OF EE11003 ELECTRICAL TECHNOLOGY**

**Autumn 2020**

**Module A**

**Theory component: Introduction (3 Lectures) 1-3 NPTEL MODULE 1 Chapters 1-2 in DelToro**

Sources of Electrical energy; General structure of electrical power systems; Voltage Source-Battery and Current Source – Solar Cell.

**DC Networks: (3 Lectures) 4-6 NPTEL MODULE 2 Chapter 3 in DelToro**

Node voltage and mesh current methods, Concept of Ground and Earthing, Superposition principle, Thevenin's and Norton's theorems-

**Transients: (4 Lectures) 7-10 NPTEL MODULE 3 Chapter 5 in DelToro**

Introduction to Inductance and Capacitance. Differential equation formulation for the solution of DC networks comprising R-L and R-C circuits. Concept of time constant and derivation of the time domain solution. Response to Sinusoidal Excitation.

**Module B**

**Single phase AC circuits: (6.5 Lectures) 11-16.5 NPTEL MODULE 4 Chapters 7 up to 7.10 in DelToro**

Single phase EMF generation, average and effective values of sinusoids, solution of R,L,C series circuits, the j operator, complex representation of impedances, phasor diagram, power factor, power in complex notation, solution of parallel and series – parallel circuits, Resonance series, parallel. Maximum power transfer theorem. Network Solutions in ac.

**Module C**

**Three phase AC Circuits: (5.5 Lectures) 16.5-22 NPTEL MODULE 5 Section 7.11 in DelToro**

Three phase EMF generation, delta and Y – connection, line and phase quantities, solution of three phase circuits, balanced supply voltage and balanced load, phasor diagram, measurement of power in three phase circuits, Three phase four wire circuits.

## **Module D**

### **Magnetic Circuits: (2 Lectures) 23-24 NPTEL MODULE 6 Chapter 15 in DelToro**

Ampere's circuital law, B- H curve, solution of magnetic circuits, hysteresis and eddy current losses

### **Transformers: (5 Lectures) 25-30 NPTEL MODULE 7 Chapter 16 in DelToro**

Construction, EMF equation, ratings, phasor diagram on no load and full load, equivalent circuit, regulation and efficiency calculations, open and short circuit tests, auto-transformers.

## **Module E**

### **Induction Motor: ( 6 Lectures) 31-36 NPTEL MODULE 8 Chapters 17-18 in DelToro**

The revolving magnetic field, principle of orientation, ratings, equivalent circuit, Torque – speed characteristics, starters for cage and wound rotor type induction motor. Electrical Safety.

Text Book: <https://nptel.ac.in/courses/108/105/108105053/>

Electrical Engineering Fundamentals by Vincent Del Toro Prentice Hall of India available on Amazon  
Second Edition printed in 2015 by Pearson

**NOTE:**

- i) Course is divided into Five Modules.
- ii) Each module to have one home work and one hour test common across the whole first year.
- iii) Weightage will be 50% for home works, 50 % for four or five Common Class tests.
- iv) Moodle for Home works and Quizzes.

**Learning Objectives:**

1. Able to List the Components of an Electric Power System
2. Able to List the Energy Resources useful for Generate Electricity
3. Able to completely solve an Electric Circuit using Appropriate Technique
4. Obtain Equivalent Circuit of a Transformer for Performance Analysis
5. Obtain Equivalent Circuit of a Three Phase Induction Motor for Performance Analysis