TECHNO INDIA UNIVERSITY
WESTBENGAL

EM 4, Sector V, Salt Lake, Kolkata-700091, West Bengal, India
Phone: +91 9836544416/17/18/19, Fax: +91 33 2357 1097

3-Year Diploma Engineering Curriculum and
Syllabus for Electrical Engineering (EE)
Third Semester

Course Structure

Course Code	Course Title	Contact Hrs. / Week			Credit
		L	T	P	
Theory					
TIU-DEN-T201	Career Advancement &Skill Development	2	1	0	3
TIU-DMB-T201	Environmental Engineering	2	1	0	3
TIU-DCS-T201	Programming in C	2	1	0	3
TIU-DEE-T203	Electrical Machines I	2	1	0	3
TIU-DEE-T205	Electrical Measurement & Measuring Instruments	2	1	0	3
TIU-DEE-T207	Circuit Theory	2	1	0	3
Practical					
TIU-DCS-L201	Programming in C Lab	0	0	3	2
TIU-DEE-L203	Electrical Machine Lab I	0	0	3	2
TIU-DEE-L205	Electrical Measurement & Measuring Instruments Lab	0	0	3	2
TIU-DEE-L209	Electrical Workshop I	0	0	3	2
Sessional					
TIU-DES-S299	Entrepreneurship Skill Development	0	0	2	2
Total Credits					28

Detailed Syllabus

Career Advancement & Skill Development
TIU-DEN-T201

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LTP: 2-1-0
Credits: 3

The detailed syllabus to be provided by the Department of Humanities.

Environmental Engineering
TIU-DMB-T201
LTP: 2-1-0
Credits: 3

The detailed syllabus to be provided by the Department of Chemistry and Microbiology.

Programming in C
TIU-DCS-T201
LTP: 2-1-0
Credits: 3

The detailed syllabus to be provided by the Department of Computer Science.

Circuit Theory
TIU-DEE-T207
LTP: 2-1-0
Credits: 3

G R O U P - A

- **NETWORKS & A.C. FUNDAMENTALS**
  - Definitions & explanation**:** Active & passive elements as well as networks – Linear & non-linear networks – Unilateral & bilateral networks, Voltage source and Current source –their conversion.
  - Statement, explanation, limitation & problems on Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Star-delta conversion.
  - Single-phase A.C. Circuits**:** Concept of complex impedance – Rectangular & polar form.
  - R-L-C Series Circuit**:** Representation of impedance, voltage, current and power in complex form phasor diagram Impedance triangle – problems.
  - Parallel Circuit**:**Phasor diagram, problems (maximum 3 branches).

G R O U P - B

- **RESONANCE & SELECTIVITY**

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- SERIES RESONANCE: General aspects – Impedance & phase angle of series resonant circuit – Voltages & current in series resonant circuit – Study of different curves – Quality factor – Selectivity & bandwidth – Voltage magnification – Problems – Acceptor Circuit (concept only).
- PARALLEL RESONANCE: Resonant frequency for a tank circuit study of curves attaining resonance by varying frequency & R_L – Current magnification – Quality Factor – Selectivity & bandwidth – Applications – Problems – Rejecter circuit (concept only).
- Comparison between series & parallel resonance.

GROUP - C

MODULE 3 TRANSIENTS

- Steady State & Transient Response – Initial & Steady-state condition – Time constant and DC response of RC circuit – problems.
- Sinusoidal response of R-L & R-C circuits – problems.
- POLYPHASE CIRCUITS: 3 phase system – Phase sequence – Advantages over 1-phase system – Inter connection of 3-phase sources & loads – Relation between line & phase values of voltage & current both in star & delta connections – 3-phase power – Problems on balanced as well as unbalance (3-phase 4-wire) system.

GROUP - D

MODULE 4 COUPLED CIRCUITS & FILTERS

- COUPLED CIRCUITS: Introduction, mutual coupled circuits & mutual imp, dot convention, coefficient of coupling, series & parallel connection of coupled inductors.
- LAPLACE TRANSFORMATIONS: Definition & properties – Laplace transform of unit step, impulse, ramp, exponential, sine cosine function and periodic functions (no deviation – only formula) – Laplace transform theorems – Differential, integral, initial value & final value – The inverse transformation – Convolution Integral – Applications of Laplace Transformations for solving differential equations describing simple electric circuits – problems.
- Idea about Fourier series, FILTERS: Low pass, High pass, Band pass and Bond stop (conceptions & applications only).

Electrical Machines I
TIU-DEE-T203
LTP: 2-1-0
Credits: 3

Module – 1 GENERAL INTRODUCTION OF ROTATING MACHINE

Basic constructional features of generators and motors. Hetero-polar and homopolar configuration.
Space distribution of flux density and time-variation of voltage.

D.C Machines:

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D.C. Generator: basic principles, brief description of different parts and working, different types, e.m.f equation, building up of e.m.f in self-excited generator – applications of D.C. generator – problems on e.m.f. equation.Armature reaction (concept only)

D.C. Motors: basic principles, significance of back e.m.f., speed and torque equation, speed-current, torque-current, speed-torque characteristics, Types – applications. losses and Efficiency (no problem)
Diff. Methods of speed control of motors, starters, industrial applications – problems.

Module - 2
TRANSFORMERS: Principles.
Constructional details: selection of core material & winding materials considering different types of losses, insulating materials, core & coil construction, Transformer oil, Accessories: tank & radiator, breather, conservator, bucholtz relay, bushings, pressure relief valve {PRV} & explosion vent (protection from explosion).
Different types of cooling methods.

1-phase Transformers:
E.m.f. equation, derivation of core losses, no-load operation, phasor diagram under no-load and load conditions, equiv-resistance and reactance, approx, equivalent circuit, dependence of circuit parameters' on V and f., impedance voltage, Regulation, Losses and efficiency (including all-day efficiency) – Problems

Cause of noise & vibration in transformers – Rating of transformer.
S.C. and O.C. tests – separation of eddy current and hysterisis losses – Problems.
Types- Distribution and power transformers, Dry-type transformer, New compact transformer

Module - 3
Principles of 1-phase Autotransformer, tertiary winding, comparison of weight, copper loss, --problems.
Methods of tap-changing. Tap changers (off load and on-load type) – practical use.
Conditions for Parallel operation of transformers and their significances - significance of parallel operation. Parallel operation of two 1-ph transformers – problems.
Three-phase transformer (as a single unit or 3 single-phase units) –connections & specifications, Vector grouping, Scott-connected transformer.
Checks and steps in connecting two 3-ph transformers in parallel.

Electrical Measurement & Measuring Instruments
TIU-DEE-T205
LTP: 2-1-0
Credits: 3

Module - I
Definition & brief explanations of:
Range, sensitivity, true & indicated value, Errors (including limiting errors), Resolutions, Accuracy, Precision and instrument efficiency.

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Classification of instruments:
Absolute and secondary instruments, Analog (electro-mechanical and electronic) and digital instruments, secondary Instruments - Indicating, integrating & recording instruments.

Basic Requirements for measurements:
Deflection torque and methods of production.
Controlling torque and controlling system (Spring Control & Gravity control system)
Damping torque & different methods of damping
Balancing of moving parts.
[No mathematical deductions – only the final expression (if any) to be mentioned]

Different types of instruments:
Brief idea about construction & operating principle, Final Expression of steady state or balanced condition (no deduction), Merits and demerits, Errors and remedies, Practical ranges; Applications of – PMMC instruments, MI Instruments, Electrodynamometer type instruments, Thermocouple instruments and Induction type instruments.
Instruments- multimeter, energy-meter. --- Elementary idea with block diagram.

Module - II
Multi-range ammeter and voltmeter – theory and problems.
Wheatstone Bridge principle (no deduction), Working principle & construction of simple D.C. potentiometer
Methods of measuring diff. Electrical quantities:
Measurement of Low resistance by Kelvin's double bridge – simple problems.
Principle of dynamometer type wattmeter (no description of instrument) and special features incorporated for low p.f. circuits.
Measurement of 3-phase power by two-wattmeter& 3-wattmeter method. – Problems.
1-phase Induction type energy meter. (Briefly mention construction and operating principle – no deductions, only final expressions for av. torque to be mentioned)
Errors adjustments
Phantom loading
Testing of energy meters.

Module - III
Classifications of resistances
Description of Megger – measurement of high/insulating resistance by using it. Measurement of Inductance: ---Maxwell's inductance bridge.
Measurement of capacitance: Schering Bridge - Problems

Module - IV
Instrument Transformers: Introduction and utility of using Instrument transformers (in the light of measurement and protection purposes) .

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Current Transformer (CT) : Constructional details of (i) Bar CT, Ring C.T. (wound type) and (ii) CT used in HV installations—multicore-secondary C.T (iii) Reduction of errors (Mention the various methods briefly). Accuracy class, Burden on CT, Specifications, Precautions in the use of CT

Potential / Voltage Transformer (VT)
Types – Mention the names with comparative study in brief. (Electromagnetic VT, CVT and CCVT) – basic circuit diagram of CVT, Working principle, Errors (concept only), Accuracy class, Burdens, Specifications, Precautions.

Circuit diagram for the measurement of current, voltage and power in a 3-phase circuit.

Detection of Diff. Types of faults – consequences. Detection of Cable faults by Cable-Fault locating equipment.