## UTTRAKHAND TECHNICAL UNIVERSITY DEHRADUN
### STUDY AND EVALUATION SCHEME
#### B.TECH.II Year Semester-IV
##### ELECTRICAL ENGINEERING, ELECTRICAL AND ELECTRONICS ENGINEERING
(Effective from the Session : 2008-2009)

<table>
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<tr>
<th>S.No</th>
<th>Course No.</th>
<th>Subject</th>
<th>Periods</th>
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<td>Electrical &amp; Electronics Engineering Materials</td>
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<td>Microprocessors</td>
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### Practical/Design

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### Total

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|      |         | 15      | 5          | 6            |
|      |         | 525     | 575        | 1100         |
ELECTRO-MECHANICAL ENERGY CONVERSION-I (TEE-401)

Unit-I
**Principles of Electro-mechanical Energy Conversion** - Introduction, Flow of Energy in Electromechanical Devices, Energy in magnetic systems (defining energy and Coenergy), Singly Excited Systems; determination of mechanical force, mechanical energy, torque equation, Doubly excited Systems; Energy stored in magnetic field, electromagnetic torque, Generated emf in machines; torque in machines with cylindrical air gap. (7)

Unit-3
**D.C. Machines** - Construction of DC Machines, Armature winding, Emf and torque equation, Armature Reaction, Commutation, Interpoles and Compensating Windings. (9)

Unit-3
**D.C. Machines** - Performance Characteristics of D.C.motors, Starting of D.C.motors; Concept of starting (3 point and 4 point starters), Speed control of D.C.motors; Field Control, armature control and Voltage Control (Ward Lenonard method), Efficiency and Testing of D.C.machine (Hopkinson’s and Swinburn’s Test). (8)

Unit-4
**Transformer** - Three phase transformer Construction, Three-phase unit transformer and Bank of three single phase transformers with their advantage, Three-phase transformer Groups (Phasor groups) and their connections, Y-∆ connection, Open delta connection, Three-phase/2 phase Scott connection and it’s application. (8)

Unit-5
**Transformer (Contd)**:
Sumpner’s test, All day efficiency, polarity test Excitation Phenomenon in Transformers, Harmonics in Single Phase and 3-phase transformers, Parallel operation and load sharing of Single phase and three phase transformers, Three winding transformers, Tertiary winding
**Auto Transformer** : Single phase Auto-transformer, Volt-amp relation, efficiency, Conversion of a two-winding Transformer to an Auto transformer, Saving in conductor material, Advantages, disadvantages and application of autotransformers.

Text Books:

Reference Books:
7. M.G.Say,” The Performance and Design of AC machines”, Pitman & Sons
**Power Station Practice (TEE 402)**

**Topic Name**

**Introduction:**
Electric energy demand and growth in India, electric energy sources.

**Thermal Power Plant:**
Site selection, general layout and operation of plant, detailed description and use of different parts.

**Hydro Electric Plants:**
Classifications, location and site selection, detailed description of various components, general layout and operation of plants, brief description of impulse, reaction, Kaplan and Francis turbines, advantages and disadvantages, hydro-potential in India.

**Nuclear Power Plant:**
Location, site selection, general layout and operation of plant, Brief description of different types of reactors Moderator material, fissile materials, control of nuclear reactors, disposal of nuclear waste material, shielding.

**Gas Turbine Plant:**
Operational principle of gas turbine plant and its efficiency, fuels, open and closed-cycle plants, regeneration, inter-cooling and reheating, role and applications.

**Diesel Plants:**
Diesel plant layout, components and their functions, its performance, role and applications.

**Sub-stations Layout:**
Types of substations, bus-bar arrangements, typical layout of substation.

**Power Plant Economics and Tariffs:**
Load curve, load duration curve, different factors related to plants and consumers, Cost of electrical energy, depreciation, generation cost, effect of Load factor on unit cost. Fixed and operating cost of different plants, role of load diversity in power system economy. Objectives and forms of Tariff,. Causes and effects of low power factor, advantages of power factor improvement, different methods for power factor improvements.

**Economic Operation of Power Systems:**

**Non Conventional Energy Sources:**
Power Crisis, future energy demand, role of Private sectors in energy management.

**MHD generation:** Working principle, open and closed cycles, MHD systems, advantages, parameters governing power output.

**Solar power plant:** Conversion of solar heat to electricity, Solar energy collectors, Photovoltaic cell, power generation, future prospects of solar energy use.

**Wind Energy:** Windmills, power output with combined operation of wind turbine generation and isolated generating system, technical choices & economic size.

**Geothermal Energy:** Earth energy, heat extraction, vapor turbine cycle, difficulties & disadvantages.

**Tidal energy:** Tidal phenomenon, tidal barrage, tidal power Schemes.

**Ocean Thermal Energy:** Introduction, energy conversion, problems.

**Text Books:**

**Reference Books:**
ELECTRICAL & ELECTRONICS ENGINEERING MATERIALS (TEE 403)

Unit-I

**Crystal Structure of Materials:**
A. Bonds in solids, crystal structure, co-ordination number, atomic packing factor, Miller Indices, Bragg's law and x-ray diffraction, structural Imperfections, crystal growth
B. Energy bands in solids, classification of material using energy band. (8)

Unit- II

**Conductivity of Metals:**
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, superconductivity and super conducting materials. (7)

Unit-III

**Dielectric Properties of Material:**
Polarisation and dielectric constant, dielectric constant of mono-atomic, poly atomic gases and solids, frequency dependence of electronic and ionic polarisabilities, dipolar relaxation, dielectric loss, piezoelectricity, ferroelectric materials. (8)

Unit-IV

**Mechanism of Conduction in semiconductor materials:**
Types of semiconductors, current carriers in semiconductors, Half effect, Drift and Diffusion currents, continuity equation, P-N junction diode, junction transistor, FET & IGFET. (7)

Unit- V

**Magnetic Properties of Material:**
Origin of permanent magnetic dipoles in matters, Classification Diamagnetism, Paramagnetism, Ferromagnetism, Anti-ferromagnetism and Ferrimagnetism, magnetostriction

**Electrical Engineering Materials:**
Properties and application of electrical conducting, semiconducting, insulating and magnetic materials, soft and hard magnetic materials, permanent magnetic materials, mechanical properties of metals, optical properties of solids.

Text Books :

References:
MICROPROCESSORS (TEE 404)

Unit 1
*Introduction To Microprocessor*: 8085 Evolution Of Microprocessor, Register Structure, ALU, Bus Organization, Timing And Control, instruction set. (5)

*Architecture of 16-bit Microprocessors*: Architecture of 8086: (Bus Interface Unit, Execution unit) Register Organization, Bus Operation, Memory Segmentation. (3)

Unit 2
*Assembly Language Programming*: Addressing Modes and instruction set of 8086, Arithmetic and Logic instructions, Program Control Instructions (jumps, conditional jumps, subroutine call) Loop and string instruction, Assembler Directives. (7)

Unit 3
*CPU Module*: Signal Description of pins of 8086 and 8088, Clock generator, Address and Data bus Demultiplexing, Buffering Memory Organization, Read and Write cycle Timings, Interrupt Structures, Minimum Mode, Maximum Mode Operation. (9)

Unit 4
*Peripheral Interfacing*: Programmed I/O, Interrupt Driven, I/O, DMA, Parallel I/O, (8255-PPI, Parallel port), 8253/8254 programmable Timer/Counter Interfacing with ADC. (7)

Unit 5
*(a) Peripheral Interfacing (Contd.)*:

- 8259 Programmable Interrupt controller, 8237 DMA controller (5)
- Concept of Advanced 32 bit Microprocessors: Pentium Processor (4)

**Text Books**

3. Hall D.V./"Microprocessors Interfacing"/ Tata McGraw Hill /2nd Ed

**Reference Book**:

ELECTROMAGNETIC FIELD THEORY (TEC-401)

Unit-I
Review of Vector analysis, Rectangular, Cylindrical and Spherical Coordinates and their transformation. Divergence, gradient and curl in different coordinate systems. Electric field intensity, Electric Flux density, Energy and potential.

Unit-II
Current and conductors, Dielectrics and capacitance, Poission’s and Laplace’s equation.

Unit-III
Steady magnetic field, magnetic forces, materials and inductance, Time varying field and Maxwell’s equation.

Unit-IV
Uniform plane waves, Plane wave reflection and dispersion.

Unit-5
Transmission lines, and guided waves

Text Book

Reference Books
ELECTROMECHANICAL ENERGY CONVERSION-I LAB (TEE 451)

Note: Minimum eight experiments are to be performed from the following list:

1. To obtain magnetization characteristics of a d.c. shunt generator
2. To obtain load characteristics of a d.c. compound generator (a) Cummulatively compounded (b) Differentially compounded
3. To obtain load characteristics of a dc shunt generator
4. To obtain load characteristics of a dc series generator
5. To obtain efficiency of dc shunt machine using Swinburn’s test
6. To perform Hopkinson’s test and determine losses and efficiency of DC machine
7. To obtain speed-torque characteristics of a dc shunt motor
8. To obtain speed control of dc shunt motor using (a) armature resistance control (b) field control
9. To obtain speed control of dc separately excited motor using Ward Leonard method
10. To study polarity and ratio test of single phase and 3-phase transformers
11. To obtain efficiency and voltage regulation of a single phase transformer by Sumpner’s test
12. To obtain 3-phase to 2-phase conversion by Scott connection
13. To perform open circuit and short circuit tests on a three phase transformer and determine parameters of equivalent circuit
MICROPROCESSOR LABORATORY (TEE 452)

A. Study Experiments

1. To study 8085 based microprocessor system
2. To study 8086 and 8086A based microprocessor system
3. To study Pentium Processor

B. Programming based Experiments (any four)

4. To develop and run a program for finding out the largest/smallest number from a given set of numbers.
5. To develop and run a program for arranging in ascending/descending order of a set of numbers
6. To perform multiplication/division of given numbers
7. To perform conversion of temperature from °F to °C and vice-versa
8. To perform computation of square root of a given number
9. To perform floating point mathematical operations (addition, subtraction, multiplication and division)

C. Interfacing based Experiments (any four)

10. To obtain interfacing of RAM chip to 8085/8086 based system
11. To obtain interfacing of keyboard controller
12. To obtain interfacing of DMA controller
13. To obtain interfacing of PPI
14. To obtain interfacing of UART/USART
15. To perform microprocessor based stepper motor operation through 8085 kit
16. To perform microprocessor based traffic light control
17. To perform microprocessor based temperature control of hot water.
TEE 453 : Electrical Simulation Lab

Note: Minimum eight experiments are to be performed from the following list:
The experiments are based upon circuit simulation using PSpice or MULTISIM software:

1. Verification of principle of superposition with dc and ac sources
2. Verification of Thevenin, Norton and Maximum power transfer theorems in ac circuits
3. Verification of Tellgin’s theorem for two networks of the same topology
4. Determination of transient response of current in RL and RC circuits with step voltage input
5. Determination of transient response of current in RLC circuit with stem voltage input for underdamp, critically damp and overdamp cases
6. Determination of frequency response of current in RLC circuit with sinusoidal ac input
7. Determination of z and h parameters (dc only) for a network and computation of Y and ABCD parameters.
8. Determination of driving point and transfer functions of a two port ladder network and verify with theoretical values
   Write Demo for the following (in Ms-Power point)
10. Verification of parameter properties in inter-connected two port networks : series, parallel and cascade also study loading effect in cascade
11. Determination of frequency response of a Twin- T notch filter
Study of A DC Position Control System 2. Study of An AC Position Control System 3. Study of A Stepper Motor and its Translator 4. Study of A Feedback Illumination Control System 5. Study of A Variable-voltage, Variable-Frequency Speed Control System for An Induction Motor 6. Identification of the 2nd-order Model of a Linear System from Step Response. 2. Study and characterization of magnetic, inductive, capacitive and optical proximity sensor. 3. Study of the characteristics of load cells and their associated electronic systems to construct a weighing system. B.Tech in Electrical Engineering From India's Top Ranked Colleges/ University In Punjab - LPU. Check Course details, Eligibility, Fees, Career, Admission 2020. This Course Develop new Electrical equipment & all kind of Electronic devices which deals with Electricity. Student can make their Career As a Aerospace engineer, Electrical engineer etc. Å Electronics and Communication Engineering (ECE). Mechanical Engineering (ME). Biotechnology (BT). Computer Science and Engineering (CSE). ME-Mechatronics. Food Technology. Robotics and Automation. Information Technology (IT). Automobile Engineering (AE). Å B.Tech. (Electrical Engineering (EE) ) 4 yrs. (8 Semesters). (Subject to approval by PCI) (Approved by ICAR). Programme Details. Electrical and Electronics Engineering Department was founded with a threefold mission in teaching, research, and public service. Based on that foundation, the mission of the Department, in all major fields of electrical engineering, is to instill in students the attitudes, values, vision, and training that will prepare them for lifetimes of continued learning and leadership, to develop the ability and passion to work wisely, creatively, and effectively for the benefit of society; to generate new knowledge for the betterment of. Å The undergraduate program is designed for students who may wish to delay their decisions until the end of the fifth semester as to which of the several fields of Electrical and Electronic Engineering they will choose.