SCHEME OF EXAMINATION

For

B. Tech. Electrical & Electronics Engineering

(Effective from the session: 2010-2011)

Uttrakhand Technical University, Dehradun
### UTTARAKHAND TECHNICAL UNIVERSITY DEHRADUN

**STUDY AND EVALUATION SCHEME**

**B.TECH. IInd YEAR  SEMESTER-IV**

**ELECTRICAL & ELECTRONICS ENGINEERING**

**EFFECTIVE FROM SESSION:-2010-2011**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Course No.</th>
<th>Subject</th>
<th>Periods</th>
<th>Evaluation</th>
<th>Subject Total</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Theory</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
<td>P</td>
<td>CT</td>
</tr>
<tr>
<td>1.</td>
<td>TEE 405</td>
<td>Electromechanical Energy Conversion-II</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>2.</td>
<td>TEE 406</td>
<td>Elements of Power Systems</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>3.</td>
<td>TEE 403</td>
<td>Electrical &amp; Electronics Engineering Materials</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>4.</td>
<td>TEE 404</td>
<td>Microprocessors &amp; its Applications</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td>5.</td>
<td>TEC 405</td>
<td>Communication Engineering</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>6.</td>
<td>TEC-402</td>
<td>Signal and Systems</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Practical /Design</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>PEE-454</td>
<td>Electromechanical Energy Conversion-I Lab</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>50</td>
</tr>
<tr>
<td>8.</td>
<td>PEE-452</td>
<td>Microprocessors Lab</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>9.</td>
<td>PEC-455</td>
<td>Communication Engineering Lab</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>25</td>
</tr>
<tr>
<td>10.</td>
<td>GP-401</td>
<td>General Proficiency (NSS/NCC/Sports/Cultural)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1000</td>
</tr>
</tbody>
</table>
UNIT – I : Crystal Structure of Materials:
Bonds in solids, crystal structure, co-ordination number, atomic radius representation of plane distance b/w two planed packing factor, Miller Indices, Bragg’s law and x-ray diffraction, structural Imperfections, crystal growth

UNIT – II : Dielectric Materials:
Polarization 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

UNIT – III : Electrical Engineering Material:
Electron theory of metals, factors affecting electrical resistance of materials, thermal conductivity of metals, heat developed in current carrying conductors, Half effect, Drift and Diffusion currents, continuity equation, thermoelectric effect, superconductivity and superconducting materials, optical properties of solids

UNIT – IV : Magnetic Material:

References :
UNIT-I : Introduction to Microprocessors: Evolution of Microprocessors, history of computers, Timing and control, Memory devices: Semiconductor memory organization, Category of memory

UNIT-II: 8-bit Microprocessors (8085): Architecture, Instruction Set, Addressing modes, Assembly Language Programming.

UNIT-III: 16-bit Microprocessors (8086): Architecture, Physical address, segmentation, memory organization, Bus cycle, Instruction Set, Addressing modes, difference between 8085 & 8086, Assembler Directives, Assembly Language Programming of 8086

UNIT-IV: Peripheral Interfacing: Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (8251), Keyboard-display controller (8279), Programmable Priority Controller (8259), 8253, ADC, Application of peripheral devices

UNIT-V: Advanced Microprocessors: Introduction to 80186, 80286, 80386, 80486, Pentium microprocessors, introduction To Microcontroller (8051)

Reference Books:

3. Brey, Barry B. “INTEL Microprocessors” Prentice Hall (India)
5. M. Rafiquzzaman, “Microprocessors- Theory and applications” PHI
TEE – 405: Electro-mechanical Energy Conversion - II

Unit I. Synchronous Machine I

Constructional features, Armature winding, EMF Equation, Winding coefficients, equivalent circuit and phasor diagram, Armature reaction, O. C. & S. C. tests, Voltage Regulation using Synchronous Impedance Method, MMF Method, Potier’s Triangle Method, Parallel Operation of synchronous generators, operation on infinite bus, synchronizing power and torque co-efficient

Unit II Synchronous Machine II:

Two Reaction Theory, Power flow equations of cylindrical and salient pole machines, Operating characteristics
Synchronous Motor: Starting methods, Effect of varying field current at different loads, VCurves, Hunting & damping, synchronous condensor

Unit III Three phase Induction Machine – I:

Constructional features, Rotating magnetic field, Principle of operation
Phasor diagram, equivalent circuit, torque and power equations, Torque- slip characteristics, no load & blocked rotor tests, efficiency, Induction generator

Unit IV Three phase Induction Machine- II

Starting, Deep bar and double cage rotors, Cogging & Crawling, Speed Control (with and without emf injection in rotor circuit.)

Single phase Induction Motor

Double revolving field theory, Equivalent circuit, No load and blocked rotor tests, Starting methods, repulsion motor.AC Commutator Motors:

Unit V

Universal motor, Single phase a.c. series compensated motor, stepper motors

Reference Books:
1. El Hawary, “Principles of Electrical Machines with Power Electronics”, Wiley India
3. Sen, Principles of Electrical Machines & Power Electronics, Wiley India
TEE - 406: Elements of Power Systems

Unit No.1  Power System Components:

Single line Diagram of Power system,Brief description of power system Elements: Synchronous machine, transformer, transmission line, bus bar , circuit breaker and isolator.

Supply System
Different kinds of supply system and their comparison, choice of transmission voltage

Transmission Lines:
Configurations, types of conductors, resistance of line, skin effect, Kelvin’s law.
Proximity effect

Unit 2 Over Head Transmission Lines
Calculation of inductance and capacitance of single phase, three phase, single circuit and double circuit transmission lines,
Representation and performance of short, medium and long transmission lines, Ferranti effect.
Surge impedance loading

Unit 3 Corona and Interference:
Phenomenon of corona, corona formation, calculation of potential gradient, corona loss, factors affecting corona, methods of reducing corona and interference.
Electrostatic and electromagnetic interference with communication lines,
Overhead line Insulators:
Type of insulators and their applications, potential distribution over a string of insulators, methods of equalizing the potential, string efficiency.

Unit 4 Mechanical Design of transmission line:
Catenary curve, calculation of sag & tension, effects of wind and ice loading, sag template, vibration dampers.

Unit 5 Insulated cables:
Type of cables and their construction, dielectric stress, grading of cables, insulation resistance, capacitance of single phase and three phase cables, dielectric loss, heating of cables.

Reference Books
1. Weedy, “Electric Power Systems”, Wiley India
TEC - 405: Communication Engineering

Unit 1 Amplitude Modulation:
Amplitude modulation, DSBSC, SSB and VSB modulation and demodulation schemes, AM transmitters and receivers, super-heterodyne receiver, IF amplifiers, AGC circuits. Frequency division multiplexing.

Unit 2 Angle Modulation:
Frequency modulation, phase modulation, Generation of frequency modulation FM receivers and demodulators
Noise:
External noise, internal noise, Noise calculations, signal to noise ratio, Noise in AM and FM systems

Unit 3 Pulse Communication
Sampling Process, PAM,PWM,PPM and PCM, Delta modulation and adaptive delta modulation
Digital Modulation:
Introduction, brief description of phase shift keying(PSK), Differential phase shift keying (DPSK), frequency shift Keying (FSK), Quadrature amplitude modulation (QAM) and time division multiplexing (TDM).

Unit 4 Radio Propagation:
Ground waves, sky wave propagation, space waves, tropospheric scatter propagation, Satellite Communication- transponders, Geo-stationary satellite system, low earth and medium earth-orbit satellite system.
Introduction to Cellular system
Personal communication system (PCS), data communication with PCS.

Reference Books :

5. Roy Blake, “Wireless Communication Technology” Thomson Asia Pvt. Ltd. Singapore
TEC-402 SIGNALS AND SYSTEMS

Unit-I Signals and Systems:
Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equation.

Unit-II Fourier series and Fourier Transformer:
The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equation.

Unit-III Time and Frequency Characterization of Signals and Systems:

Unit-IV Sampling and Laplace Transform:
Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.

Unit-V Z-Transform:
Z-Transform, Region of convergence, Inverse Ztransform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.

References:
1. Haykin, “Signals & Systems”, Wiley India
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 \(0\text{ F}\) to \(0\text{ C}\) 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.
Note: The minimum 8 experiments are to be performed from the following, out of which there should be at least two software based experiments.

1. To perform no load and blocked rotor tests on a three phase squirrel cage induction motor and determine equivalent circuit.
2. To perform load test on a three phase induction motor and draw:
   (i) Torque - speed characteristics
   (ii) Power factor - line current characteristics
3. To perform no load and blocked rotor tests on a single phase induction motor and determine equivalent circuit.
4. To study speed control of three phase induction motor by Keeping V/f ratio constant
5. To study speed control of three phase induction motor by varying supply voltage.
6. To perform open circuit and short circuit tests on a three phase alternator and determine voltage regulation at full load and at unity, 0.8 lagging and leading power factors by (i) EMF method (ii) MMF method.
7. To determine V-curves and inverted V-curves of a three phase synchronous motor.
8. To determine Xd and Xq of a three phase salient pole synchronous machine using the slip test and draw the power-angle curve.
9. To study synchronization of an alternator with the infinite bus by using:
   (i) dark lamp method (ii) two bright and one dark lamp method

Software based experiments (Develop Computer Program in ‘C’ language or use MATLAB or other commercial software)

10. To determine speed-torque characteristics of three phase slip ring induction motor and study the effect of including resistance, or capacitance in the rotor circuit.
11. To determine speed-torque characteristics of single phase induction motor and study the effect of voltage variation.
12. To determine speed-torque characteristics of a three phase induction motor by (i) keeping v/f ratio constant (ii) increasing frequency at the rated voltage.
13. Draw O.C. and S.C. characteristics of a three phase alternator from the experimental data and determine voltage regulation at full load, and unity, 0.8 lagging and leading power factors.
TEC 455: Communication Engineering Laboratory:

Note: A minimum of 10 experiments is to be performed.

1. To study amplitude modulation using a transistor and determine depth of modulation.
2. To study generation of DSB-SC signal using balanced modulator.
3. To study generation of SSB signal.
4. To study envelop detector for demodulation of AM signal and observe diagonal peak clipping effect.
5. To study super heterodyne AM receiver and measurement of sensitivity, selectivity and fidelity.
6. To study frequency modulation using voltage controlled oscillator.
7. To detect FM signal using Phase Locked Loop.
8. To measure noise figure using a noise generator.
9. To study PAM, PWM and PPM.
10. To realize PCM signal using ADC and reconstruction using DAC and 4 bit/8bit system. Observe quantization noise in each case.
11. To study Delta Modulation and Adaptive Delta Modulation.
12. To study PSK-modulation system.
13. To study FSK-modulation system.
14. To study sampling through a Sample-Hold circuit and reconstruction of the sampled signal and observe the effect of sampling rate & the width of the sampling pulses.
15. To study functioning of colour television.