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UNIVERSITY, LUCKNOW**



**EVALUATION SCHEME & SYLLABUS
FOR
B. TECH. IV YEAR
ELECTRICAL & ELECTRONICS ENGINEERING**

Session: 2020-21

EVALUATION SCHEME

B-Tech. Electrical & Electronics Engineering

YEAR 4th / SEMESTER-VII

S. No.	Subject Code	Subject Name	Department	L-T-P	Th./Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		OPEN ELECTIVE COURSE-1	Other Deptt.	3--0--0	70	20	10	100	3
2		DEPTT ELECTIVE COURSE-3	Core Deptt.	3--0--0	70	20	10	100	3
3		DEPTT ELECTIVE COURSE-4	Core Deptt.	3--1--0	70	20	10	100	4
4	REN701	COMMUNICATION SYSTEMS	Core Deptt.	3--1--0	70	20	10	100	4
5	REE702	POWER SYSTEM PROTECTION	Core Deptt.	3--0--0	70	20	10	100	3
6	REE751	INDUSTRIAL AUTOMATION & PLC LAB	Core Deptt.	0--0--2	50		50	100	1
7	REE752	POWER SYSTEM LAB	Core Deptt.	0--0--2	50		50	100	1
8	REN753	INDUSTRIAL TRAINING	Core Deptt.	0--0--3			100	100	2
9	REN754	PROJECT-1	Core Deptt.	0--0--6			200	200	3
TOTAL					450	100	450	1000	24

DEPTT. ELECTIVE COURSE-3

1. REE070: Microprocessors and Microcontrollers
2. REE071: Utilization of Electrical Energy & Electric Traction
3. REE072: Introduction to Smart Grid
4. REN070: Introduction to Robotics

DEPTT. ELECTIVE COURSE-4

1. REE075: Industrial Automation and Control
2. REE076: Energy Efficiency & Conservation
3. REE077: Reliability Engineering
4. REN075: Telemetry & Data Transmission

EVALUATION SCHEME

B-TECH. ELECTRICAL & ELECTRONICS ENGINEERING

YEAR 4th / SEMESTER-VIII

S. No.	Subject Code	Subject Name	Department	L-T-P	Th/Lab Marks	Sessional		Total	Credit
					ESE	CT	TA		
1		OPEN ELECTIVE COURSE-2	Other Deptt.	3--0--0	70	20	10	100	3
2		DEPTT ELECTIVE COURSE-5	Core Deptt.	3--1--0	70	20	10	100	4
3		DEPTT ELECTIVE COURSE-6	Core Deptt.	3--0--0	70	20	10	100	3
4	REN851	GD & SEMINAR	Core Deptt.	0--0--3			100	100	2
5	REN852	PROJECT-2	Core Deptt.	0--0--12	350		250	600	12
TOTAL					560	60	380	1000	24

DEPTT. ELECTIVE COURSE-5

1. REE080: Advanced Control System
2. REE081: Introduction to Power Quality & FACTS
3. REE082: Power System Dynamics, Control and Monitoring (NPTEL)
4. REN080: Optical Fiber Communication

DEPTT. ELECTIVE COURSE-6

1. REE085: EHVAC & DC Transmission
2. REE086: Power Theft & Energy Management
3. REE087: Digital Image Processing
4. REE088: Antennas (NPTEL)

SYLLABUS FOR 7TH SEMESTER B.TECH. EN

1. OPEN ELECTIVE COURSE -1

Units	Understanding the Human Being Comprehensively–Human Aspirations and its Fulfilment: ROE- 074
1	Introduction: The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.
2	Understanding Human being and its expansion: The domain of right understanding starts from understanding the human being (the knower, the experiencer and the doer); and extends up to understanding nature/existence – its interconnectedness and co-existence; and finally understanding the role of human being in existence (human conduct).
3	Activities of the Self: Understanding the human being comprehensively is the first step and the core theme of this course; human being as co-existence of the self and the body; the activities and potentialities of the self; Reasons for harmony/contradiction in the self
4	Understanding Co-existence with other orders: The need and the process of inner evolution (through self-exploration, self- awareness and self-evaluation)- particularly awakening to activities of the Self: Realization, Understanding and Contemplation in the Self (Realization of Co-Existence, Understanding of Harmony in Nature and Contemplation of Participation of Human in this harmony/ order leading to comprehensive knowledge about the existence)
5	Expansion of harmony from self to entire existence: Understanding different aspects of All-encompassing Resolution (understanding, wisdom, science etc.), Holistic way of living for Human Being with All-encompassing Resolution covering all four dimensions of human endeavour viz., realization, thought, behaviour and work (participation in the larger order) leading to harmony at all levels from self to Nature and entire existence..

2. DEPARTMENTAL ELECTIVE COURSE - 3

Units	Utilization of Electrical Energy & Electric Traction: REE-071
1	Introduction: The basic human aspirations and their fulfillment through Right understanding and Resolution; All-encompassing Resolution for a Human Being, its details and solution of problems in the light of Resolution.
2	Electric Welding: Electric Arc Welding Electric Resistance Welding Electronic welding control Electrolyte Process: Principles of electro deposition, Laws of electrolysis, applications of electrolysis
3	Illumination:

	Various definitions, Laws of illumination, requirements of good lighting Design of indoor lighting and outdoor lighting systems Refrigeration and Air Conditioning: Refrigeration systems, domestic refrigerator, water cooler Types of air conditioning, Window air conditioner
4	Electric Traction - I Types of electric traction, systems of track electrification Traction mechanics- types of services, speed time curve and its simplification, average and schedule speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence
5	Electric Traction – II Salient features of traction drives Series – parallel control of dc traction drives (bridge transition) and energy saving Power Electronic control of dc and ac traction drives Diesel electric traction.

3. DEPARTMENTAL ELECTIVE- 4: Energy Efficiency & Conservation

Units	Energy Efficiency & Conservation : REE076
1	Energy Conservation: Principles of Energy Conservation, Energy conservation Planning, Energy conservation in small scale industries, Large scale industries and in electrical generation, transmission and distribution, Energy conservation Legislation
2	Aim of energy Audit, Strategic of Energy Audit, Energy management Team Consideration in implementing energy conservation Programme, Instruments for energy audit, Energy audit of Electrical Systems, HVAC, Buildings, Economic analysis.
3	Demand Side Management: Concept and Scope of Demand Side Management, Evolution of Demand Side Management, DSM Strategy, Planning, Implementation and its application, Customer Acceptance & its implementation issues, National and International Experiences with DSM.
4	Voltage and Reactive power in Distribution Systems: Voltage and reactive power calculations and control, Voltage classes and nomenclature, voltage drop calculations, Voltage control, VAR requirements and power factor, Capacitors unit and bank rating, Protection of capacitors and switching, Controls for switched capacitors and fields testing.
5	Efficiency in Motors and Lighting system: Load scheduling/shifting, Motor Drives-motor efficiency testing, energy efficient motors, and motor speed control. Lighting- lighting levels, efficient options, fixtures, day lighting, timers, Energy efficient windows, UPS selection, Installation operation and maintenance. Indian Electricity Act 1956, Distribution Code and Electricity Bill 2003.

4. COMMUNICATION SYSTEMS

Units	COMMUNICATION SYSTEMS: REN701
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.
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.
3	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).
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
5	Television: TV systems and standards, scanning and synchronizing, common video and sound circuits, vertical and horizontal deflections, colour transmission and reception. Fibre Optical Communication: Optical fibre and fibre cables, fibre characteristics and classification, fibre optic components and systems.

5. POWER SYSTEM PROTECTION

Units	POWER SYSTEM PROTECTION: REE702
1	<p>Introduction to Protection System: Introduction to protection system and its elements, functions of protective relaying, protective zones, primary and backup protection, desirable qualities of protective relaying, basic terminology. Relays: Electromagnetic, attracted and induction type relays, thermal relay, gas actuated relay, design considerations of electromagnetic relay.</p>
2	<p>Relay Application and Characteristics: Amplitude and phase comparators, over current relays, directional relays, distance relays, differential relay. Static Relays: Comparison with electromagnetic relay, classification and their description, over current relays, directional relay, distance relays, differential relay.</p>
3	<p>Protection of Transmission Line: Over current protection, distance protection, pilot wire protection, carrier current protection, protection of bus, auto re-closing.</p>
4	<p>Circuit Breaking: Properties of arc, arc extinction theories, re-striking voltage transient, current chopping, resistance switching, capacitive current interruption, short line interruption, circuit breaker ratings. Testing of Circuit Breaker: Classification, testing station and equipment, testing procedure, direct and indirect testing.</p>
5	<p>Apparatus Protection: Protection of Transformer, generator and motor. Circuit Breaker: Operating modes, selection of circuit breakers, constructional features and operation of Bulk Oil, Minimum Oil, Air Blast, SF₆, Vacuum and d. c. circuit breakers.</p>

6. INDUSTRIAL AUTOMATION & PLC LAB : REE751

Note: - Experiments shall be performed on following virtual lab links:

Expt	INDUSTRIAL AUTOMATION & PLC LAB
1	For Industrial Automation (minimum 5 experiments): http://ialcoep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering
2	For PLC (minimum 5 experiments): http://plccoep.vlabs.ac.in/List%20of%20experiments.html?domain=Electrical%20Engineering

7. POWER SYSTEM LAB : REE752

Note: - At least 10 experiments should be performed out of which 3 should be simulation based.

(A) Hardware Based

Expts	
1	To determine direct axis reactance (X_d) and quadrature axis reactance (X_q) of a salient pole alternator.
2	To determine negative and zero sequence reactances of an alternator.

3	To determine sub transient direct axis reactance (X_d') and sub transient quadrature axis reactance (X_q') of an alternator
4	To determine fault current for L-G, L-L, L-L-G and L-L-L faults at the terminals of an alternator at very low excitation
5	To study the IDMT over current relay and determine the time current characteristics
6	To study percentage differential relay
7	To study Impedance, MHO and Reactance type distance relays
8	To determine location of fault in a cable using cable fault locator
9	To study ferranti effect and voltage distribution in H.V. long transmission line using transmission line model.
10	To study operation of oil testing set
(B) Simulation Based Experiments (using MATLAB or any other software)	
11	To determine transmission line performance.
12	To obtain steady state, transient and sub-transient short circuit currents in an alternator
13	To obtain formation of Y-bus and perform load flow analysis
14	To perform symmetrical fault analysis in a power system
15	To perform unsymmetrical fault analysis in a power system

SYLLABUS OF 8TH SEMESTER B.TECH. EN

1. OPEN ELECTIVE COURSE -2

RENEWABLE ENERGY RESOURCES

Units	RENEWABLE ENERGY RESOURCES : ROE 086
1	Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits. Solar Cells: Theory of solar cells. Solar cell materials, solar cell array, solar cell power plant, limitations.
2	Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.
3	Geothermal Energy: Resources of geothermal energy, thermodynamics of geothermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations. Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations. Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

4	Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations. Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.
5	Bio-mass: Availability of bio-mass and its conversion theory. Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations. Wave and Tidal Wave: Principle of working, performance and limitations. Waste Recycling Plants

2. Departmental Elective -5

INTRODUCTION TO POWER QUALITY & FACTS

Units	INTRODUCTION TO POWER QUALITY & FACTS : REE-081
1	Introduction to Power Quality: Terms and definitions of transients, Long duration Voltage Variations: under Voltage, Under Voltage and Sustained Interruptions; Short Duration Voltage Variations: interruption, Sag, Swell; Voltage Imbalance; Notching D C offset, waveform distortion; voltage fluctuation; power frequency variations.
2	Voltage Sag: Sources of voltage sag: motor starting, arc furnace, fault clearing etc; estimating voltage sag performance and principle of its protection; solutions at end user level- Isolation Transformer, Voltage Regulator, Static UPS, Rotary UPS, and Active Series Compensator.
3	Electrical Transients: Sources of Transient Over voltages- Atmospheric and switching transients- motor starting transients, pf correction capacitor switching transients, ups switching transients, neutral voltage swing etc; devices for over voltage protection.
4	FACT Systems: Introduction – Terms & Definition, Fact Controllers, Type of FACT devices i.e. SSC, SVC, TSC, SSS, TCSC, UPFC Basic relationship for power flow control.
5	Harmonics: Causes of harmonics; current and voltage harmonics: measurement of harmonics; effects of harmonics on – Transformers, AC Motors, Capacitor Banks, Cables, and Protection Devices, Energy Metering, Communication Lines etc., Harmonic Mitigation Techniques.

3. DEPARTMENTAL ELECTIVE- 6

EHV AC & DC TRANSMISSION

Units	EHV AC & DC TRANSMISSION: REE-085
1	Need of EHV transmission, standard transmission voltage, comparison of EHV AC & DC transmission systems and their applications & limitations, surface voltage gradients in conductor, distribution of voltage gradients on sub-conductors, mechanical considerations of transmission lines, modern trends in EHV AC and DC transmission.
2	EHV AC Transmission: Corona loss formulas, corona current, audible noise – generation and characteristics corona pulses their generation and properties, radio interference (RI) effects, over voltage due to switching, Ferro resonance, reduction of switching surges on EHV system, principle of half wave transmission
3	Extra High Voltage Testing: Characteristics and generation of impulse voltage, generation of high AC and DC voltages, measurement of high voltage by sphere gaps and potential dividers. Consideration for Design of EHV Lines: Design factors under steady state limits, EHV line insulation design based upon transient over voltages. Effects of pollution on performance of EHV lines.
4	EHV DC Transmission – I: Types of dc links, converter station, choice of converter configuration and pulse number, effect of source inductance on operation of converters. Principle of DC link control, converter controls characteristics, firing angle control, current and excitation angle control, power control, starting and stopping of DC link.
5	EHV DC Transmission – II: Converter faults, protection against over currents and over voltages, smoothing reactors, generation of harmonics, AC and DC filters, Multi Terminal DC systems (MTDC): Types, control, protection and applications.

