Syllabus for B.E-I - Semester for academic year 2022 – 2023

(For students admitted to I year in 2022-23)

22UEE136B	**Renewable Energy Sources**	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**(10 Hours)**

Introduction to Energy Sources:

Classification of energy resources, conventional energy resources – availability and their limitations; non-conventional energy resources – classification, advantages, limitations; comparison of conventional and non-conventional energy resources.

Solar Energy Basics:

Introduction, solar constant, basic sun-earth angles – definitions and their representation; solar radiation geometry, solar radiation data measuring instruments – Pyranometer and Pyrheliometer.

UNIT – II	**(10 Hours)**

Solar Thermal Systems:

Principle of conversion of solar radiation into heat, solar water heaters (Flat plate collectors); solar cookers – box type, concentrating dish type; solar driers, solar still.

Solar Electric Systems:

Solar thermal electric power generation – solar pond and concentrating solar collector (parabolic trough, parabolic dish, central tower collector), advantages and disadvantages; solar photovoltaic – solar cell fundamentals, module, panel and array; solar PV systems – street lighting, domestic lighting and solar water pumping systems.

UNIT – III	**(10 Hours)**

Wind Energy:

Wind and its properties, history of wind energy, basic principles of Wind Energy Conversion Systems (WECS), wind data measuring instrument, classification of WECS, parts of a WECS, power in the wind; Vertical axis wind turbine generator - Savinous and Darrius types, advantages and limitations of WECS.

Biomass Energy:

Introduction, photosynthesis process, biomass conversion technologies, biomass gasification – principle and working of gasifiers; biogas - production of biogas, factors affecting biogas generation; types of biogas plants–KVIC and Janata model.

UNIT – IV	**(10 Hours)**

Geothermal Energy:

Introduction, classification, conversion technologies, applications, advantages and limitations of geothermal resources.

Energy from Ocean:

Principle of tidal power, components of Tidal Power Plant (TPP), classification, advantages and limitations of TPP.

Ocean Thermal Energy Conversion (OTEC): Principle of OTEC system, types of OTEC power generation, block diagram, applications, advantages and limitations.

Reference Books:

1. B. H. Khan, "Conventional Energy Resources", Tata McGraw-Hill Education Private Limited, New Delhi, 3rd Edition, 2007.
2. G. D. Rai, "Non-conventional Energy sources", Khanna Publication, 4th Edition, 2015.
3. G. N. Tiwari and M K. Ghosal, "Fundamentals of Renewable Energy Resources", Alpha Science International Ltd, 1st Edition, 2007.
4. Shobh Nath Singh, "Non-Conventional Energy Resources", Pearson Education, 2nd Edition 2018.
5. Bent Sorensen, "Renewable Energy", Academic Press, 5th Edition, 2017 (e-book).
6. David Buchla, Thomas Kissell and Thomas Floyd, "Renewable Energy Systems", Pearson, 1st Edition, 2014 (e-book).
7. Roland Wengenmayr, Thomas Buhrke, "Renewable Energy: Sustainable Energy Concepts for the Future", Wiley-VCH, 2nd Edition, 2008 (e-book).

Course Outcomes:

After completion of the course the students will be able to,

1. Identify electrical and mechanical devices of solar, wind, biomass, geothermal and ocean energy conversion systems.
2. Measure performance parameters related to solar, wind, biomass, geothermal and ocean energy conversion systems.
3. Compute the power generation of wind and solar energy correspond to variable data.
4. Compare the features of solar, wind, biomass, geothermal and ocean energy conversion systems.

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	22UEE136B.1	3	1	1			1	1	1		1	1	1	3	1	
2	22UEE136B.2	3	1	1	1		1	1	1		1		1	2	3	
3	22UEE136B.3	3	2	3	1							1	1	1	1	
4	22UEE136B.4	3	3	3	2				1				1	1		1

Syllabus for B.E-I - Semester for academic year 2022 – 2023

(For students admitted to I year in 2022-23)

22UEE115C	**Elements of Electrical Engineering**	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**(10 Hours)**

Electrical Power Generation: Hydel plant, thermal plant, nuclear plant - working principle, site selection parameters, merits and demerits.

Electromagnetism: Faraday's laws of electromagnetic induction, Lenz's law, Fleming's rules, statically and dynamically induced emf, concepts of self and mutual inductance, coefficient of coupling, energy stored in magnetic field.

UNIT – II	**(10 Hours)**

DC Circuits: Ohm's law and Kirchhoff's laws, analysis of series, parallel and series-parallel circuits, current and voltage sources, source transformation and shifting, dependent and independent sources, mesh current analysis, node voltage analysis.

UNIT – III	**(10 Hours)**

Single-Phase AC Circuits: Generation of sinusoidal voltage, average and rms values, form factor and peak factor, phasor representation of alternating quantities, analysis of R, L, C, R-L, R-C, R-L-C circuits with phasor diagrams, real power, reactive power, apparent power, power factor, series, parallel and series-parallel circuits.

Three-Phase AC Circuits: Advantage of 3-phase system, generation of 3-phase power, relationship between line and phase values of balanced star and delta connections, power in balanced 3-phase circuits, measurement of 3-phase power by 2-wattmeter method.

UNIT – IV	**(10 Hours)**

Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads.

Electrical Energy Calculation: Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers.

Electrical Safety Measures:

Equipment: Types of equipment, voltage and current issues, safety.

Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.

Reference Books:

1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2014.
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019.
3. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010.
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", 2nd Edition, PHI Learning, 2009.
5. V.N.Mittle & A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005
6. S. K. Bhattacharya, "Basic Electrical and Electronics Engineering", 2nd Edition, Pearson Publications, 2017.

Syllabus for B.E-I - Semester for academic year 2022 – 2023

(For students admitted to I year in 2022-23)

Course outcomes:

After completion of the course the students will be able to,

1. Suggest suitable site for Hydro –electric, Thermal and Nuclear power plants by understanding the working principle and pros & cons
2. Apply the fundamental concepts of electromagnetism to assess the parameters of magnetic circuits
3. Apply electric circuit theorems to DC and AC (single phase and three phase) circuits to determine current, voltage, and power in various branches
4. Identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	22UEE115C.1	3											1	1		
2	22UEE115C.2	3	2	2	2								1	2		1
3	22UEE115C.3	3	3	2	2	1	1						1	1		
4	22UEE115C.4	3	3	1	3	1	1		1		1		2	1		1

Syllabus for B.E-I - Semester for academic year 2022 – 2023

(For students admitted to I year in 2022-23)

22UEE116N	**Introduction to Electrical Engineering**	03 - Credits (3 : 0 : 0)
Hours/Week : 03		CIE Marks : 50
Total Hours : 40		SEE Marks : 50

UNIT – I	**(10 Hours)**
Introduction: General structure of electrical power systems using single line diagram approach. **Power Generation:** Hydel, thermal, nuclear power plants (block diagram approach). **DC Circuits:** Ohm's law and its limitations, KCL & KVL, series, parallel, series-parallel circuits. Simple Numerical.	
UNIT – II	**(10 Hours)**
AC. Fundamentals: Equation of AC voltage and current, waveform, time period, frequency, amplitude, phase, phase difference, average value, RMS value, form factor, peak factor (only definitions), voltage and current relationship with phasor diagrams in R, L, and C circuits, concept of impedance, analysis of R-L, R-C, R-L-C series circuits, active power, reactive power and apparent power, concept of power factor. (Simple Numerical). **Three Phase Circuits:** Generation of three phase AC quantity, advantages and limitations, star and delta connection, relationship between line and phase quantities (excluding proof)	
UNIT – III	**(10 Hours)**
DC Generator, DC Motor, Transformers: Working principle, construction, equations, types and classifications, specifications, applications, cost. Simple numerical.	
UNIT – IV	**(10 Hours)**
Domestic Wiring: Requirements, Types of wiring, Two way and three way control of loads. **Electrical Energy Calculation:** Power rating of household appliances, two-part electricity tariff, calculation of electricity bill for domestic consumers. **Electrical Safety Measures:** Equipment: Types of equipment, voltage and current issues, safety. Human: Electric shock, effect of shock on body, factors affecting severity of shock, safety precautions.	

Reference books:

1. B.L Theraja, "Fundamentals of Electrical Engineering and Electronics", S. Chand Publications, 27th Edition, 2014
2. D C Kulshreshtha, "Basic Electrical Engineering", Tata McGraw Hill, 10th Edition, 2019.
3. Edward Hughes, "Electrical and Electronic Technology", Pearson Publications, 10th Edition, 2010
4. Rajendra Prasad, "Fundamentals of Electrical Engineering", 2nd Edition, PHI Learning, 2009
5. V.N.Mittle & A.Mittal, "Basic Electrical Engineering", Tata McGraw-Hill Education, 2005

Syllabus for B.E-I - Semester for academic year 2022 – 2023

(For students admitted to I year in 2022-23)

Course Outcomes:

After completion of the course the students will be able to,

1. Understand the working of Hydro –electric, Thermal and Nuclear power plants
2. Apply the electric circuit theorems to DC and AC (single phase and three phase) circuits to determine current, voltage, and power in various branches
3. Analyze the working principle and construction to identify the suitable applications of DC generators, motors and transformers by identifying the specifications
4. Identify the safety aspects in different types of wiring mechanisms and evaluate the energy consumption in domestic loads

Course Outcomes - Programme Outcomes Mapping Table

Sl.	Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	22UEE116N.1	3											1	1		
2	22UEE116N.2	3	1	1	1								1	2		1
3	22UEE116N.3	3	1	1	1								1	2		1
4	22UEE116N.4	3	1	1	1				1		1		1	1		1