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Renewable Energy Power Plants — Complete Syllabus (Program Elective-2, Option 1)

BTEUP Diploma in Electrical Engineering • 4th Semester • Session 2026-27

Subject 4.5.1 (Program Elective-2, Theory) • Total 100 Marks • 3 Credits • L 3 - P 0 •

Choose this OR Biomass and Micro-Hydro Power Plants

Please note — cover year vs approval: BTEUP's own file for this curriculum prints “YEAR 2025-2026” on its cover, while carrying the approval line “UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026” on every page. It is filed in BTEUP's 2026-27 folder (folder2627), so it is treated here as the 2026-27 syllabus on the strength of that approval. The scheme it carries is identical, subject for subject and mark for mark, to the 2025-26 scheme.

Examination Scheme

Code	Paper	Type	L - P	Credits	Internal	External	Total
4.5	Program Elective -2: Renewable Energy Power Plants	Theory	3 - 0	3	40	60 (3 hrs)	100
Renewable Energy Power Plants Total				3	40	60	100

What This Subject Aims To Do

To help students maintain the efficient operation of various types of renewable energy power plants.

Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks Share
I	Solar PV and Concentrated Solar Power Plants	07	20%
II	Large Wind Power Plants	09	20%
III	Small Wind Turbines	08	20%
IV	Micro Hydro Power Plants	09	20%
V	Biomass-based Power Plants	09	20%

Unit - I: Solar PV and Concentrated Solar Power Plants (07 Periods, 20%)

Topics: Solar Map of India: Global solar power radiation; Classification of solar thermal collectors, construction and working of (a) flat type, (b) focusing type; Concentrated Solar Power (CSP) plants, construction and working of: Power Tower, Parabolic Trough, Parabolic Dish, Fresnel Reflectors; Solar Photovoltaic (PV) power plant: components layout, construction, working; Rooftop solar PV power system, on-grid and off-grid solar PV system.

Unit - II: Large Wind Power Plants (09 Periods, 20%)

Topics: Wind Map of India: Wind power density in watts per square meter; Lift and drag principle; long path theory; Geared type wind power plants: components, layout and working; Direct drive type wind power plants: components, layout and working; Constant Speed Electric Generators: Squirrel Cage Induction Generators (SCIG), Wound Rotor Induction Generator (WRIG); Variable Speed Electric Generators: Doubly-fed induction generator (DFIG), wound rotor synchronous generator (WRSG), permanent magnet synchronous generator (PMSG).

Unit - III: Small Wind Turbines (08 Periods, 20%)

Topics: Horizontal axis small wind turbine: direct drive type, components and working; Horizontal axis small wind turbine: geared type, components and working; Vertical axis small wind turbine: direct drive and geared, components and working; Types of towers and installation of small wind turbines on roof tops and open fields; Electric generators used in small wind power plants.

Unit - IV: Micro Hydro Power Plants (09 Periods, 20%)

Topics: Energy conversion process of hydro power plant; Classification of hydro power plant: High, medium and low head; Layouts of micro-hydro power plants; Construction and working of hydro turbines used in different types of hydro power plant: (a) High head – Pelton turbine, (b) Medium head – Francis turbine, (c) Low head – Kaplan turbine; Pumped storage hydro power plants; Safe Practices for micro hydro power plants.

Unit - V: Biomass-based Power Plants (09 Periods, 20%)

Topics: Properties of solid fuel for biomass power plants: bagasse, wood chips, rice husk, municipal waste; Properties of liquid and gaseous fuel for biomass power plants: Jatropha, bio-diesel, gobar gas; Gasifier and its types; Types of Bio-gas power plant – fixed and floating dome type; Layout of a Bio-chemical based (e.g. biogas), Thermo-chemical based (e.g. Municipal waste), Agro-chemical based (e.g. bio-diesel) power plant.

Reference Books (as listed in the syllabus)

- Deambi, Suneel: From Sunlight to Electricity: a practical handbook on solar photovoltaic application; TERI, New Delhi ISBN: 9788179935736
- David M. Buchla, Thomas E. Kissell, Thomas L. Floyd – Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826
- Rachel, Sthuthi; Earnest, Joshua – Wind Power Technologies, PHI Learning, New Delhi, ISBN: 978-93-88028-49-3; E-book 978-93-88028-50-9
- Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology: Towards Sustainable Development; TERI, New Delhi; ISBN: 9788179934043
- Gipe, Paul: Wind Energy Basics, Chelsea Green Publishing Co; ISBN: 978-1603580304
- Wizelius, Tore & Earnest, Joshua - PHI Learning, New Delhi, ISBN: 978-8120351660
- Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI Learning, New Delhi, ISBN: -978-81-203-4470-9
- Bhadra, S.N., Kastha, D., Banerjee, S, Wind Electrical Systems installation; Oxford University Press, New Delhi, ISBN: 9780195670936
- O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi (ISBN: 978-9386173-683)

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Source: BTEUP 2nd Year curriculum (folder2627) — cover prints YEAR 2025-2026, but the approval line 'UPDATED AND APPROVED BY BOARD OF TECHNICAL EDUCATION U.P. LUCKNOW IN C.D.C MEETING HELD ON 16.07.2026' appears on every page (95 times); treated as the 2026-27 curriculum. Topic lists follow the official syllabus; short explanations are the author's own plain-English summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.