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## Biomass and Micro-Hydro Power Plants — Complete Syllabus (Program Elective-2, Option 2)

BTEUP Diploma in Electrical Engineering • 4th Semester • Session 2026-27  
Subject 4.5.2 (Program Elective-2, Theory) • Total 100 Marks • 3 Credits • L 3 - P 0 •  
Choose this OR Renewable Energy 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: Biomass and Micro-Hydro Power Plants | Theory | 3 - 0 | 3        | 40        | 60 (3 hrs) | 100        |
| <b>Biomass and Micro-Hydro Power Plants Total</b> |                                                           |        |       | <b>3</b> | <b>40</b> | <b>60</b>  | <b>100</b> |

### What This Subject Aims To Do

To help students maintain the efficient operation of various types of biomass and micro-hydro power plants.

## Unit-Wise Complete Topic List

| Unit | Topic                                       | Periods | Marks Share |
|------|---------------------------------------------|---------|-------------|
| I    | Basics of Biomass-based Power Plants        | 7       | 20%         |
| II   | Biomass Gasification Power Plants           | 8       | 20%         |
| III  | Different Types of Gasifiers                | 9       | 23%         |
| IV   | Micro-hydro Power Plants                    | 9       | 17%         |
| V    | Different types of Micro-hydro power plants | 9       | 20%         |

### Unit - I: Basics of Biomass-based Power Plants (7 Periods, 20%)

**Topics:** Types of biomass fuel - bagasse, wood chips, rice husk, municipal waste, Jatropha, bio-diesel, gohar gas, Layout of a Bio-chemical based (e.g. biogas) power plant; Layout of a Thermo-chemical based (e.g. Municipal waste) power plant; Layout of an Agro-chemical based (e.g. bio-diesel) power plant; Selection of biomass power plants.

### Unit - II: Biomass Gasification Power Plants (8 Periods, 20%)

**Topics:** The basic principle to convert Agriculture and forestry products and wood processing remains (including rice husks, wood powder, branches, offcuts, corn straws, rice straws, wheat straws, cotton straws, fruit shells, coconut shells, palm shells, bagasse, corncobs) into combustible gas; General Construction and working of a typical gasifier; Power generation in gas engine.

### Unit - III: Different Types of Gasifiers (9 Periods, 23%)

**Topics:** Construction, working and limitations of the following types of gasifiers: Rice Husk Gasification Power Plant and their specifications, Straw Gasification Power Plant and their specifications; Bamboo Waste, Bamboo Chips Gasification Power Plant and their specifications; Coconut shell, coconut peat, coconut husk, Gasification Power Plant and their specifications; Bagasse/Sugar Cane Trash Gasification Power Plant and their specifications; Gobar gas plant and its specifications.

### Unit - IV: Micro-hydro Power Plants (9 Periods, 17%)

**Topics:** Locations of micro-hydro power plant; Energy conversion process of hydro power plant; Classification of hydro power plant: High, medium and low head; General Layouts of typical micro-hydro power plant; Strengths and limitations of micro-hydro power plants.

## Unit - V: Different types of Micro-hydro power plants (9 Periods, 20%)

**Topics:** Construction and working of High head – Pelton turbine and their specifications; Construction and working of medium head – Francis turbines and their specifications; Construction and working of Low head – Kaplan turbine and their specifications; Preventive and breakdown maintenance of micro-hydro power plants; Safe Practices for micro-hydro power plants.

### Reference Books (as listed in the syllabus)

- Khoiyangbam, R S Navindu; Gupta and Sushil Kumar; Biogas Technology: Towards Sustainable Development; TERI, New Delhi; ISBN: 9788179934043
- David M. Buchla; Thomas E. Kissell; Thomas L. Floyd - Renewable Energy Systems, Pearson Education New Delhi, ISBN: 9789332586826
- Kothari, D.P. et al: Renewable Energy Sources and Emerging Technologies, PHI
- Rachel, Sthuthi, Earnest, Joshua; - Wind Power Technologies, PHI Learning
- O.P. Gupta, Energy Technology, Khanna Publishing House, ISBN: 978-93-86173-683

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