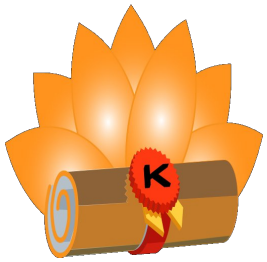
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Green Energy & Engineering — Complete Syllabus

BTEUP Diploma in Mechanical Engineering (Production) • 6th Semester • Session 2026–27

Subject 6.4.1 (Theory) • Elective Specialization • Total 100 Marks • 3 Credits

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About this document: Green Energy & Engineering is subject 6.4.1 of the 6th semester of the Diploma in Mechanical Engineering (Production). It is one of the four Elective Specialization options — a student picks any ONE of the four: Green Energy & Engineering (6.4.1), Maintenance of Machine Tools (6.4.2), Non-Destructive Testing (6.4.3) and Product Design & Development (6.4.4). This document gives the complete unit-wise syllabus, the examination scheme and the reference books from the official curriculum.

Examination Scheme

Code	Paper	Type	L – P	Credits	Internal	External	Total
6.4.1	Green Energy & Engineering	Theory	3 – 0	3	Theory 40	Theory 60 (3 hrs)	100
Green Energy & Engineering Total				**3**	**40**	**60**	**100**

What This Subject Aims To Do

To show students how energy can be produced and used without damaging the environment — solar, wind, ocean, biomass and hydrogen energy, efficient systems, and green manufacturing — so that they can work toward sustainable development.

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Unit-Wise Complete Topic List

Unit	Topic	Periods	Marks
1	Introduction to Energy Sources	8	12
2	Solar Energy and Wind Energy	8	12
3	Ocean, Biomass Energy and Hydrogen	10	12
4	Energy Efficient Systems	8	12
5	Green Manufacturing Systems	8	12

Total: 42 periods, 60 marks (external theory). Each of the five units carries 12 marks in the external theory paper, as per the suggested distribution of marks in the official syllabus.

Unit 1 — Introduction to Energy Sources (8 Periods, 12 Marks)

Topics: Overview of conventional and renewable energy sources, types of renewable energy systems, future of energy use, present Indian and international energy scenario of conventional and RE sources, energy for sustainable development, environmental aspects of energy, limitations of RE sources.

In simple words: Where the world's energy comes from today, what renewable sources offer, and why energy must serve sustainable development.

Unit 2 — Solar Energy and Wind Energy (8 Periods, 12 Marks)

Topics: Theory of solar cells, concept of Solar PV systems, flat plate and concentrating collectors, Solar PV applications, solar heating/cooling technique, solar distillation and solar drying, solar cookers. Energy from wind, Horizontal axis Wind Turbine, Vertical Axis Wind Turbine, Wind Energy Conversion Systems.

In simple words: How sunlight and wind become electricity and heat — solar cells and PV systems, collectors, solar cookers, and horizontal- and vertical-axis wind turbines.

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Unit 3 — Ocean, Biomass Energy and Hydrogen (10 Periods, 12 Marks)

Topics: OTEC, principles of utilization, setting of OTEC plants, tidal and wave energy. Principles of bio-conversion, types of bio-gas digesters, gas yield, utilization for cooking, bio fuels, I.C. engine operation and economic aspects. Chemical production of hydrogen, electrolytic hydrogen, thermolytic hydrogen, photolytic hydrogen, photobiologic hydrogen production.

In simple words: Energy from the ocean, from biomass and from hydrogen — OTEC, tides and waves, biogas digesters, biofuels, and the four routes to hydrogen.

Unit 4 — Energy Efficient Systems (8 Periods, 12 Marks)

Topics: Energy efficient motors, energy efficient lighting and control. Fuel cells: principles, thermodynamic aspects, selection of fuels and working of various types of fuel cells, environment friendly and energy efficient compressors and pumps.

In simple words: Using less energy for the same work — efficient motors, lighting, fuel cells, compressors and pumps.

Unit 5 — Green Manufacturing Systems (8 Periods, 12 Marks)

Topics: Environment impact of the current manufacturing practices and systems, benefits of green manufacturing systems, selection of recyclable and environment friendly materials in manufacturing, sustainable green production systems, alternate casting and joining techniques, zero waste manufacturing.

In simple words: Making things cleanly — recyclable materials, sustainable production, alternate casting and joining, and zero-waste manufacturing.

Learning Outcomes

- Study the conventional and renewable energy sources, energy scenarios, sustainability aspects, and environmental impacts.
- Explain the principles, components, and applications of solar and wind energy conversion systems.
- Analyze ocean energy, biomass energy systems, and various hydrogen production technologies.
- Study energy-efficient systems including motors, lighting, fuel cells, compressors, and pumps.
- Apply concepts of green manufacturing, sustainable production systems, and zero-waste manufacturing practices.

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Reference Books (as listed in the syllabus)

- D. S. Chauhan & S. K. Srivastava, Non-Conventional Energy Resources, New Age International Private Limited, 4th Edition, 2021.
- John Twidell & Tony Weir, Renewable Energy Resources, Routledge, 3rd Edition, 2015.
- D. P. Kothari, K. C. Singal & Rakesh Ranjan, Renewable Energy Sources and Emerging Technologies, PHI Learning, 3rd Edition, 2022.
- Ritu Dogra, Renewable Energy and Green Technology, Brillion Publishing, 1st Edition, 2023.
- Soli J. Arceivala, Green Technologies, McGraw Hill Education (India) Private Limited, 1st Edition, 2017.
- Chandan Deep Singh & Harleen Kaur, Sustainable Green Development and Manufacturing Performance through Modern Production Techniques, Taylor & Francis Ltd, 1st Edition, 2021.
- Web: https://onlinecourses.nptel.ac.in/noc21_ch11/preview

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Source: IRDT Kanpur NEP-2020 curriculum for the Diploma in Mechanical Engineering (Production), updated and approved by the Board of Technical Education, U.P., Lucknow, in the C.D.C. meeting held on 16.07.2026. Topic lists follow the official syllabus; short explanations are the author's own plain-language summaries, not syllabus text. Please confirm with your own polytechnic for any local changes.

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