

Centre for Energy & Environment

Admission Test Syllabus M.Tech (Renewable Energy)

Energy Scenario: Global Energy consumption patterns, world energy reserves, and the role of renewables and non renewables in the global energy mix.
Energy profile of India, energy consumption in different sectors, Indian renewable sector and its potential and installation

Policy and Regulations: National Action Plan on Climate Change (NAPCC), Electricity Act 2003, Energy Conservation Act 2001, Roles of MNRE, BEE, IREDA, and SECI.

Sustainability :

Impact of conventional energy (fossil fuels) on air, water, and land; Acid rain and Ozone layer depletion, Greenhouse Effect,
Global warming and international agreements (Kyoto Protocol, Paris Agreement).
Concepts of sustainable development, SDG 17 goals, concept of life cycle assessment (LCA)

Basics of Renewable Energy:

Solar energy:

Solar radiation geometry, solar constant, flat plate collectors, concentrating collectors (parabolic trough, dish, tower), and solar thermal storage,
Fundamentals of semiconductors, P-N junction, solar cell/module characteristics, types of solar cells, and Balance of Systems (BOS).

Biomass Energy: Biomass resources, photosynthesis, biochemical conversion (anaerobic digestion, fermentation), thermochemical conversion (combustion, gasification, pyrolysis), and biogas plant operations.

Wind Energy: wind speed and direction measurement and characteristics, Betz limit, components of wind energy generation system, and site selection.

Hydro Energy: Classification of hydropower plants (large, small, mini, micro), water cycle basics, hydraulic turbines (Pelton, Francis, Kaplan), and essential fluid mechanics.

Hydrogen Energy: Methods of production (electrolysis, steam methane reforming), storage (compressed gas, liquid, metal hydrides), and basic principle of fuel cells.

Energy Storage Technologies:

Basics of Mechanical Storage: Working principles and applications of Pumped Hydroelectric Storage (PHS), Compressed Air Energy Storage (CAES), and Flywheels.

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Basics of Electrochemical Storage: Classification of batteries (Lead-Acid, Lithium-ion, Flow batteries, Sodium-sulfur), battery performance parameters (State of Charge, Depth of Discharge, Cycle life), and Supercapacitors.

Basics of Thermal Storage: Sensible heat storage (water, molten salts, rocks), Latent heat storage using Phase Change Materials (PCM), and Thermochemical storage basics.