

Maulana Abul Kalam Azad University of Technology, West Bengal
(Formerly West Bengal University of Technology)

Syllabus for B. Tech in Civil Engineering
(Applicable from the academic session 2018-2019)

CE(ES)302	Energy Science & Engineering	1L + 1T =	2 Credits
Module 1	Introduction to Energy Science Scientific principles and historical interpretation to place energy use in the context of pressing societal, environmental and climate issues; Introduction to energy systems and resources; Introduction to Energy, sustainability & the environment. Tutorials: Compile a World map showing Energy Reserves by source, Total Energy consumption, Per capita energy consumption and Carbon Footprint		3L
Module 2	Energy Sources Overview of energy systems, sources, transformations, efficiency, and storage. Fossil fuels (coal, oil, oil-bearing shale and sands, coal gasification) - past, present & future, Remedies & alternatives for fossil fuels - biomass, wind, solar, nuclear, wave, tidal and hydrogen; Sustainability and environmental trade-offs of different energy systems; possibilities for energy storage or regeneration (Ex. Pumped storage hydro power projects, superconductor-based energy storages, high efficiency batteries) Tutorials: Compile a Word Map showing Alternative Energy source usage; Compile a Process diagram for a Pumped Storage project; Collect details of a typical North Sea oil platform. Compile a map of India showing existing potential and utilized potential for hydro power. List the pros and cons for Thermal, hydro, nuclear and solar power projects.		4L
Module 3	Energy & Environment Energy efficiency and conservation; introduction to clean energy technologies and its importance in sustainable development; Carbon footprint, energy consumption and sustainability; introduction to the economics of energy; How the economic system determines production and consumption; linkages between economic and environmental outcomes; How future energy use can be influenced by economic, environmental, trade, and research policy Tutorials: Study the functioning of an Electro Static Precipitator in a thermal power plant; study the uses of coarse and fine Fly Ash from thermal power plants. Compile the safety provisions in design and construction of a reactor containment building		5L
Module 4	Civil Engineering Projects connected with the Energy Sources Coal mining technologies, Oil exploration offshore platforms, Underground and under-sea oil pipelines, solar chimney project, wave energy caissons, coastal installations for tidal power, wind mill towers; hydropower stations above-ground and underground along with associated dams, tunnels, penstocks, etc.; Nuclear reactor containment buildings and associated buildings, design and construction constraints and testing procedures for reactor containment buildings; Spent Nuclear fuel storage and disposal systems Tutorials: Compile a process diagram for a typical underground hydropower project; Collect details of a model solar chimney project; collect details of a wave energy project at Vizhinjam; Collect details of the Kalpasar (Tidal energy) project		10L
Module 5	Engineering for Energy conservation Concept of Green Building and Green Architecture; Green building concepts (Green building encompasses everything from the choice of building materials to where a building is located, how it is designed and operated); LEED ratings; Identification of energy related enterprises that represent the breath of the industry and prioritizing these as candidates; Embodied energy analysis and use as a tool for measuring sustainability. Energy Audit of Facilities and optimization of energy consumption. Tutorials: Draw a typical geometrical orientation of a house in your area to avoid sun's radiation in the bed room in the evening; Identify typical examples of Indian buildings having various LEED ratings; List various building materials with their embodied energy content. Do an Energy Audit of your Departmental Building in the college		8L
Reference	1. Boyle, Godfrey (2004), Renewable Energy (2nd edition). Oxford University Press 2. Boyle, Godfrey, Bob Everett, and Janet Ramage (Eds.) (2004), Energy Systems and Sustainability: Power for a Sustainable Future. Oxford University Press 3. Schaeffer, John (2007), Real Goods Solar Living Sourcebook: The Complete Guide to Renewable Energy Technologies and Sustainable Living, Gaia 4. Jean-Philippe; Zaccour, Georges (Eds.), (2005), Energy and Environment Set: Mathematics of Decision Making, Loulou, Richard; Waaub, XVIII, 5. Ristinen, Robert A. Kraushaar, Jack J. A Kraushaar, Jack P. Ristinen, Robert A. (2006) Energy and the Environment, 2nd Edition, John Wiley 6. UNDP (2000), Energy and the Challenge of Sustainability, World Energy assessment 7. E H Thorndike (1976), Energy & Environment: A Primer for Scientists and Engineers, Addison-Wesley Publishing Company 8. Related papers published in international journals		