Course Title: Energy for Sustainable Development **(Elective course)**

Course Code: ESE-840

Course Objectives:

Following are the course objectives:

- To understand the principles of sustainability and development.
- To intertwine the dimensions of Sustainable development, society, environment, culture and economy.
- To create an ability for a systems approach to undertake problem identification, formulation, and solution.
- To develop a Capacity for independent critical thought, rational inquiry, and self-directed learning for power system planning.
- To communicate effectively, with technical folks and community at large.

Learning Outcomes.

This course is structured to equip students with the tools to assess energy systems and sources from a sustainability perspective. It covers a spectrum of technologies integral to establishing sustainable energy supplies. Furthermore, it explores the relationship between the increasing energy demands in developing nations and the imperative for global and local sustainability while minimizing environmental impact. Through this course, students will be able to refine their ability to identify policy gaps crucial for achieving sustainable development within energy systems, and they are empowered to craft recommendations aimed at bridging these gaps. The course's focus on critical analysis enables students to scrutinize energy systems, understand their environmental implications, and propose strategies that align with the goal of sustainable energy generation.

Detailed Contents:

Energy and Development; Sustainability Concept and indicators; UN Sustainable Development goals SDGs & Linkage of SDG7 with all UN SDGs; Role of Energy for the Development; Framework of Sustainable development.

Energy Resources – Supply and Demand; Energy Consumption and Demand-Global perspectives; Renewable and conventional energy resources for sustainable energy supplies; Waste to energy Techniques; World conflicts and Energy Security, Affordability, Accessibility; Importance of Energy Efficiency & conservation at supply and demand side; Transmission and distribution system challenges

Sustainable Energy supplies and Climate Concerns; Carbon versus non-carbon energy supply and their Climate impacts; International Protocols Regarding Global Climate Change due to energy usage; Sustainable & efficient utilization of conventional energy resources for net zero emissions in developing countries; Sustainable water usage for the power generation systems; Nationally Determined Contributions at CoP26 climate conference; Carbon capture and storage.

Energy Markets & Policies; Analysis of Policies for the sustainable energy supplies; A comparative overview of the world energy policies; Energy demand forecasting-Challenges and opportunities; Circular debt in Power sector: Core Issues, Challenges and Sustainable solution Energy; Policies and its impact for the sustainable energy access in Rural and Isolated Areas.

Key Emerging Technologies for sustainable development; Hydrogen economy for sustainable development– opportunities and challenges for developing countries; Repowering of the power plants-Conventional and non-conventional.

Text/Ref Books:

- Energy and Sustainable Development by Quinta Nwanosike Warre; De Gruyter; 1st edition
- Exergy: Energy, Environment and Sustainable Development by Ibrahim Dincer (Author), Marc A Rosen (Author); 3rd Edition; Elsevier Science

Energy for Sustainable Development: Demand, Supply, Conversion and Management; by Md Hasanuzzaman (Editor), Nasrudin Abd Rahim; Academic Press; 1st edition