

ME356 Principles of Energy Conversion

Credit: 4

Approval: Approved in 3rd Senate

Prerequisite: Thermodynamics

Students intended for:

Elective or Core: Elective

Semester: Odd/Even

Course objective

The course extends the theoretical base of various subjects to power generation technologies. In a multi-disciplinary approach, it covers practical aspects of power system planning, system level design, equipment features and environmental aspects. Thermal, nuclear, combined cycle, hydro and renewable power plants are covered in the syllabus.

Course content:

Introduction to power system and technologies. Demand variation and forecasting. Grid features. Siting and costing.

Diesel generators: system, equipment and layout.

Fossil-fuelled steam power plants: boiler and accessories. Turbine and accessories, feed cycle equipment, generator.

Combined cycle power plants: gas turbine, heat recovery boiler.

Nuclear power: nuclear reactions, fuel, moderator and coolant. Neutron life cycle. Light water, heavy water, gas cooled and fast reactors.

Hydroelectric plants: features and siting, Pelton, Francis, Kaplan and propeller turbines construction, mini and micro turbines.

Renewable energy: solar, geothermal, wind, biomass, ocean, fuel cells, unique features of decentralized systems. Co-generation systems. Environmental issues, sustainability and future scenarios.

Suggested Books

BEI International, Hambling, P., (Ed.), Modern Power Station Practice: Nuclear Turbines, and Associated Plant, Pergamon Press, 1992.

Drbal, L. F., Boston, P. G., Westra, K. L., Black and Veatch, Power Plant Engineering, Kluwer Academic, 1995.

Elliott, T. C., Chen, K., and Swanekamp, R., Standard Handbook of Power Plant Engineering, McGraw-Hill Professional, 2nd ed., 1997

El-Wakil, M. M., Power Plant Technology, McGraw-Hill, 1984.

Jog, M., Hydro-electric and Pumped Storage Plants, John Wiley, 1989.

Fritz, J. J., Small and Mini Hydropower Systems, McGraw-Hill, 1984.

Central Board for Irrigation and Power (CPIB), India, Design and Construction Features of Selected Dams in India, 1983.

Borbely, Anne-Marie, and Kreider, Jan J., (Eds.), Distributed Generation: The Paradigm for the New Millennium, CRC Press, 2003.

Larminie, J., and Dicks, A., Fuel Cell Systems Explained, John Wiley, 2003.

Vielstich, W., Lamm, A., and Gasteiger, H., Handbook of Fuel Cells: Fundamentals, Technology, Applications, John Wiley, 2003

Appleby, A. J., and Foulkes, F. R. Fuel Cell Handbook, van Nostrand Reinhold, 1996.

Harrison, R., Hau, E., and Snel, H., Large Wind Turbines: Design and Economics, John Wiley, 2001.

Bejan, Adrian, Advanced Engineering Thermodynamics, Interscience, 1997

Patents and catalogues related to various equipment