MEC7229: Conventional Power Generation

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
35	10	10	45	100	60	40	3

Course Description:
This course covers the fundamentals of Power Plants. It covers the design and analysis of Steam Power Plants, Gas Turbine Power Plants, Combined Cycle Power Plants, Diesel Power Plants and Nuclear Power Plants and the related Economics of Power Generation.

Course Objective:
The goal of the course is to provide a fundamental understanding of the principles of conventional power plants, including coal, gas, steam Nuclear and Combined Power Plants.

Student Learning Outcomes:
At the end of the course the students will:

- Understand the different types of thermal power systems and their components
- Develop the ability to analyse and evaluate the performance of different thermal energy conversion systems
- Identify and rate the different fossil fuels used as sources of energy in thermal energy conversion and their environmental impacts
- Develop a mathematical and theoretical skill and knowledge to analysis and design of steam generators (boiler)
- Have sound understanding on analysis, modelling and design of steam thermal energy systems.

Course Outline:

Fundamentals of Power Plant **(5 Hours)**

- Introduction; Concept of Power Plants; Classification of Power Plants;
- Review of Thermodynamics Cycles Related to Power Plants;
- Classification of Power Plant Cycle.

Steam Power Plant **(5 Hours)**

- Introduction; Essentials of Steam Power Plant Equipment;
- Steam generators; steam turbines; fuels and combustion
- Boilers and heat exchangers

Gas Turbine Power Plant **(6 Hours)**

- Introduction;
- Classification of Gas Turbine Power Plant;
- Elements of Gas Turbine Power Plants;
- Regeneration and Reheating

Combined Cycle Power Plants **(4 Hours)**

- Combined cycle power plants; combined heat and power;
- Thermodynamic analysis of CHP cycles.

Diesel Power Plant **(6 Hours)**

- Introduction; Operating Principle; Basic Types of IC Engines;
- Application of Diesel Power Plant;
- General Layout of Diesel Power Plant;
- Performance of Diesel Engine; Fuel System of Diesel Power Plant;
- Diesel Plant Operation; Efficiency of Diesel Power Plant;
- Heat Balance Sheet

Nuclear Power Plant **(5 Hours)**

- Introduction; Nuclear Energy Concepts and Terms;
- Chemical and Nuclear Equations; Nuclear Fusion and Fission;
- Nuclear Reactor; Classification of Reactors;
- Cost of Nuclear Power Plant; Safety Measures for Nuclear Power Plants;
- Major Nuclear Power Disasters

Economics of Power Generation **(4 Hours)**

- Daily load curves-load factor-diversity.
- factor-load deviation curve-load
- management-number and size of generating
- Unit cost of electrical energy-tariff-power factor improvement.

Mode of Delivery

Include formal lectures (including those from Visiting Lecturers), case studies, tutorial exercises, practical demonstrations, directed learning and individual work

Method of Assessment

The method of assessment is by written examination and both analytical and experimental work. Examination will carry 60% and assignments 40%.

Reference text books:

1. Paul Breeze, (2005) Power Generation Technologies.
2. Frank Kreith, (1999) Mechanical Engineering Handbook, Energy Conversion.
3. C. Elanchezhian (2007) "Power Plant Engineering" I K International Publishing House ISBN-13: 978-8189866303
4. Larry Drbal et al (1995)"Power plant Engineering" Springer; 1 edition (December 31, 1995) ISBN-13: 978-0412064012
5. Philip KiamehHard (2002) Power Generation Handbook : Selection, Applications, Operation, Maintenance McGraw-Hill Professional ISBN-10: 0071396047, ISBN-13: 978-0071396042