

# **Complex Engineering Problem**

## **Power Generation (EE-414)**

Complex engineering problems are following the Washington Accord (IEA2015). These problems must involve attributes (a) and at least one of the attributes (b) – (g) stated below:

- a. Cannot be resolved without in-depth engineering knowledge.
- b. Involve wide-ranging or conflicting technical, engineering and other issues.
- c. Have no obvious solution and require abstract thinking and originality in analysis to formulate suitable models.
- d. Involve infrequently encountered issues.
- e. Outside problems encompassed by standards and codes of practice for professional engineering.
- f. Involve diverse groups of stakeholders with widely varying needs.
- g. High level problems including many component parts or sub-problems.

### **Problem Statement:**

Consider a **daily** load profile (industry/utility company/ research paper) and **outline** necessary theoretical knowledge for electrical power generating stations design. Choose **two** different types of generation for it. **Analyze** and evaluate the technical and economical parameters using software (MATLAB/VB/GUI etc.) for both powers generating stations, **draw** layout plan, show comparative results of both stations via **table** and **graph**. **Compare** the impact of both generations on the environment and sustainability and **propose** optimal power generation solution for the world. Also justify your proposal via sufficient references.

### **Deliverables:**

All pages should be set with the same margin. The left margin should be 4 cm and 2.5 cm for the top, right and bottom margins, Font size for main text body=12, line spacing=1.5cm

Submit the assigned tasks in the form of a short report with software code, **figures**, **calculations**, **graphs** and other entities in it.

### **Methodology:**

- With the Help of Books/Research Papers (at least 10)/ Authentic Web sources (For data), select **one** load profile (industry/utility company/research paper)
- Choose two different types of power generations and find all details about their station design.
- Analyze these stations with technical and economical parameters calculations related to its practical design, software tools must be used to make analysis.
- Draw layout plan, comparative table and graph of both power generating stations.
- Compare the impact of both generations on the environment and sustainability and propose optimal power generation solution for the world. Also justify your proposal via sufficient references.

### **CEP Learning Outcomes (CLOs) are as follows:**

- **CLO-01: Outline** the necessary theoretical knowledge for basic and advanced concepts in Electrical Power Generating Stations.
- **CLO-02: Analyze** and evaluate the technical/economical parameters of Power Generating stations.
- **CLO-03: Compare** the impact of different power generating stations on the environment and sustainability. (CEP)
- **CLO-04: Acknowledge** and **value** the need for teamwork, leadership, diversity of ideas and inclusion. (CEP)

### **Guidelines:**

- Use one Column Format for writing your report.
- Sessional Marks: 16
- No. of Group members: Maximum 4, No. Pages per report: Maximum 20 (Including Names and Roll No. and List of references).
- Submission Deadline: 14<sup>th</sup> week, Spring 2024
- The first 2-4 pages, must comprise of general description/equations justifying those results
- Next pages must be on a selected load profile results/discussion/analysis/ coding /graph/**comparative table/layout plan**.
- References must be cited and list of references must be included.

**Washington Accord (IEA2015) Attributes:**

- a. Cannot be resolved without in-depth engineering knowledge.
- b. Involve wide-ranging or conflicting technical, engineering and other issues.
- c. Have no obvious solution and require abstract thinking and originality in analysis to formulate suitable models.
- d. Involve infrequently encountered issues.

**Marking Criteria:**

Criteria	Marks/Percentage	CLO	Taxonomy level	PLO
Outline the necessary theoretical knowledge for basic and advanced concepts in Electrical Power Generating Stations.	[4 Marks]	1	C4	1
Analyze and evaluate the technical/economical parameters of Power Generating stations.	[6 Marks]	2	C4	2
Compare the impact of different power generating stations on the environment and sustainability. (CEP)	[4 Marks]	3	C4	7
Acknowledge and value the need for teamwork, leadership, diversity of ideas and inclusion. (CEP)	[2 Marks]	4	A3	9

### Evaluation Rubrics:

CLO	Unsatisfactory (< 60%)	Average (60%)	Good (80%)	Excellent (100%)
1	Unable to gather the relevant data for technical and economic analysis of load profile and two generating station design	Gathered relevant data for technical and economic analysis only for load profile not for two different types of generating station design	Gathered relevant data for technical and economic analysis of load profile and only for one generating station design	Exactly all relevant data are gathered for technical and economic analysis of load profile, <b>two</b> generating station design.
2	Students unable to analyze and evaluate the technical and economic parameters using software for both stations design. Study is not conclusive	Students analyzed and evaluated the technical and economic parameters using software only for one station design. Clarity of results/ codes /layout plan/ graph / table are not presented. Study is not conclusive	Students analyzed and evaluated the technical and economic parameters using software for both station design. Clarity of results/ codes / layout plan/ graph / table are partially presented. Some of the results are concluded	Students analyzed and evaluated the technical and economic parameters using software for both stations design. Clarity of results/codes/ <b>layout plan/graph/table</b> are presented. Study well concluded
3	Unable to compare the impact of both generating station on the environment and sustainability. Neither proposed optimal power generation solution for the world nor provided references.	Discuss the environmental impact of one generating stations on the environment and sustainability. Neither proposed optimal power generation solution for the world nor provided references.	Students partially compared the impact of both generating station on the environment and sustainability. Proposed optimal power generation solution for the world but not provided justifications of proposal via sufficient references	Students completely compared the impact of both generating station on the environment and sustainability. Proposed optimal power generation solution for the world and provided <b>justifications</b> of proposal via sufficient references