

## Power Stations COURSE SYLLABUS

| Course Code | Course Name    | Credits | Contact Hours |
|-------------|----------------|---------|---------------|
| 0401580     | Power Stations | 3       | 3 T           |

| INSTRUCTOR/COORDINATOR |                        |
|------------------------|------------------------|
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| TEXTBOOK                     |   |
|------------------------------|---|
| <b>Title</b>                 | Power Generation Handbook : Selection, Applications, Operation, Maintenance |
| <b>Author/Year</b>           | <a href="#">Philip Kiameh</a> , 2019  |
| Other Supplemental Materials |   |
| <b>Title</b>                 | Power generations technologies  |
| <b>Author/Year</b>           | Paul Breeze, 2014   |
| <b>Electronic Materials</b>  |   |

| SPECIFIC COURSE INFORMATION   |
|---|
| <b>A. Brief Description of the Content of the Course (Catalog Description)</b>  |
| Introduction: energy and power; conservation of energy, and forms of energy; theory of heat engines and the laws of thermodynamics; heat engines; heat transfer: conduction, convection and radiation; comparison of energy content and efficiency of different fuels; use of energy in society; coal, oil and gas power stations; nuclear energy; hydroelectricity; solar energy; advantages and disadvantages of different methods of generating electricity. |
| <b>B. Pre-requisites (P) or Co-requisites (C)</b>   |
| None  |
| <b>C. Course Type (Required or Elective)</b>  |
| Compulsory  |
| SPECIFIC GOALS  |
| <b>A. Specific Outcomes of Instruction</b>  |

- CLO1- The student should understand the basic energy conversion methods and techniques [1].
- CLO2- The student should be able to distinguish the different types of power stations based on the principle of operation [1].
- CLO3- The student should be able to analyze the dynamic operation of the various power station using the proper table sheets and charts [7]
- CLO4- The student should be able to analyze the economics of different power stations and in particular renewable energy stations [7].

### **Fifth : Course Plan Distribution**

#### **B. Student Outcomes Addressed by the Course**

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |  |  |  |  |
|---|---|---|---|---|---|---|--|--|--|--|
| ✓ |   |   |   |   |   | ✓ |  |  |  |  |

#### **BRIEF LIST OF TOPICS TO BE COVERED**

| <b>List of Topics</b>  | <b>No. of Weeks</b> | <b>Contact Hours</b> |
|--|---------------------|----------------------|
| Review of some thermodynamic principles: First and second laws of thermodynamics, perfect and imperfect gases, vapors, reversibility, Carnot cycle.  | 1                   | 3                    |
| Open and closed systems, energy types, entropy, enthalpy, process and cycle, P-V and T-s diagrams, Fuels and combustion  | 2                   | 6                    |
| The Rankine cycle: The ideal Rankine cycle, superheat, reheat, regeneration, feedwater heating, open contact feedwater heaters, closed type feedwater heaters, Cogeneration.   | 2                   | 6                    |
| Gas turbine and combined cycles: Gas turbine cycles, the ideal Brayton cycle, the nonideal Brayton cycle, combined cycles.   | 2                   | 6                    |
| Principles of nuclear energy: The atomic structure, chemical and nuclear reactions, energy from nuclear reactions, nuclear fusion and fission, radioactivity, decay rate and half-lives, fission reactor types                                 | 2                   | 6                    |
| Hydro- electric plants: Water power, advantages of hyder-electric plants, hydrology, site selection of hydro-electric plants, classification of hydro-electric plants, hydraulic turbines.   | 2                   | 6                    |
| Power plant economics: Cost of electrical energy, capital cost of plants, operating cost, effect of load factor on unit energy cost, fixed and operating costs of steam plants, hydro- plants, and nuclear plants, electricity cost reduction. | 2                   | 6                    |
| <b>Total</b>   | <b>15</b>           | <b>45</b>            |

**EVALUATION**

| <b>Assessment Tool</b>                              | <b>Due Date</b>                      | <b>Weight (%)</b> |
|---|--------------------------------------|-------------------|
| Mid Exam  | According to the university calendar | 30                |
| Course Work (Homeworks, Quizzes, Projects, ...etc.) | One week after being assigned        | 20                |
| Final Exam  | According to the university calendar | 50                |

**ABET's Students Learning Outcomes (Criterion # 3)**

|          | Relationship to program outcome |   |
|----------|---------------------------------|---|
| ABET 1-7 |                                 |   |
| 1.       | ✓                               | an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics.  |
| 2.       |                                 | an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors.                   |
| 3.       |                                 | an ability to communicate effectively with a range of audiences.  |
| 4.       |                                 | an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts. |
| 5.       |                                 | an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.   |
| 6.       |                                 | an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.  |
| 7.       | ✓                               | an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.   |