|  |  |
| --- | --- |
| **Course Title:** | POWER PLANTS |
| **Course Code:** | **ME 460** |
| **Program:** | **Mechanical Engineering (UG)** |
| **Department:** | **Mechanical & Industrial Engineering** |
| **College:** | **College of Engineering** |
| **Institution:** | **Majmaah University** |

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# A. Course Identification

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1. Credit hours: 03 (3-1-0)** | | | | | | |  | | | | | | | | | |
| **2. Course type** | | | | | | | | | | | | | | | | |
| **a.** | University | | **x** | College | | | | **x** | Department | | | | **√** | Others |  |  |
| **b.** | | Required | | | **√** | Elective | | | | **x** |  | | | | | |
| **3. Level/year at which this course is offered:** | | | | | | | | | | | | **10th /4th** | | | | |
| **4. Pre-requisites for this course** (if any)**: Heat Transfer (ME 354)** | | | | | | | | | | | | | | | | |
| **5. Co-requisites for this course** (if any)**: NIL** | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | |

## 6. Mode of Instruction (mark all that apply)

| **No** | **Mode of Instruction** | **Contact Hours** | **Percentage** |
| --- | --- | --- | --- |
| **1** | **Traditional classroom** | 60 | 80 |
| **2** | **Blended** | 05 | 10 |
| **3** | **E-learning** | 05 | 10 |
| **4** | **Correspondence** | 0 | -- |
| **5** | **Other** | 0 | -- |

**7. Actual Learning Hours** (based on academic semester)

|  |  |  |
| --- | --- | --- |
| **No** | **Activity** | **Learning Hours** |
| **Contact Hours** | | |
| **1** | **Lecture** | 45 |
| **2** | **Laboratory/Studio** | -- |
| **3** | **Tutorial** | 15 |
| **4** | **Others** (specify) | -- |
|  | **Total** | 60 |
| **Other Learning Hours\*** | | |
| **1** | **Study** | 20 |
| **2** | **Assignments** | 20 |
| **3** | **Library** | -- |
| **4** | **Projects/Research Essays/Theses** | -- |
| **5** | **Others** (specify) | -- |
|  | **Total** | 40 |

**\*** The length of time that a learner takes to complete learning activities that lead to achievement of course learning outcomes, such as study time, homework assignments, projects, preparing presentations, library times

# B. Course Objectives and Learning Outcomes

|  |
| --- |
| 1. Course Description |
| Energy demand and power generation systems. Steam and gas power cycles. Fuels and combustion. Basic and auxiliary systems of a steam p.p. Steam generator analysis. Steam turbines and their controls. Diesel engine and gas turbine power plants. Overall plant performance. Economics of power plants. |
| 2. Course Main Objective After completing this course, students should be able to:  1. Explain different form of energies for power generation.  2. Explain different power generation systems, and steam and gas power cycles.  3. Explain basic and auxiliary systems of steam power plant.  4. To determine the performance of different power plant.  5. To determine the energy generation by combustion of fuel.  6. To determine the economics of different power plants  7. Explain the working principles of different components of various power plant |
|  |

## 3. Course Learning Outcomes

| **CLOs** | | **Aligned****PLOs** |
| --- | --- | --- |
| 1 | **Knowledge:** |  |
| 1.1 | Recognize the knowledge of fundamental concepts of power generation through various types of power plant | a (d1) |
| 1.2 | Define and describe the common technical term used to evaluate the performance of power plant. | a (d1) |
| 1.3 | Label different types of power plants and list the factors affecting the performance of power plant. | a (d1) |
| **2** | **Skills :** |  |
| 2.1 | Estimate the performance of power plant and its components under imposed conditions | e (b3) |
| 2.2 | Differentiate the merits and demerits of different types of power plants | a (d1) |
| 2.3 | Formulate the problems and analysis it through a creative thinking. | e (b3) |
| **3** | **Competence:** |  |
| 3.1 | Sharing of ideas with colleagues | a (d1) |
| 3.2 | Time management & keeping dead lines | a (d1) |

# C. Course Content

|  |  |  |
| --- | --- | --- |
| **No** | **List of Topics** | **Contact Hours** |
| 1 | Energy demand and power generation systems | 3 |
| 2 | Steam and gas power cycles | 9 |
| 3 | Fuels and combustion. | 3 |
| 4 | Basic and auxiliary systems of a steam p.p. | 6 |
| 5 | Steam generator analysis. | 3 |
|  | Steam turbines and their controls. | 3 |
|  | Gas turbine power plants | 6 |
|  | Diesel engine power plants | 6 |
|  | Overall plant performance | 3 |
| ... | Economic of power plant | 3 |
| **Total** | | 60 |

# D. Teaching and Assessment

## 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

| **Code** | **Course Learning Outcomes** | **Teaching Strategies** | **Assessment Methods** |
| --- | --- | --- | --- |
| **1.0** | **Knowledge** | | |
| 1.1 | Recognize the knowledge of fundamental concepts of power generation through various types of power plant | Attending Lectures and tutorials | Assignments  Mid Term and Final exam |
| 1.2 | Define and describe the common technical term used to evaluate the performance of power plant. | Solve additional problems from text book | Assignments  Mid Term and Final exam |
| 1.3 | Label different types of power plants and list the factors affecting the performance of power plant. | Investigating: Self Learning from text books | Assignments  Mid Term and Final exam |
| **2.0** | **Skills** | | |
| 2.1 | Estimate the performance of power plant and its components under imposed conditions | Attending: Lectures, tutorials | Assignments  Mid Term and Final exam |
| 2.2 | Differentiate the merits and demerits of different types of power plants | Investigating: Self Learning from text books | Assignments  Mid Term and Final exam |
| 2.2 | Formulate the problems and analysis it through a creative thinking. | Discussing: tutorial problem solving | Group discussion |
| **3.0** | **Competence** | | |
| 3.1 | Sharing of ideas with colleagues | Class discussions | Group discussion |
| 3.2 | Time management & keeping dead lines | Assigning homework with deadlines | Assignments |

## 

## 2. Assessment Tasks for Students

| **#** | **Assessment task\*** | **Week Due** | **Percentage of Total Assessment Score** |
| --- | --- | --- | --- |
| **1** | First Major Exam | 6th week | 20 |
| **2** | Second Major Exam | 13th week | 20 |
| **3** | Final Exam | Final exam week | 40 |
| **4** | Assignments | Total four | 20 |

**\*Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

# E. Student Academic Counseling and Support

|  |
| --- |
| **Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice :** |
| **Lecture hours as given in Time Tables**: Monday 8.00 a.m.-10.00 a.m., Tuesday 10.00 to 12.00.  Office hours: 8 AM -2 Noon Sunday to Thursday (Office location 044-02-30) |

# F. Learning Resources and Facilities

## 1.Learning Resources

|  |  |
| --- | --- |
| **Required Textbooks** | Power Plant Engineering, P.K.Nag, McGraw Hill |
| **Essential References Materials** | Power plant Technology, by M.M. EL-Wakil, McGraw Hill |
| **Electronic Materials** | NIL |
| **Other Learning Materials** | NIL |

## 2. Facilities Required

| **Item** | **Resources** |
| --- | --- |
| **Accommodation**  (Classrooms, laboratories, demonstration rooms/labs, etc.) | Class Rooms |
| **Technology Resources**  (AV, data show, Smart Board, software, etc.) | Smart board is provided |
| **Other Resources**  (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list) | -- |

# G. Course Quality Evaluation

| **Evaluation**  **Areas/Issues** | **Evaluators** | **Evaluation Methods** |
| --- | --- | --- |
| Effectiveness of Teaching | Students | Indirect Assessment |
| CLOs achievement | Faculty | Direct/Indirect Assessment |
| Learning Resources | Students | Indirect Assessment |
| Course Contents | Students | Indirect Assessment |

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

**Assessment Methods** (Direct, Indirect)

# H. Specification Approval Data

|  |  |
| --- | --- |
| **Council / Committee** | Department Council |
| **Reference No.** | 1/34/9767 |
| **Date** | 25/02/1432 H |