Course Specifications: Heat Engine and Combustion(A)

**University:** Benha University

**Faculty:** Faculty of Engineering at Shoubra

**Department offering the program:** Mechanical Engineering Department

**Program offering the course:** Mechanical Power Engineering Program

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| --- | --- | --- | --- | --- | --- |
| **1- Course Data** | |  |  |  |  |
| **Course Code:** MPE311 | |  | **Course Title:** Heat Engine and Combustion(A) | | |
| **Specialization:** Mechanical Power Engineering | |  | **Course Type:** Compulsory |  | **Semester/Year:** First/Third |
| **Teaching Hours:** Lecture: 4 | Tutorial: 2 |  | Practical: 2 |  | Total: 8 |

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| **2-Course objectives** |
| **For students undertaking this course, the aims are to:**   1. Apply knowledge of engineering thermodynamics on different cycles. 2. Enhance practical skills in the fields of thermal engineering such as steam and gas turbines power plants, refrigeration, and air standard cycle to increase the ability for employment. 3. Increase the ability to define, analyze and solve mechanical power engineering problems to reach proper conclusions, and to communicate these conclusions with others. 4. Understand the concepts and basic principles of gas-vapor mixture and combustion. |

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| **3- Course competencies (NARS)** |
| **Level (A) Engineering Competencies:**  On completing this course, students will be able to demonstrate the knowledge and understanding of:  A1) Identify the power cycles by applying engineering fundamentals, basic science and mathematics  A2) Apply engineering design processes to produce cost-effective solutions produces high performance in power generation system  A3) Identify, formulate, and solve engineering problems related with combustion and gas mixtures.  **Level (B) Mechanical Engineering Competencies:**  At the end of this course, the students will be able to:  B1) Select conventional mechanical equipment according to the required performance  B2) Analyze and design physical systems applicable to generating power system by applying the concepts of Thermodynamics  **Level (C) Mechanical Power Engineering Competencies:**  On completing this course, the students are expected to be able to:  C1) Design and evaluate mechanical power and energy for power generating systems |

**4- Course Contents**

1. **Course Description** (As indicated in program Bylaw)

|  |
| --- |
| Thermodynamics cycles |
| Thermodynamics cycles |
| Steam power cycles and their modifications |
| Steam power cycles and their modifications |
| Steam power cycles and their modifications |
| Gas Power systems |
| Gas Power cycles and Air-standard cycles |
| Refrigeration Systems |
| Gas and Gas - Vapor Mixtures |
| Gas and Gas - Vapor Mixtures |
| Introduction to fuel |
| Combustion of Fuels |

1. Topics to be Covered weekly & Matrix of Competencies

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Week | Topics | Course Competencies | | | | | |
| A1 | A.2 | A3 | B1 | B2 | C1 | |
| 1 | Thermodynamics cycles | **√** |  |  |  |  |  | |
| 2 | Thermodynamics cycles | **√** | **√** |  |  |  |  | |
| 3 | Steam power cycles and their modifications |  | **√** |  | **√** |  | **√** | |
| 4 | Steam power cycles and their modifications |  | **√** | **√** | **√** |  | **√** | |
| 5 | Steam power cycles and their modifications |  | **√** |  | **√** |  |  | |
| 6 | Gas Power systems |  | **√** | **√** | **√** |  |  | |
| 7 | Gas Power cycles and Air-standard cycles |  | **√** | **√** | **√** |  |  | |
| 8 | Refrigeration Systems |  | **√** |  | **√** | **√** | **√** | |
| 9 | Gas and Gas - Vapor Mixtures |  | **√** | **√** | **√** | **√** |  | |
| 10 | Gas and Gas - Vapor Mixtures |  | **√** | **√** | **√** | **√** |  | |
| 11 | Introduction to fuel |  | **√** | **√** | **√** |  |  | |
| 12 | Combustion of Fuels |  | **√** | **√** | **√** |  |  | |
| 13 | Thermodynamics cycles |  | **√** | **√** | **√** |  |  | |

**5- a) Teaching and Learning Methods**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Competencies** | | **Teaching and Learning Methods** | | | | | | | | | |
| Face-to-face Lecture | Online Education | Tutorial / Exercise | Group Discussions | Laboratory | Site Visit | Presentation | Mini Project | Research and Reporting | Brain Storming |
| **Level A** | A1 | **√** |  | **√** |  |  |  |  |  |  |  |
| A2 | **√** |  | **√** |  |  |  |  |  |  | **√** |
| A3 |  |  | **√** |  |  |  |  |  | **√** |  |
| **Level B** | B1 | **√** |  | **√** |  |  |  |  |  |  | **√** |
| B2 | **√** |  | **√** |  |  |  |  |  |  | **√** |
| **Level C** | C1 | **√** |  | **√** |  |  |  |  |  |  | **√** |

**5- b) Teaching and Learning Methods of Disables**

None

**6- Student Academic Counseling and Support**

* Students are directed to contact teaching staff for academic support during specific office hours.
* Regarding this course, I will be available for students for two hours a week as indicated on my time table declared for students from the beginning of the semester.

**7- Student Assessment**

**a- Student Assessment Methods**

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Competencies** | | **Assessment Methods** | | | | | | | | | |
| Written Exams | Online Exams | Oral Exam | Quizzes | Lab Exam | Take-Home Exam | Research Assignments | Reporting Assignments | Project Assignments | In-class Questions |
| **Level A** | A1 | **√** |  | **√** |  |  |  |  | **√** |  | **√** |
| A2 | **√** |  |  | **√** |  |  |  | **√** |  | **√** |
| A3 |  |  | **√** |  |  |  |  | **√** |  | **√** |
| **Level B** | B1 | **√** |  |  | **√** |  |  |  | **√** |  | **√** |
| B2 | **√** |  |  | **√** |  |  |  | **√** |  | **√** |
| **Level C** | C1 | **√** |  |  |  |  |  |  | **√** |  | **√** |

**b- Assessment Schedule and Weight**

|  |  |  |
| --- | --- | --- |
| **Assessment** | **Week** | **Weight** |
| Midterm Examination | 7 | 20 % |
| Final Term Examination | (As Schedule) | 60 % |
| Oral Examination | 12 | 10 % |
| Semester Work | 2, 4, 8, 11 | 10% |
| **Total** |  | **100** % |

**8- Facilities**

The following facilities are needed for this course:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ■ | Classroom | □ | Smart Board | □ | Computer with software |
| □ | Lecture Hall | □ | White Board | □ | MIS system |
| ■ | Sound and Microphone | ■ | Data Show | □ | Internet Access |
| □ | Other: ………………… |  |  |  |  |

**9- List of References**

**a- Course Notes**

Lectures Notes in PDF

**b- Books**

1. Yunus A. Cengel and Michael A. Boles, “Thermodynamics, an Engineering Approach" 8th Edition, 2014.

**c- Recommended Books**

1. Van Wylen, G. Sonntag R. and Borgnakke, C. Fundamentals of Classical Thermodynamics, John Wiley & Sons, Inc. 4th edition.

**d- Web Sites**

[http://www.bu.edu.eg/staff/](http://www.bu.edu.eg/staff/ahmedhussein3-courses/15061/files)

**10- Matrix of Course Objectives and Competencies**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Course Objectives** | **Course Competencies** | | | | | |
| **A1** | **A2** | **A3** | **B1** | **B2** | **C1** | |
| Course Objective #1 | **√** |  | **√** |  |  |  | |
| Course Objective #2 | **√** | **√** |  | **√** | **√** |  | |
| Course Objective #3 |  | **√** | **√** |  | **√** | **√** | |
| Course Objective #4 |  | **√** | **√** | **√** |  | **√** | |

**- Course Coordinator:**

**Prof. Dr. Nabil Shafiq Signature:**

**Dr**. **Said wahba Beshay**

**Dr.** **Mamdouh Wafaay Eldosqy**

**Dr.Mahmoud Ahmed Sharafeldin**

**- Program Coordinator:**

**Prof.** **Mohamed Moawed Signature:**