# Course Specifications

| | |
|---|---|
| **Program(s) on which this course is given:** | B.Sc. in Aerospace Engineering |
| **Department offering the program:** | **Aerospace Engineering** |
| **Department offering the course:** | **Aerospace Engineering** |
| **Academic Level:** | **4th year** |
| **Date** | March 2015 |
| **Semester (based on final exam timing)** | ☐ Fall ☐ Spring |

## A- Basic Information

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1. Title:** | **Airplane Propulsion Systems** | | | **Code: AER 405** | | | | |
| **2. Units/Credit hours per week:** | Lectures | 3 | Tutorial | 2 | Practical | | Total | 5 |

## B- Professional Information

| | |
|---|---|
| **1. Course description:** | This course provides the capability of conducting preliminary gas turbine engine design analysis by applying design and off design analyses. |
| **2. Intended Learning Outcomes of Course (ILOs):** | **a) Knowledge and Understanding** |
| | **a1-** Analyzing and optimizing aero-gas turbine engines at design point. |
| | **a2-** Evaluating engines off design performance. |
| | **a3-** Introduction to engine dynamics and control. |
| | **b) Intellectual Skills** |
| | **b1-** Hypothesizing and synthesizing the modeling process. |
| | **b2-** The ability to analyze results and draw control. |
| | **c) Professional and Practical Skills** |
| | **c1- Construct** and use software codes.. |
| | **d) General and Transferable Skills** |
| | **d1-** The capability to split complicated systems into model-able modules. |
| | **d2-** The capability to choose a convenient model rigorous to employ.. |
| | **d3-** To have an over view of the design process. |

**3. Contents**

| Topic | Total hours | Lectures hours | Tutorial/ Practical hours |
|---|---|---|---|
| Gas turbine overall performance parameters | 6 | 4 | 2 |
| Real performance of jet engine components | 6 | 4 | 2 |
| Design point analysis of Turbojet with afterburner/ramjet | 6 | 4 | 2 |
| Design point analysis of unmixed turbofan engine | 12 | 6 | 6 |
| Design point analysis of mixed turbofan engine | 7 | 4 | 3 |
| Design point analysis of turboprop engine | 7 | 4 | 3 |
| Review of off design performance of jet engine | 1 | 1 | |

| | | | |
|---|---|---|---|
| components | | | |
| Matching of single spool gas generator | 4 | 2 | 2 |
| Matching of gas generator with exhaust nozzle | 2 | 1 | 1 |
| Off design analysis of single spool turbofan engine | 7 | 4 | 3 |
| Off design analysis of unmixed turbofan engine | 6 | 4 | 2 |
| Off design analysis of mixed turbofan engine | 6 | 4 | 2 |
| Off design analysis of turboprop engine | 4 | 2 | 2 |
| Fundamentals of turbojet engine transient performance | 2 | 2 | |
| | Σ 76 | 46 | 30 |
| **4. Teaching and Learning Methods** | Lectures (✓) | Practical Training/ Laboratory (✓) | Seminar/Workshop () |
| | Class Activity (✓) | Case Study () | Projects () |
| | E-learning (✓) | Assignments /Homework (✓) | Other: |

**5. Student Assessment Methods**

| • **.Assessment Schedule** | **Week** |
|---|---|
| Assessment 1 Quiz 1 | Week 3 |
| Assessment 2 Report 1 | Week 4 |
| Assessment 3 Quiz 2 | Week 5 |
| Assessment 4 Report2 | Week 7 |
| Assessment 5 Midterm exam | Week 8 |
| Assessment 6 Report 3 | Week 9 |
| Assessment 7 Quiz 3 | Week 10 |
| Assessment 8 Report4 | Week 12 |
| Assessment 9 Quiz 4 | Week 13 |
| Assessment 10 Report 5 | Week 15 |
| Assessment 11 final Exam | Week 16 |

| • **Weighting of Assessments** | |
|---|---|
| -Mid-Term Examination | 10% |
| -Final-term Examination | 68% |
| -Project | |
| -Class Test | 22% |
| -Presentation | |
| -Total | 100% |

**6. List of References**

6.1- Course Notes

Note available.

6.2- Essential Books (Text Books)

1- J.D. Mattingly P.Flectcher, “Elements of Propulsion Gas Turbines and Rockets”, 2006.

2- G.C.Oates,"Aerothermodynamics of Gas Turbines and Rocket Propulsion". 1997.

6.3- Recommended Books


1- P.P. Walsh, P.Fletcher, "Gas Turbine Performance", 1998.
2- H. Cohen, G.F.C Rogers, H.Saravanamuttoo, "Gas Turbine Theory", 1996.
3- N.Cumpsty, "Jet Propulsion"1997.
4- J.L.Kerrbrock, "Aircraft Gas Turbines and Engines", 1992.
5- P.G. Hill, G.R.Peterson, "Mechanics and Thermodynamics of Propulsion" 1992.
6- D.G.Wilson, T.Korakiantis, "The Design of High Efficiency Turbomachines and Gas Turbines", 1998.
7- J.D.Mattingly, W.H.Hieser, D.H.Daley, "Aircraft Engine Design", 2002.


**7. Facilities Required for Teaching and Learning**

1- Lecture rooms.
2- Projector and overhead projectors.
3- PC computer and internet connection..

| | |
|---|---|
| **Course Coordinator:** | Prof. Dr. Aly Hashem |
| **Head of Department:** | Prof. Dr. Ayman Hamdy |