**Cairo University**
**Faculty of Engineering**

**Department of Aerospace**

# Course Specifications

| | |
|---|---|
| **Program(s) on which this course is given:** | Masters Program |
| **Department offering the program:** | **Department of Aerospace** |
| **Department offering the course:** | **Department of Aerospace** |
| **Academic Level:** | Masters |
| **Date** | |
| **Semester (based on final exam timing)** | ■ Fall ☐ Spring |

## A- Basic Information

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **1. Title:** | **Aerodynamic Design of Aircrafts** | | | | **Code:** | **AER617** | | |
| **2. Units/Credit hours per week:** | Lectures | 3 | Tutorial | NA | Practical | **NA** | Total | 3 |

## B- Professional Information

| | |
|---|---|
| **1. Course description:** | This course focuses on Aerodynamic properties of an aircraft and its components can in many cases be computed by solving the governing differential equations for the flow with numerical methods. This course teaches the methods for and applications of Computational Fluid Dynamics (CFD) in design of aircraft. |
| **2. Intended Learning Outcomes of Course (ILOs):** | **a) Knowledge and Understanding** |
| | • motivate different mathematical models of the aerodynamic forces acting on aircraft |
| | **b) Intellectual Skills** |
| | • use modern CFD methods to compute pressure distributions and aerodynamic forces acting on aircraft, both at low and high speed |
| | **c) Professional and Practical Skills** |
| | • Compute the influence of boundary layers, separated flow, stall, wave drag and shock stall for an aircraft wing. |
| | **d) General and Transferable Skills** |
| | • Apply CFD to perform aerodynamic design of aircraft, and explain the obtained results. |

**3. Contents**

| Topic | Total hours | Lectures hours | Tutorial/ Practical hours |
|---|---|---|---|
| Introduction | 3 | 3 | |
| Aerodynamics of Aircrafts: low order methods (Lifting line theory, Lifting surface, Vortex Lattice) | 6 | 6 | |
| The basic theory used in CFD methods: models for viscous flow, inviscous flow coupled with boundary layer solvers, compressible and incompressible flow. | 12 | 12 | |
| Properties of the governing partial equations are treated, as well as | 6 | 6 | |

| | | | |
|---|---|---|---|
| numerical methods for solving these. | | | |
| A CFD code is used to solve a series of applied problems in aerodynamics. | 12 | 3 | 9 |
| **4. Teaching and Learning Methods** | Lectures ■ | Practical Training/ Laboratory ( ) | Seminar/Workshop ( ) |
| | Class Activity ( ) | Case Study ( ) | Projects ■ |
| | E-learning ( ) | Assignments /Homework ( ) | Other: Computer Lab ■ |

| **5. Student Assessment Methods** | |
|---|---|
| • **Assessment Schedule** | **Week** |
| -Assessment 1; Class test | NA |
| -Assessment 2; Project Assignment | During the last week of the course |
| -Assessment 3; Presentations | NA |
| -Assessment 3; Midterm Exam | NA |
| -Assessment 4; Final Exam | 15 |
| • **Weighting of Assessments** | |
| -Mid-Term Examination | NA |
| -Final-term Examination | 70% |
| -Project | 15% |
| -Computer Lab | 15% |
| -Presentation | NA |
| -Total | 100% |

**6. List of References**


- Andras Sobester, Alexander I J Forrester, ”Aircraft Aerodynamic Design: Geometry and Optimization” John Wiley & Sons Ltd, 2014.
- Obert E,” Aerodynamic Design of Transport Aircraft“, Delft University Press, 2009.


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

.Higher Computers specifications, More text books in the library

| | |
|---|---|
| **Course Coordinator:** | **Prof. Galal Bahgat Salem** |
| **Head of Department:** | **Dr. Ayman Kassem** |