Instructor Info  Dr. Periklis Papadopoulos  
Office: Engr. 272D (408) 924-7168  
periklis.papadopoulos@sjsu.edu

Office Hours  Wed 4:30 pm – 6:30 pm

Course Credit  3 units

Class Days / Time  TR 10:30 – 11:45 am
Final Exam  Wednesday 16 May 12:15 – 2:30 pm
Classroom  Engr-331

Prerequisites  “C-” or better in: Math 129A, AE160

Textbook  *Fundamentals of Computational Fluid Dynamics*  
ISBN 3-540-41607-2

Description

AE 169 – Computational Fluid Dynamics – Spring 2019

**Goals**

Introduce students to basic numerical methods for fluid dynamics as well as to the basics of grid generation.

**Learning Objectives**

Students completing AE169 should be able to:

1. Use numerical tools based on the Euler and Navier-Stokes equations to analyze inviscid and viscous flows.
2. Generate appropriate grids for various aerospace engineering flows.
3. Determine the accuracy of numerical methods.
4. Use linear theory to design a numerical algorithm for a specific application.

**Approximate Weekly Schedule**

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic(s)</th>
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<tbody>
<tr>
<td>01</td>
<td>Introduction to computational fluid dynamics</td>
</tr>
<tr>
<td>02</td>
<td>Partial differential equations</td>
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<tr>
<td>03</td>
<td>Discretization methods: errors, stability and consistency</td>
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<td>04</td>
<td>Explicit time differencing methods</td>
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<tr>
<td>05</td>
<td>Implicit time differencing methods</td>
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<td>06</td>
<td>Central, upwind and characteristics of spatial differencing techniques</td>
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<td>07</td>
<td>Classical relaxation methods</td>
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<tr>
<td>08</td>
<td>Multigrid methods</td>
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<td>09</td>
<td>Numerical methods for inviscid flows</td>
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<td>10</td>
<td>Shock-capturing methods</td>
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<td>11</td>
<td>Numerical methods for boundary layer flows</td>
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<tr>
<td>12</td>
<td>Numerical methods for the Navier-Stokes equations</td>
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<tr>
<td>13</td>
<td>Modeling of 3-D aerodynamic flows</td>
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<tr>
<td>14</td>
<td>Grid generation; algebraic, differential equation, and variational methods</td>
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<tr>
<td>15</td>
<td>Grid generation; unstructured and adaptive grids</td>
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<tr>
<td>16</td>
<td>Contemporary methods and codes</td>
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**Grading**

Biweekly Quizzes 600 points
Project 200 points
Homework Problems 200 points

950 points < A+
900 points < A
850 points < A-
800 points < B+
750 points < B
700 points < B-
675 points < C+
650 points < C
625 points < C-
600 points < D
Below 600 points = F
Project

Work in assigned teams to define a CFD project relating to your aircraft or spacecraft design project. A proposal is due no later than the 3rd week of the semester following the posted guidelines. Progress reports are due every 2 weeks throughout the semester. A final report and an oral presentation are due at the end of the semester.

University Policies

Per University Policy S16-9, university-wide policy information relevant to all courses, such as academic integrity, accommodations, etc. will be available on Office of Graduate and Undergraduate Programs' Syllabus Information web page at http://www.sjsu.edu/gup/syllabusinfo/

AE Department and SJSU policies are also posted at http://www.sjsu.edu/ae/programs/policies/