Course Description

Welcome to the course of “Helicopters Dynamics, Stability and Control”. This course is an online course giving you a basic understanding of helicopter principles. In this course you will learn the basic principles of helicopter aerodynamics, performance, stability and control. You will learn to build a simulation model for helicopter and fly a maneuver.

The knowledge gained throughout this course can be applied to any helicopter application which requires an understanding of these vehicles. To learn from online you are advised to keep a personal learning journal for this course, capturing the pieces of this jigsaw that make up the complex picture of helicopter theory. Herein you can reflect on things that you learnt.

Your reflection needs to reveal the what, the how and the why of the theory, and may involve breaking down denial barriers. It is only from these reflections that you will integrate new knowledge and skills for helicopters. Please use the discussion board to share some of your reflections in this learning process on helicopters. Hope you will enjoy the course.

Learning Objectives

By the end of this course you will be able to:

1. Be aware of the importance of helicopters as flying machines.
2. Develop the ability to prepare parametric studies for rotorcraft.
3. Develop the understanding of how this ‘man’s triumph of ingenuity over common sense’ (as someone kindly wrote about the helicopter) is capable of flying.
4. Develop understanding of the interrelationships that exist between the aerodynamics, structures, flight mechanics, stability and control when applied to helicopters.
5. Develop the ability to define, calculate and understand the flapping motion.
6. Have the opportunities to develop your own simulation programme of a very nonlinear flying system.
7. Develop understanding of the stability and control when applied to helicopters.
8. Be part of an academic atmosphere which stimulates discussions and reflections on helicopter theory.
9. Gain a ‘capstone’ experience for further understanding of helicopters.
10. Become aware of the new developments into helicopters.

Study Materials

1. AE4-213 Lecture Notes Helicopter, Delft University of Technology, November 2002 - will be provided via the Electronic Learning Environment.
**Course Structure and Dates**

<table>
<thead>
<tr>
<th>Week 1</th>
<th>Introduction to helicopter and its history</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Activities</td>
<td>Watch the videos and read the slides; Present yourself; Read, write and think on Article 1</td>
</tr>
<tr>
<td>Assignments</td>
<td>Present yourself; Participate in the discussion board on Article 1; Work on Question 1 of Assignment 1</td>
</tr>
<tr>
<td>Assessment</td>
<td>Present yourself: 2% of the Final grade; Discussion Article 1: 2% of the Final Grade; Assignment 1: 25% of the Final Grade.</td>
</tr>
<tr>
<td>Deadline Assignments</td>
<td>Present yourself: End week 1; Article 1: End week 1; Assignment 1: End week 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 2</th>
<th>Hovering flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Activities</td>
<td>Watch the videos, read the slides; Read, write and think on Article 2</td>
</tr>
<tr>
<td>Assignments</td>
<td>Participate in the discussion board on Article 2; Work on Question 2 of Assignment 1</td>
</tr>
<tr>
<td>Assessment</td>
<td>Discussion Article 2: 2% of the Final Grade; Assignment 1: 25% of the Final Grade</td>
</tr>
<tr>
<td>Deadline Assignments</td>
<td>Article 2: End week 2; Assignment 1: End week 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 3</th>
<th>Vertical climb and descent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Activities</td>
<td>Watch the videos, read the slides; Read, write and think on Article 3; Optional reading</td>
</tr>
<tr>
<td>Assignments</td>
<td>Participate in the discussion board on Article 3; Work on Questions 3 and 4 of Assignment 1</td>
</tr>
<tr>
<td>Assessment</td>
<td>Discussion Article 3: 2% of the Final Grade; Assignment 1: 25% of the Final Grade</td>
</tr>
<tr>
<td>Deadline Assignments</td>
<td>Article 3: End week 3; Assignment 1: End week 5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Week 4</th>
<th>Forward flight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning Activities</td>
<td>Watch the videos, read the slides; Read, write and think on Article 4</td>
</tr>
<tr>
<td>Assignments</td>
<td>Participate in the discussion board on Article 4; Work on Questions 5 and 6 of Assignment 1</td>
</tr>
<tr>
<td>Assessment</td>
<td>Discussion Article 4: 2% of the Final Grade; Assignment 1: 25% of Final Grade</td>
</tr>
<tr>
<td>Deadline Assignments</td>
<td>Article 4: End week 4; Assignment 1: End week 5</td>
</tr>
</tbody>
</table>
## Course Structure and Dates

### Week 5

**Flapping dynamics**

**Learning Activities**  
Watch the videos, read the slides; Read, write and think on Article 5

**Assignments**  
Participate in the discussion board on Article 5; Finish Assignment 1; Start Assignment 2

**Assessment**  
Discussion Article 5: 2% of the Final Grade; Assignment 1: 25% of the Final Grade; Assignment 2: 25% of the Final Grade

**Deadline Assignments**  
Article 5: End week 5; Assignment 1: End week 5; Assignment 2: End week 7

### Week 6

**Simulation modeling**

**Learning Activities**  
Watch the videos, read the slides; Read, write and think on Article 6.

**Assignments**  
Participate in the discussion board on Article 6; Work on Assignment 2; Start Assignment 3

**Assessment**  
Discussion Article 6: 2% of the Final Grade; Assignment 2: 25% of Final Grade; Assignment 3: 30% of the Final Grade

**Deadline Assignments**  
Article 6: End week 6; Assignment 2: End week 7 and Assignment 3: End week 10

### Week 7

**Stability and Introduction to aeroelasticity**

**Learning Activities**  
Watch the videos, read the slides; Read, write and think on Article 7; Optional reading.

**Assignments**  
Participate in the discussion board on Article 7; Finish Assignment 2, Work on Assignment 3

**Assessment**  
Discussion Article 7: 2% of the Final Grade; Assignment 2: 25% of Final Grade; Assignment 3: 30% of the Final Grade

**Deadline Assignments**  
Article 7: End week 7, Assignment 2: End week 7 and Assignment 3: End week 10

### Week 8, 9, 10

Continue working on Assignment 3 to be handed in at the End of Week 10 or Earlier
**Dr. Marilena Pavel**, Assistant Professor at the Department of Control & Simulation, Faculty of Aerospace Engineering, at Delft University of Technology.

You can find out more about the lecturer of this course by following:

Online Learning Support - Email: onlinelearningsupport@tudelft.nl. For questions about registration, accounts and other questions not related to the content of the course.