Helicopter Dynamics, Stability and Control

2018/2019

Online/ Classic Lectures Academic Course

TU Delft

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

The goals for this M.Sc. course on helicopters are:

1. Make student aware of the importance of helicopters as flying machines.
2. Develop the student's ability to prepare parametric studies for rotorcraft.
3. Develop the student's 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 the student's understanding of the interrelationships that exist between the aerodynamics, structures, flight mechanics, stability and control when applied to helicopters.
5. Develop the students' ability to define, calculate and understand the flapping motion.
6. Provide the student with opportunities to develop his/her own simulation program of a very nonlinear flying system.
7. Develop the student's understanding of the stability and control when applied to helicopters.
8. Provide the student with an academic atmosphere which stimulates discussions and reflections on helicopter theory.
9. Provide the student with a 'capstone' experience for further understanding of helicopters.
10. Make students aware of the new developments into helicopters.

Study materials

1. AE4-314 Lecture Notes, Delft University of Technology, 2002 - will be provided via the Electronic Learning Environment.
2. Seddon, J., 'Basic Helicopter Aerodynamics', B.S.P. Professional Books, 1990
3. Gessow, A., Meyers, G.C., 'Aerodynamics of the Helicopter', Dover Publication, (2nd edition of the first published book in 1952)
4. Padfield, Gareth D, "Helicopter Flight Dynamics", Blackwell Science, 1st edition 1996
5. Bramwell, A.R.S., 'Helicopter Dynamics', Edwards Arnold, 1976, standard textbook of good quality, watch out for the misprints (Reprinted as 'Bramwell's Helicopter Dynamics', by Butterworth-Heinemann, 2001)

Course Structure and Dates

Week 1	Introduction to helicopter and its history
Learning Activities	Watch the videos and read the slides. Present yourself. Discuss on the discussion board on subjects related to helicopters.
Assignments	Present yourself, Work on Assignment 1
Assessment:	Present yourself: 2% FG, Assignment 1: 10% FG
	Assignment1: End week 2
Deadline Assignment	DEADLINE PRESENT YOURSELF
	FG= Final Grade

Week 2	Hovering flight
Learning Activities	Watch the videos, read the slides, read discussion board
Assignments	Participate in the discussion board, Work on Assignment 1
Assessment	Assignment 1: 10% FG
	Assignment 1: End week 2
Deadline Assignment	DEADLINE ASSIGNMENT 1

Week 3	Vertical climb and descent
Learning Activities	Watch the videos, read the slides. Read, comment on the discussion board, Read Optional reading
Assignments	Participate in the discussion board, Work on Assignment 2.
Assessment	Assignment 2: 20% FG
	Assignment 2: End week 5
Deadline Assignment	

Week 4	Forward flight
Learning Activities	Watch the videos, read the slides. Participate in the discussion board
Assignments	Work on Assignment 2.
Assessment	Assignment 2: 20% FG
Deadline Assignment	Assignment 2: End week 5

Week 5	Flapping dynamics
Learning Activities	Watch the videos, read the slides. Participate in the discussion
Assignment	Finish Assignment 2
Assessment	Assignment 2: 20% of the Final Grade
	Assignment 2: End week 5
Deadline Assignments	DEADLINE ASSIGNMENT 2

Week 6	Simulation modeling
Learning Activities	Watch the videos, read the slides.Participate in the discussion, Work on Assignment 3
Assignment	Assignment 3: 20% FG
Assessment	Assignment 3: End week 7

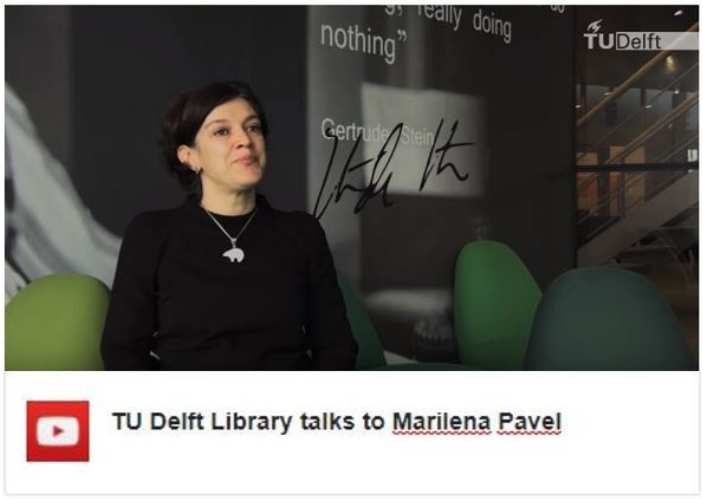
Week 7	Stability and Introduction to aeroelasticity
Learning Activities	Watch the videos, read the slides. Read Optional reading. Participate in the discussion board, Finish Assignment 3
Assignments	Assignment 3: 20% of the Final Grade
Assessment	Assignment 3: End week 7
Deadline Assignments	DEADLINE ASSIGNMENT 3

Week 8, 9, 10	WORK ON ASSIGNMENT 4 to be handed in at the End of Week 10 or Earlier (38% FG)

Contacts

Dr. M.D. Pavel (Marilena), Associate 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.