TECHNISCHE UNIVERSITÄT DRESDEN

Faculty of Mechanical Science and Engineering Institute of Aerospace Engineering

Chair of Aircraft Engineering
Prof. Dr.-Ing. Klaus Wolf

Introduction to Airplane
Flight Mechanics

Course Objectives

The course provides an introduction to the mechanics of flight. The main emphasis is on flight performance, basic flight manoeuvers and the static stability of subsonic airplanes.

After the course students should be able

- to apply fundamentals of mechanics and mathematics for modelling the motion of airplanes,
- to understand the effect of aerodynamic and inertial forces as well as the characteristics of propulsion systems on the performance

and

- to apply analytical methods for estimating the performance of airplanes.

Course Topics:

The course includes following topics:

- Equations of motion of an aircraft
- Aerodynamic forces and moments
- Airplane propulsion
- Linearized equations of longitudinal motion
- Performance at take-off and landing (e.g. take-off and landing distance)
- Climb and descend performance (e.g. rate of climb, angle of climb)
- En route performance (e.g. range and endurance)
- Airplane manoeuvers (e.g. banked turn, pull-up and pull-down)
- Longitudinal static stability

Class Schedule: 4 hours per week (2 hours lecture, 2 hours exercise)

Credits: 5 ECTS credit points (5 LP)

Offered: in fall/winter term (*Wintersemester*; October - February)

Prerequisites:

Basic courses in *mechanics* and *fluid dynamics*

Course Material:

Course material is provided on the web page:

http://tu-dresden.de/ilr/lft/studium/flugmechanik

Instructions on how to download this material are given during the first lecture.

Further reading:

Rossow, C.; Wolf, K.; Horst, P.
Handbuch der Luftfahrzeugtechnik, Hanser Verlag, 2014

Filippone, A.
Advanced Aircraft Flight Performance, Cambridge University Press, 2012

Brockhaus, R.; Alles, W.; Luckner, R.
Flugregelung, Springer-Verlag, 3. neu bearbeitete Auflage, 2011

Phillips, W. F.
Mechanics of Flight, John Wiley & Sons, 2nd Edition, 2009

Hull, D. G.
Fundamentals of Airplane Flight Mechanics, Springer Verlag, 2007

Filippone, A.
Flight Performance of Fixed and Rotary Wing Aircraft, Elsevier Ltd., Oxford, 2006

Stengel, R.F.
Flight Dynamics, Princeton University Press, 2006

Assessment: Written examination (120 minutes)