Jordan University of Science and Technology
Faculty of Engineering
Aeronautical Engineering Department

AE563 Aircraft Stability & Control - JNQF Level: 7
First Semester 2023-2024

Course Catalog
3 Credit Hours. Basic definitions of flight mechanics, control, and control surfaces. The general structure of flight control systems. Aircraft static and dynamic stability and stability derivatives. Static longitudinal and lateral stability. Aircraft longitudinal and lateral dynamic equations. Nonlinear dynamic equations. Linearization of equations. Longitudinal modes of motion. Short and long period approximation. Lateral modes of motion. Transient response of aircraft dynamic. Basic concepts of aircraft control systems. Review of modern control theory. Application to autopilot design.

Text Book	
Title	Flight Stability & Automatic Control
Author(s)	Robert Nelson (1998)
Edition	2nd Edition
Short Name	Textbook
Other Information	

Course References

Short name	Book name	Author(s)	Edition	Other Information
Ref #1	Dynamics of Flight: Stability & Control	Etkin, B. and Reid, L. (1998)	3rd Edition	
Ref #2	Introduction to Aircraft Flight Dynamics	Schmidt , L.V. (1998)	1st Edition	
Ref #3	Airplane Flight Dynamics and Automatic Flight Control, Part I	Roskam, J. (2007)	1st Edition	
Ref #4	Flight Dynamics Principles	Cook, M.V. (2007)	2nd Edition	

Instructor

Name	**Prof. Tariq Darabseh**
Office Location	N1 L2
Office Hours	Sun : 11:00 - 13:00 Mon : 10:00 - 12:00 Tue : 11:00 - 12:00 Wed : 11:00 - 12:00
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Class Schedule & Room

Section 1:
  Lecture Time: Sun, Tue, Thu : 13:30 - 14:30
  Room: CH2110

Prerequisites		
Line Number	**Course Name**	**Prerequisite Type**
714640	AE464 Automatic Control	Prerequisite / Study
713440	AE344 Aerodynamics (1)	Prerequisite / Pass

Tentative List of Topics Covered		
Weeks	**Topic**	**References**
Week 1	Introduction, Atmospheric Properties, and Aerodynamics	From **Textbook**
Weeks 2, 3, 4, 5	Static stability and control	**Chapter 2** From **Textbook**
Weeks 6, 7	Aircraft Equations of Motion	**Chapter 3** From **Textbook**
Weeks 8, 9	Longitiudinal Motion (Stick Fixed)	**Chapter 4** From **Textbook**
Weeks 10, 11	Lateral Motion (Stick Fixed)	**Chapter 5** From **Textbook**
Weeks 12, 13, 14	Modern Control Theory	**Chapter 9** From **Textbook**
Weeks 15, 16	Application of Modern Control Theory to Aircraft Autopilot Design	**Chapter 10** From **Textbook**

Mapping of Course Outcomes to Program Outcomes and NQF Outcomes	**Course Outcome Weight (Out of 100%)**	**Assessment method**
Identify the conditions of static stability and trim for an aircraft to determine the stick-fixed and stick-free neutral points. [1SO1] [1L7K1]	20%	First exam
Recognize the effect of changing the center of gravity location on the aircraft's longitudinal static stability and trim. [1SO1] [1L7K1]	15%	First exam
Design the size of the elevator, rudder, and aileron control surfaces required to trim the aircraft. [1SO2] [1L7S1, 1L7S2]	15%	First exam

Evaluate and interpret aircraft dynamic stability, including stability derivatives, to assess the inherent stability of an aircraft. [1SO6] [1L7S3]	10%	
Evaluate the longitudinal and lateral modes of motion in aircraft, considering their implications for overall stability. [1SO6] [1L7S3]	10%	
Analyze the transient response of aircraft dynamics, particularly focusing on how the aircraft responds to perturbations and disturbances. [1SO6] [1L7S3]	15%	
Apply modern control theory to design and evaluate effective control strategies for aircraft, considering stability, performance, and robustness, with a specific focus on autopilot design. [1SO2] [1L7S1, 1L7S2]	15%	

Relationship to Program Student Outcomes (Out of 100%)						
SO1	SO2	SO3	SO4	SO5	SO6	SO7
35	30				35	

Relationship to NQF Outcomes (Out of 100%)			
L7K1	L7S1	L7S2	L7S3
35	15	15	35

Evaluation	
Assessment Tool	**Weight**
First exam	25%
Second exam	25%
Assignments and Project	10%
Final exam	40%

Policy	
Homework policy	Attendance The student is required to attend all the registered courses. The instructor shall register student attendance or absence electronically. JUST policy requires the faculty member to assign ZERO grade (35) if a student misses 20% of the classes. If you miss a class, it is your responsibility to find out about any announcements or assignments you may have missed Exam/Homework Makeup exam should not be given unless there is a valid excuse according to JUST policies. Arrangements to take an exam at a time other than the one scheduled MUST be made prior to the scheduled exam time. Cheating or copying from a neighbor on exam, quiz, or homework is an illegal and unethical activity. The standard JUST policy will be applied. All assignments must be your own work (your own words) Students are responsible for all the information provided in the lecture. Information presented in class supersedes any information posted elsewhere.