DEPARTMENT OF AERONAUTICAL ENGINEERING
COURSE SYLLABUS

AE 461: Performance of Aerospace Vehicles

COURSE TITLE	*ENGLISH CODE/NO*	*ARABIC CODE/NO.*	*CREDITS*			
			Th.	*Pr.*	*Tr.*	*Total*
Performance of Aerospace Vehicles	AE 461	461 هـ ط	3	1	-	3
Pre-requisites:	AE 303					
Course Role in Curriculum *(Required/Elective):*	Elective Course					

Catalogue Description:
Aircraft performance in steady flight. Straight and level flight. Flight limitations. Drag, power, and performance curves in terms of thrust and power. Gliding flight. Range and endurance. Climbing flight. Aircraft performance in accelerated flight. Takeoff and landing. Turning flight. Introduction to helicopters performance. Thrust and torque theory. Rotor flow effects and power requirement. Vertical climb Space flight. Rocket Performance. Trajectories and escape velocity. Circular & elliptic Orbits.

***Textbooks*:**
1. Anderson, John D., *Introduction to Flight*, McGraw-Hill, 6th edition, 2007.

***Supplemental Materials*:**
1. Houghton, E.L.& Caruthers, N.B., *Aerodynamics for Engineering students*, Edward Arnold, Houghton & P.W. Carpenter, 5th edition, 2003.
2. Layton, D.M., *Helicopter Performance*, Matrix Publisher, Inc, 1984.

***Course Learning Outcomes*:**
By the completion of the course the student should be able to:
1. Derive the equation of motion for an airplane in straight and level flight.
2. Describe the flight limitation for airplane and identify the significance of the equivalent air speed in level flight.
3. Identify the importance of aircraft aspect ratio, zero lift drag coefficient and Oswald efficiency on aircraft performance.
4. Solve problems predict the effect of compressible drag on aircraft performance.
5. Derive the conditions of the minimum drag flight and the minimum power flight.
6. Compute and draw the performance curves in terms of thrust and in terms of power.
7. Describe the effect of wing loading, thrust loading, zero lift drag coefficient and altitude on the maximum flight speed.
8. Explain the effect of change of aircraft weight, altitudes and aircraft configurations on performance curves
9. Solve problems related to aircraft performance in straight and level flight, gliding, and climbing.
10. Describe the conditions of the maximum horizontal covered distance and the maximum duration.
11. Derive the equation to determine the maximum rate of climb, range and endurance for jet and propeller driven aircraft.
12. Show the conditions for maximum range and endurance for different types of aircraft.

Topics to be Covered:	***Duration in Weeks***
1. Straight and Level Flight	3
2. Gliding Flight	1
3. Climbing Flight	2
4. Range and Endurance	1
5. Other Methods of Solution to Performance Problems	1
6. Takeoff and landing Flight	2
7. Turning Flight	2
8. Helicopters	2

Student Outcomes addressed by the course: (Put a ✓ sign)

(a)	an ability to apply knowledge of mathematics, science, and engineering	✓
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	an ability to identify, formulate, and solve engineering problems	✓
(f)	an understanding of professional and ethical responsibility	
(g)	an ability to communicate effectively	
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	✓
(j)	a knowledge of contemporary issues	✓
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

Key Student Outcomes assessed in the course: (a) and (e)

Instructor or course coordinator: Prof. Abdulrahman Bajodah
Last updated: May 2015