Cairo University
Faculty of Engineering

Aerospace

Engineering Department

Course Specifications

Program(s) on which this course is given:	M.Sc. in Aerospace Engineering
Department offering the program:	Aerospace Department
Department offering the course:	Aerospace Department
Academic Level:	PhD.
Date	2nd term
Semester (based on final exam timing)	☐ Fall ☐ Spring

A- Basic Information

1. Title:	**Navigation systems**			**Code:**		**AER 792**		
2. Units/Credit hours per week:	Lectures	3	Tutorial		Practical		Total	3

B- Professional Information

1. Course description:	This course deals with the following main topics: Advanced study on requirements and methods of navigation, coordinate transformation, principles of inertial navigation systems, stability, navigation in geographic coordinates, coherent bands, similarity transformation navigation, advanced analysis of autonomous navigation, accelerators in gravity field, gyro dynamics, error divergence analysis, estimation using discrete observations, navigation measurements, dynamics of northern navigation system, navigation and tracking, initial settings, processing of ground data.
2. Intended Learning Outcomes of Course (ILOs):	**a) Knowledge and Understanding**
	Understand and correctly apply the functions of navigation
	Identify the different types of navigation systems.
	b) Intellectual Skills
	Evaluate the performance of navigation
	Derive the equations that describe navigation systems.
	Analyze and interpret ground data.
	c) Professional and Practical Skills
	Create and evaluate technical reports, papers, and thesis
	Design, compare and evaluate different navigation systems
	d) General and Transferable Skills
	Work and communicate with others through sharing ideas. Work in a team. Lead a team.

3. Contents

Topic	Total hours	Lectures hours	Tutorial/ Practical hours
Methods and requirements for navigation, coordinate transformation		3	
principles of Non-Inertial navigation principals		3	2
principles of inertial navigation systems		3	2

navigation based on Geographic coordinates		3	2
coherent bands and similarity transformation navigation		3	
analysis of autonomous navigation, accelerators in gravity field		3	2
gyro dynamics, error divergence analysis, estimation using discrete observations		6	2
navigation measurements and dynamics of northern navigation system		4	3
navigation and tracking, initial settings		4	
the dynamics of the northern navigation system		3	
processing of ground data		3	2
4. Teaching and Learning Methods	Lectures (27)	Practical Training/ Laboratory (15)	Seminar/Workshop (4)
	Class Activity (5)	Case Study (1)	Projects (1)
	E-learning (5)	Assignments /Homework (5)	Other:

5. Student Assessment Methods	
• **.Assessment Schedule**	**Week**
-Assessment 1;Class test	4,5,6
-Assessment 2; Project Assignment	7
-Assessment 3; Presentations	10
-Assessment 3; Midterm Exam	9
-Assessment 4; Final Exam	16
• **Weighting of Assessments**	
-Mid-Term Examination	10
-Final-term Examination	70
-Project	5
-Class Test	1
-Presentation	4
-Total	100

6. List of References

Handouts and presentation slides prepared by the instructors.

Avionics Navigation Systems, Myron Kayton, Walter R. Fried, ISBN-10: 0471547956 Edition: 2nd

Electronic Navigation Systems by Laurie Tetley, David Calcutt , Edition: 3rd ,2001

Inertial Navigation Systems with Geodetic Applications, Christopher JekelI, de Gruyter

Inertial navigation systems analysis, Kenneth R. Britting, John Wiley & Sons Canada, Limited, 1971

7. Facilities Required for Teaching and Learning

Lecture room equipped with computer and data show. Whiteboards. Textbook available in the department library	
Course Coordinator:	Prof. Mohamed Sayed Bayoumi
Head of Department:	Prof. Ayman hamdy Kassem