Course Specifications

Program(s) on which this course is given:	Doctorate Program
Department offering the program:	**Department of Aerospace**
Department offering the course:	**Department of Aerospace**
Academic Level:	Doctorate
Date	
Semester (based on final exam timing)	■ Fall ■ Spring

A- Basic Information

1. Title:	**Hydrodynamic Stability**			**Code:**		**AER712**		
2. Units/Credit hours per week:	Lectures	3	Tutorial	NA	Practical	**NA**	Total	3

B- Professional Information

1. Course description:	Introduction to flow stability, bifurcation and transition to turbulence. Linear stability theory of parallel shear flows including inviscid and viscous instabilities. Concepts of temporal/spatial, local/global, absolute/convective instabilities. Stability results and transition mechanisms for specific flows, such as free shear, channel, boundary-layer and stratified flows.
2. Intended Learning Outcomes of Course (ILOs):	**a) Knowledge and Understanding**
	• To understand instability in flow • Derive the governing equations for inviscid and viscous flow • Derive the governing equations for two dimensional thermally buoyant flows
	b) Intellectual Skills
	• To determine stability criteria for parallel flows, thermally buoyant plumes, swirling flows and viscous flows
	c) Professional and Practical Skills
	• Apply course material to examine a relevant research project to determine stability criteria for a viscous shear flow using the Orr Somerfeld equations
	d) General and Transferable Skills
	• Solving complex fluid dynamics problems and understanding the relation between instability and turbulence

3. Contents

Topic	Total hours	Lectures hours	Tutorial/ Practical hours
Introduction	3	3	
Mathematical Background	3	3	
Kelvin Helmholtz Instability	6	6	
Rayeleigh Benard	6	6	
Centrifugal Instability	6	6	
Viscous Shear Flow	3	3	
Orr Sommerfeld Equation	3	3	
4. Teaching and Learning Methods	Lectures ■	Practical Training/ Laboratory ( )	Seminar/Workshop ( )

	Class Activity ( )	Case Study ( )	Projects ■
	E-learning ( )	Assignments /Homework ( )	Other:

5. Student Assessment Methods	
• **Assessment Schedule**	**Week**
-Assessment 1; Class test	NA
-Assessment 2; Project Assignment	During the last week of the course
-Assessment 3; Presentations	NA
-Assessment 3; Midterm Exam	NA
-Assessment 4; Final Exam	15
• **Weighting of Assessments**	
-Mid-Term Examination	NA
-Final-term Examination	70%
-Project	30%
-Class Test	NA
-Presentation	NA
-Total	100%

6. List of References

- Introduction to Hydrodynamic Stability, P. G. Drazin, Cambridge University Press; 1 edition (2002)

7. Facilities Required for Teaching and Learning

- White board, projector, computer

Course Coordinator:	**Dr. Basman Elhadidi**
Head of Department:	**Dr. Ayman Kassem**