Course Specifications

Program(s) on which this course is given:	Aerospace Engineering
Department offering the program:	Aerospace Engineering
Department offering the course:	Aerospace Engineering
Academic Level:	Aerospace Engineering
Date	2014-2015
Semester (based on final exam timing)	■ Fall ☐ Spring

A- Basic Information

1. Title:	Fluid Mechanics and Gas Dynamics			**Code:**		**201 A**		
2. Units/Credit hours per week:	Lectures	3	Tutorial	2	Practical	**0**	Total	5

B- Professional Information

1. Coursedescription:	The aim of this course is to learn the fundamental aspects of fluid mechanics (fluid properties, regimes of flow, pressure variations in fluids at rest and in motion, fluid kinematics, fluid dynamics, integral techniques, flow in pipes, similarity and introduction to turbo-machinery). • The essential elements of kinematics, including Eulerian and Lagragian mathematical descriptions of flow phenomena are covered. • The course expands on the basic analysis methods used to solve fluid dynamic problems using control volume approach: continuity, linear momentum, angular momentum and energy equations. • Applications include studies of viscous flow in pipes and ducts, flow measurements, external flow over bodies, similarity and dimensional analysis and turbo-machine problems. • The SI units are used in this course.
2. Intended Learning Outcomes of Course (ILOs):	**a) Knowledge and Understanding**
	1.Explain basic concepts and principles of fluid mechanics, including fluid properties, fluid static's, the conservation equations, control volumes analysis, and viscous flow behaviors. 2.Use dimensional analysis to correlate experimental data with actual applications. 3.Differentiate between different types of turbines and fans (radial, axial)
	b) Intellectual Skills
	1.Analyze different flow problems and apply the concepts of fluid statics and Reynolds transport theorem. 2.Solve applied problems in fluid statics, conservation of mass, linear momentum, angular momentum. 3.Solve applied problems for flow in pipes 4.Determine pressure distribution, forces, and moments on a submerged surface. 5.Use similarity to correlate experimental data for computing physical parameters on actual applications. 6.Solve problems in turbo-machines for radial and axial fans
	c) Professional and Practical Skills
	1.Perform basic fluid mechanics measurement and data analysis. 2.Formulate and solve fluid mechanics problems for applied problems in engineering by applying the principles of conservation of mass, linear momentum, and energy in a control volume analysis. 3.Communicate important results of fluid mechanics experiments in written reports of various styles.
	d) General and Transferable Skills
	1.Computing skills 2.Working in a group 3.Use of technological tool

3. Contents			
Topic	**Total hours**	**Lectures hours**	**Tutorial/ Practical hours**
Introduction to fluid mechanics	6	4	2
Fluid Statics Pressure at a point , pressure variation in a fluid at rest, standard atmosphere, Measurements of pressure, manometers, Hydrostatic force on a plane surface, pressure variation in a fluid with rigid body motion.	8	4	4
Fluid Kinematics The velocity and acceleration field, control volume and system representation, the Reynolds transport theorem.	8	4	4
Fluid Dynamics Integral Analysis of flow, continuity equation, fixed non-deforming control volume, moving non-deforming control volume, deforming control volume, Application of continuity equation.	7	3	4
Fluid Dynamics Integral analysis of flow, linear momentum equation, derivation of the linear momentum equation, applications of the linear momentum equation.	7	3	4
Fluid Dynamics Integral analysis of flow, energy equation, derivation of the energy equation, application of the energy equation, comparison of the energy with the Bernoulli equation, application of energy equation to non-uniform flows, combination of energy equation and moment of momentum equation.	8	4	4
Fluid Dynamics Integral analysis of flow, moment of moment equation, application of the moment equation, application of the moment of moment equation.	4	2	2
Similitude, dimensional analysis & modeling Dimensional analysis , modeling and similitude.	4	2	2
Viscous flow in pipes General characteristics of pipe flow fully developed laminar flow, fullydeveloped turbulent flow, dimensional analysis of pipe flow, and computing minor and major losses in pipes.	8	4	4
Introduction to Turbomachines Introduction to axial and radial turbines and fans. Using velocity triangles. Computing the power and torque from radial fans. Matchingfan curves with head losses in pipes to determine suitable fan for applications	6	4	2
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;Attendance	Every lecture
-Assessment 2; Homework	Weekly
-Assessment 3;Project	Week 6 and 13
-Assessment 3; Midterm exam	Week 7
-Assessment 4; Final exam	Finals week
• **Weighting of Assessments**	
-Attendance	5%
- Homework	5%
-Project	20%
-Midterm exam	10%
-Total	60%

6. List of References

1.Course notes on www.eng.cu.edu.eg/aerospace

2.Bruce R. Munson, Donald F. young, and Theodore H. Okiishi, "Fundamentals of fluid mechanics" , John Wiley & Sons.

7. Facilities Required for Teaching and Learning

.Aerodynamic Laboratory at the Aerospace Engineering Departement

Course Coordinator:	Dr. BasmanElhadidi
Head of Department:	Prof. Ayman Hamdy