University: Cairo Faculty: Engineering Department: Aerospace Engineering

Course Specifications

Programme(s) on which the course is given **Aerospace Engineering**

Major or Minor element of programmes

Department offering the programme **Aerospace Engineering**

Department offering the course **Aerospace Engineering**

Academic year / Level **2nd year Aero. Eng. Students**

Date of specification approval November, 2007.

A- Basic Information

Title: Fluid and gas Dynamics **Code: 201 A**
Credit Hours: 4 **Lecture: 3** **Tutorial: 2**
Practicals: **Total: 5**

B- Professional Information

1 – Overall Aims of Course

The course aims at teaching the students the basic concepts and elements of fluid kinematics, flow types, integral analysis of flow: continuity, linear momentum, angular momentum and energy equations, applications, similitude, dimensional analysis and modeling, viscous flow in pipes and ducts, flow measurements, external flow over bodies and wings and principles of turbo machines.

2 – Intended Learning Outcomes of Course (ILOs)

a-Knowledge and Understanding

a1- Explain basic concepts and principles of fluid mechanics, including fluid properties, fluid static's, the conservation, equations for control volumes analysis, and viscous flow behaviors.

a2- Analytically solve fluid mechanics principles to fluid systems.

a3- Use dimensional experimental correlations to solve internal and external viscous flow problems.

b-Intellectual Skills

b1- Analysis.
b2- problem solving.
b3- creative thinking.

c- Professional and Practical Skills

c1- managing.

c2- perform basic fluid mechanics measurement and data analysis.

c3- communicate important results of fluid mechanics experiments in written reports of various styles.

c4- Determine pressure distribution, forces, and moments on a submerged surface.

c5- Select appropriate control volumes and apply simplifying assumptions to the conservation equations for the selected control volume.

c6- Formulate and solve fluid mechanics problems by applying the principles of conservation of mass, linear momentum, and energy in a control volume analysis.

c7- Use dimensional analysis to determine prototype flow characteristics from model flow geometries.

c8- Apply fluid mechanics principles to the analysis of experimental data.

c9- Identify and communicate in written from the important results from fluid mechanics experiments.

d- General and Transferable Skills

d1- Computing skills

d2- Working in a group

d3- Use of technological tool

3- Contents

Topic	No. of hours	Lectures	Tutorial/Practical
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, , Manometry, Mechanical and Electric Measuring Device, Hydrostatic force on a plan surface, pressure variation in a fluid with rigid body motion.	8	4	4
Fluid Kinematics: The velocity field, control volume and system representation , the Reynolds transport theorem.	8	4	4
Integral Analysis of flow: continuity Equation : Derivation of the continuity Equation, fixed nonperforming control volume moving nondeforming control volume , deforming control volume, Application of continuity Equation.	7	3	4
Integral analysis of flow: linear momentum Equation: Derivation of the linear momentum equation, application of the linear momentum equation.	7	3	4
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 nonuniform flows, comination of energy equation	8	4	4

and moment of momentum equation.			
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 Analysisi & modeling : Dimenstional Analysis , modeling and similitude.	4	2	2
Viscous flow in pipes: General characteristics of pipe flow fully developed laminar flow, fully developed Turbulent flow, dimenstional analysis of pipe flow, pipe flow Examples, pipe flow rate measurements.	8	4	4

4– Teaching and Learning Methods

4.1- Lecture
4.2- Information collection
4.3- class activities
4.4- Discussions
4.5- Practical training

5- Student Assessment Methods

5.1 Class test (1)	to assess Understanding
5.2 Reports	to assess problem solving
5.3 Mid- term	to assess Gains of completed topics

Assessment Schedule

Assessment 1	Week 2
Assessment 2	Week 4
Assessment 3	Week 5,6
Assessment 4	Week 7,8
Assessment 5	Week 9,10
Assessment 6	Week 11,12
Assessment 7	Week 13
Assessment 8	Week 14,15

Weighting of Assessments

Mid-Term Examination	12	%
Final-term Examination	68	%
Oral Examination.	—	%
Practical Examination	—	%
Semester Work	15	%
Other types of assessment	5	%
Total	100	%

Any formative only assessments

6- List of References

6.1- Course Notes

6.2- Essential Books (Text Books)

Bruce R. Munson, Donald F. young , and Theodore H. Okiishi, " Fundementals of fluid mechanics" , 3rd Edition, John wiley & sons, Inc. 1998.

6.3- Recommended Books

6.4- Periodicals, Web Sites, … etc

http: // www.eng.cu.edu.eg/users/ mkhalil/ AER201A

7-Facilities Required for Teaching and Learning

Aerodynamic Laboratory at the Aerospace Engineering Departement

Head of Department: Prof. Atef Sherif

Date: November, 2007.