# *Course Specifications of: Advanced Fluid Mechanics MEP 604*

**Program(s) on which the course is given :** Post Graduate **M. Eng.** in Mechanical Power Engineering
**Compulsory or Elective element of program**: Elective
**Department offering the program: Mechanical Engineering / Power**
**Academic year / Level:** year/ 2014-2015
**Date of specification approval: 2012**

## A. Basic Information

**Title: Advanced Fluid Mechanics** **Code: MEP 604**
**Credit Hours:3** **Lecture: 3**
**Tutorial:** **Practical:** **Total: 3**

## B- Professional Information

## 1- Overall aims of course:

This course introduces students to:

1. Know the fundamental equations governing fluid flow.
2. Specify boundary conditions required of solving basic equations.
3. Understand research papers in fluid mechanics.

## 2- Intended learning outcomes of course (ILOs)

By completion of the course, the student should be able to:

### 2.1 Knowledge and understanding

a1. Define theories, fundamentals and specialized knowledge in fluid mechanics. (2.1.1)
a2. Outline the scientific developments in area of fluid mechanics. (2.1.3)
a3. Illustrate the methodologies used in computational and experimental research. (2.1.7)

### 2.2 Intellectual skills

b1. Analyze and assess information in fluid mechanics and draw analogies to solve problems.(2.2.1)
b2. Solve problems in spite of the lack of some data.(2.2.2)
b3. Illustrate different knowledge sources to solve problems.(2.2.3)
b4. Conduct a research study and/or write a scientific essay about a research problem.(2.2.4)

### 2.3 Professional and practical skills

c1. Write and evaluate professional reports.(2.3.2)
c2. Assess methods and current tools in the area of fluid mechanics.(2.3.3)
c3. Find optimal design for MPE projects under given constraints.(2.3.4)
c4. Use the various software programs for simulating the system features.(2.3.6)

## 2.4 General and transferable skills

d1. Use different sources for obtaining information and knowledge.(2.4.4)
d2. Work in a group and Lead a team in familiar professional contexts. (2.4.6)
d3. Conduct self-learning and continuous education practices.(2.4.8)

### 3- Contents

| Topic No. | Topic | No. of weeks | Total no. of hours |
|---|---|---|---|
| 1 | Fundamentals of fluid mechanics , Basic Equations in Differential forms | 2 | 6 |
| 2 | Exact Solutions, Applications of conservation equations of mass and momentum and energy | 3 | 9 |
| 3 | Approximate Solutions | 2 | 6 |
| 4 | Dimensional analysis and dynamic similarity | 1 | 3 |
| 5 | Turbulence and laminar flow, Transition to Turbulence | 3 | 9 |
| 6 | Turbulence Models, Boundary layers. | 3 | 9 |
| 7 | Exam | 1 | 3 |
| | Total | 15 | 45 |

## 4- Course Matrix

| ILO's code number | Teaching/learning methods and strategies | Assessment methods and strategies |
|---|---|---|
| 2.1.1<br>2.1.3<br>2.1.7 | Formal lectures, seminars, tutorials, directed reading, project work and independent study. | Individual coursework assignments, quizzes, oral discussions and reports. Mid-year and /or final written examination is given. |
| 2.2.1<br>2. 2.2<br>2. 2.3<br>2. 2.4 | Analysis and problem-solving skills are developed through tutorial/problem sheets and small group exercises.<br>Research skills are developed through a small subject oriented research project. | Analysis and problem-solving skills are assessed through oral and written examinations.<br>Design and research skills are assessed through project write-ups, coursework and project reports. |
| 2. 3.2<br>2. 3.3<br>2.3.4<br>2.3.6 | Experiments demonstrations, practical work, laboratory visits. | Coursework exercises and reports, project reports and presentations. |
| 2.4.4<br>2. 4.6<br>2.4.8 | Groups of students will be assigned a research topic on fluid mechanics. Together they will have a presentation on the topic and submit a review paper on it. | Project presentation |

### 5- Assessment schedule

| | | | |
|---|---|---|---|
| Assessment 1 | Assignments | on weeks | 3, 6, 9 |
| Assessment 2 | Quizzes | on weeks | 4,5,11, 13 |
| Assessment 3 | Mid-term exam | on weeks | 7 |
| Assessment 3 | Oral exam | on week | 14 |
| Assessment 4 | Final exam | on week | 15 |

## 6- Weighting of assessments

20% (60 marks) Home assignments, Quizzes, and reports
20% (60 marks) Mid-term examination and Oral examination
60% (180 marks) Final-term examination
100% (300 marks) Total

## 7- List of References

### 7.1 Essential books (Text books)

Boundary Layer Theory. By Schlichting, H.
ASME transaction, Journal of Fluids Engineering.
Advanced Fluid Mechanics by W. P. Graebel (Jul 5, 2007)

### 7.2 Recommended books; Periodicals & Websites.

-Engineering Fluid Mechanics by W. P. Graebel (Jan 19, 2001)
-www.4shared.com
-yahoo group mail

## 8- Facilities required for teaching and learning

Lecture room equipped with overhead projector
Presentation board, computer and data show

**Course coordinator: Prof. Dr. Samir Sobhy Ayad , Prof . Dr. Ahmed Reda**
**Course instructor: Prof. Dr. Samir Sobhy Ayad , Prof . Dr. Ahmed Reda**

**Head of Department: Prof. Dr. Osama Ezzat Abdellatif**

# Matrix of course content and ILO's

**Course Title**: **Advanced Fluid Mechanics** **Code**: **MEP 604**
**Lecture**: 3. **Tutorial**: ---- **Practical**: ---- **Total:** 3
**Program on which the course is given:** Post Graduate **M. Eng.** in Power Engineering.
**Major or minor element of program:** Elective
**Department offering the program:** Mechanical Engineering / Power
**Department offering the course:** Mechanical Engineering / Power
**Academic year / level: 2014/2015**. **Date of specifications approval: 2012**

| Course content | ILO's A | ILO's B | ILO's C | ILO's D |
|---|---|---|---|---|
| Fundamentals of fluid mechanics , Basic Equations in Differential forms | a1,a2 | b1 | c1 | d1 |
| Exact Solutions, Applications of conservation equations of mass and momentum and energy | a2 | b2 | c2 | d1 |
| Approximate Solutions | a1 | b2 | | d3 |
| Dimensional analysis and dynamic similarity | a2 | b4 | c3 | |
| Turbulence and laminar flow, Transition to Turbulence | a1,a3 | b3 | c4 | d1 |
| Turbulence Models, Boundary layers. | a1 | b2 | | d2 |

# Matrix of course aims and ILO's

**Course Title**: **Advanced Fluid Mechanics** **Code**: **MEP 604**
**Lecture**: 3. **Tutorial**: ---- **Practical**: ---- **Total:** 3
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| Course aims | ILO's A | ILO's B | ILO's C | ILO's D |
|---|---|---|---|---|
| 1- Know the fundamental equations governing fluid flow. | a1 | | c1 | d1,d2 |
| 2- Specify boundary conditions required of solving basic equations. | a1 | b2, b3 | c2 | d2 |
| 3- Understand research papers in fluid mechanics. | a3 | b4 | c1 | d1 |
| 4- Know the fundamental equations governing fluid flow. | a1, a2 | b1,b2 | c3 | d3 |