Course Specifications

University: Benha University  
Faculty: High Institute of Technology

Course specifications

Programme(s) on which the course is given: B.Sc. mechanical Engineering
Major or minor element of programme: N.A.
Department offering the programme: Mechanical Engineering technology
Department offering the course: Mechanical Engineering technology
Academic year / Level: Second year, first semester.
Date of specification approval: 16/4/2009

A- Basic Information

Title: Fluid Mechanics  
Code: M201
Credit Hours: N.A
Lecture: 4  
Tutorial: 2  
Total: 6
Practical: 6 per term

B- Professional Information

1 - Overall aims of course

By the end of this course the students will be able to:

i) Demonstrate knowledge about all fluid properties and some practical applications.

ii) Demonstrate knowledge of fluid statics; estimation of forces on submerged bodies in static fluid situation.

iii) Transportation of different types of fluids in a variety of applications and be able to avoid unwanted phenomena such as cavitation.

iv) Define and solve problems in fluid dynamics in various engineering applications.

v) Apply Bernoulli equation on various fluid problems.

vi) Estimation of forces on moving, or stationary bodies caused by flowing fluids, either internally or externally such as forces on nozzles, elbows, blades and drag forces on chimneys, high rise buildings, different types of constructions.

vii) Solve real fluid flow in pipes and open channel; apply steady flow energy equation on different fluid flow situations.

viii) Use similarity in fluid flow problems.

ix) Share ideas and work in a team in an efficient and effective manner under controlled supervision or independently.

2- Intended learning outcomes of course (ILOs)

a-Knowledge and understanding

a1-Define fluid properties, stresses in fluids at rest and in motion and types of fluid flows.

a2-Derive the governing equations of fluid flow: continuity, energy and momentum equations from principles of mass, energy and momentum conservation.

a3-Define the terms of Bernoulli's equation, include major and minor losses and draw the energy and the hydraulic gradient lines for flow systems.
a4 - Describe and explain velocity and flow measuring devices, boundary layers separation, friction and form drag.

a5 – Solve the fluid flow in pipe network.

a6 – Solve the different types of viscous flow problems.

a7 - Apply \( \pi \) theorem.

b. Intellectual skills

b.1 Analyze problems, conclude solutions and demonstrate creative thinking.

c- Professional and practical skills

c.1 Use appropriate fluid measurement lab equipment.

c.2 Design and perform experiments in the lab and field within proper technical, safety and ethical framework.

d- General and transferable skills

d.1 Write reports in accordance with the standard scientific guidelines.

d.2 Present reports, discuss results and defend his/her ideas.

d.3 Work coherently and successfully as a part of a team in assignments.

3- Contents

<table>
<thead>
<tr>
<th>Topic</th>
<th>No. of Hours</th>
<th>Lecture</th>
<th>Tutorial/Practical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundamental concepts: Definition of a fluid, Dimensions and units. Fluid Properties</td>
<td>12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Fluid Statics: Pressure and pressure measurements, Hydraulic forces on submerged surfaces. Rotating containers.</td>
<td>12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Basic Equations of Fluid Mechanics: kinematics of fluid flow.</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Bernoulli's Eqs. And its applications</td>
<td>12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Control volume approach, continuity, momentum, and energy equations with their applications.</td>
<td>12</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Real Viscous flow.</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Flow in Closed Conduits: laminar and turbulent flows, equation of motion, primary and minor losses, hydraulic and energy gradient lines.</td>
<td>6</td>
<td>4</td>
<td>2</td>
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<tr>
<td>Flow Over Immersed Bodies: Boundary layer growth and separation, drag on flat plate.</td>
<td>6</td>
<td>4</td>
<td>2</td>
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<tr>
<td>Dimensional analysis and similarity</td>
<td>6</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Lab.</td>
<td>10</td>
<td>4</td>
<td>6</td>
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<tr>
<td>Total</td>
<td>88</td>
<td>56</td>
<td>32</td>
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4- Teaching and learning methods

4.1- Lectures
4.2- Tutorials and discussion sessions
4.3- Laboratories

5- Student assessment methods

5.1 Written exams. : To assess the understanding of the scientific background
5.2 Oral : To assess the skills of analysis and discussion,
5.3 Class activities : (reports discussion and assignments):

Assessment schedule

<table>
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<tr>
<th>First Assignment</th>
<th>Week 3</th>
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</thead>
<tbody>
<tr>
<td>Second Assignment</td>
<td>Week 6</td>
</tr>
<tr>
<td>Mid-term exam.</td>
<td>Week 8</td>
</tr>
<tr>
<td>Third assignment</td>
<td>Week 11</td>
</tr>
<tr>
<td>Mid-term exam.</td>
<td>Week 13</td>
</tr>
<tr>
<td>Oral exam.</td>
<td>Week 14</td>
</tr>
<tr>
<td>Final exam.</td>
<td>Week 15</td>
</tr>
</tbody>
</table>

Weighting of assessments

| Mid-term examinations   | 20%   |
| Final-term examination  | 60%   |
| Oral examination        | 5%    |
| Practical examination   | 5%    |
| Semester work           | 10%   |
| Total                   | 100%  |

6- List of references

6.1- Course notes
Fluid Mechanics (lecture notes)

6.2- Essential books (text books)
6.3- Periodicals, Web sites, … etc

7- Facilities required for teaching and learning

7-1 Computers
7-2 Laboratories
7-3 Laboratory equipments
7-4 Teaching Aids(Presentation board, overhead projector, data show)

Course coordinator:  Dr. Mohamed Elsharnoby
Head of Department:  Associate Prof. Sameh Nada
Date:  16/4 /2009