**Cumilla University**

**Course Outline of MTH 415 (Hydrodynamics)**

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| Course teacher: | Office: |
| Md. Mohiuddin  Lecturer  Department Of Mathematics  Cumilla University, Cumilla. | Teacher’s room: 4th Floor, Science Faculty Building.  Cell: 01751471783  Mail: mahi.in2012@gmail.com |

This course will help to the students to develop the fundamental equations of fluid dynamics and to solve several engineering problems. It concludes the topics such as principle of conservation of mass, momentum and energy, lift and drag forces, laminar and turbulent flows, dimensional analysis, added mass and wave velocities.

**Course Objectives:**

After the successful compilation of this course, the students will be able to

1. Learn about the basic concepts of fluid dynamics,
2. Solve the wide range of problems in fluid dynamics,
3. Formulate creative design solutions in the area of fluid dynamics.

**Course Syllabus:**

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| Unit | Topics to be covered |
| 01 | 1. Velocity and acceleration of fluid particles, Relation between local and individual rates, steady and unsteady flows. 2. Equations of continuity, Equation of continuity in Cylindrical and Spherical polar coordinates, Boundary surface. 3. Uniform and non-uniform flows, Stream lines, Path lines, Vorticity vector, Rotational and irrotational flows, Angular velocity vector. |
| 02 | Euler’s equation of motion, Conservation field of force, Motion under conservative body force, Lagrange’s hydrodynamical equations of motion. |
| 03 | Bernoulli’s equation and its application. |
| 04 | 1. Motion in two dimensions, Stream function, Physical meaning of stream function, Velocity in polar coordinates, Relation between stream function and velocity potential. 2. Sources, Sinks and Doublets, Complex potential and complex velocity, Stagnation points, Complex potential due to a source and a doublet, Image system. 3. Circle theorem and its application, Blasius theorem and Cauchy residue theorem. |
| 05 | Flow and Circulation, Stokes’s Theorem, Kelvin’s circulation theorem, Permanence of irrotational motion equation of energy, Kelvin’s minimum energy theorem. |
| 06 | Motion of a circular cylinder, Liquid streaming past a fixed circular cylinder. |

**Books**

* Hydrodynamics, by ***P.P. Gupta***.
* Theoretical Hydrodynamics, by ***L.M. Milne Thompson***.
* A Text book of Fluid Dynamics, ***by F. Chorlton***.

**Attention !!**

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| **Midterm &**  **Class test** | The syllabus for midterm and class test will be declared before the announcement of the exam date. |
| **Assignment** | Make a nice top sheet including, Title of the Assignment, Your Name, Your ID number, Course Code, Course Title, Section, Date of submission etc. |
| **Presentation** | Your Presentation should have the followings: (i) Title of the Presentation, (ii) Brief Description,(iii) Discussion (iv) Example (v) Application (vi) Conclusion. |

**Grading Policy:**

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| **Marks out of 100** | **Letter Grade** | **Grade Point** |
| 80 - 100 | A+ | 4.00 |
| 75 - 79 | A | 3.75 |
| 70 - 74 | A- | 3.50 |
| 65 - 69 | B+ | 3.25 |
| 60 - 64 | B | 3.00 |
| 55 - 59 | B- | 2.75 |
| 50 - 54 | C+ | 2.50 |
| 45 - 49 | C | 2.25 |
| 40 – 44 | D | 2.00 |
| 00 - 39 | F | 0.00 |

Assessment Strategy:

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| **Type of Evaluation** | **Time** | **Marks** | **Guideline** |
| Final Exam | 3 hours | 60 | Five have to be answered out of eight questions. |
| Midterm Exam (2) | 30 minutes | 20 | Ten per exam. Two have to be answered. |
| Clast Test/Quiz | 10 minutes | 5 | Average of CT/Quiz. Instantly MCQ/Written. |
| Presentation | 10 minutes | 10 | Topic=4, Speech=4, Dress code=2. |
| Class Attendance | --- --- --- | 5 | --- --- --- --- |
|  | **Total** | **100** |  |

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**Md. Mohiuddin**

Lecturer

Department of Mathematics

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