BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani
Pilani Campus

INSTRUCTION DIVISION
FIRST SEMESTER 2017-2018

Course Handout (Part II)

Date: 02/08/2017

In addition to Part-I (General Handout for all courses appended to the time table) this portion gives further specific details regarding the course.

Course No. : **ME F212 / MF F212**
Course Name : **Fluid Mechanics**
Instructor-in-charge : **Shyam Sundar Yadav**
Tutorial Instructor : Shyam Sundar Yadav, Amol Marathe, Ashish Sreevastava, Divyanshu Agarwal

1. **Course Description:**

   Mathematical preliminaries, Fluid statics and forces on submerged bodies, Integral relations for control volume, Mass, Momentum and Energy Conservation, Reynolds Transport Theorem, Differential relations for fluid flow, Navier-Stokes Equation, Dimensional analysis and similarity, Inviscid potential flows, Bernoulli's Equation, Viscous flows, Internal flows, External flows, Introduction to Computational Fluid Dynamics

2. **Scope and Objective:**

   - Introduction of fluid mechanics and establish its relevance in mechanical engineering.
   - Derivation of the equations governing mass, momentum and energy transport.
   - Non-dimensionalization of governing equations and identification of dimensionless numbers, Modeling and similarity concepts.
   - Application of the governing equation to solve simple fluid mechanics problems.
   - Analyze laminar and turbulent flows inside pipes & ducts, Flow past immersed bodies, Boundary layer theory
   - Introduction to computational methods for fluid flows.

3. **Text books (T.B.):**

   1. Frank M White, Fluid Mechanics, 8th Edition, Tata McGraw Hill

4. Reference Books (R.T.):

1. Robert W. Fox & Alan T. McDonald; Introduction to Fluid Mechanics; John Wiley Publications; 8th Edition.
2. James. A. Fay, Introduction to Fluid Mechanics, Prentice Hall of India (2007).
3. James R. Welty; Charles E. Wicks and Robert E. Wilson, Fundamentals of Momentum, Heat and Mass transfer; John Wiley Publications, 4th Edition.

5. Course Plan:

Learning Objectives	No of Lecture Hour	Reference Chap./Sec.# (Book)
Mathematical preliminaries: Scalars, Vectors, Tensors, Indicial notation, Dot and Cross products, Gradient, Divergence and Curl, Forces on a surface, Gauss' and Stokes' theorems,	3	Class notes
Fluid Statics: Introduction, Pressure on submerged surfaces, Rigid body motion	3	T.B. Chapter 1 & 2
Fluids in Motion: Lagrangian and Eulerian representation, Reynolds Transport Theorem, Material derivative	2	Class notes
Integral Relations for a Control Volume: Conservation of Mass, Momentum and Energy for a control volume	6	T.B. Chapter 3
Differential Relations for Fluid Flow: Conservation of Mass, Momentum and Energy for a differential fluid element, Newtonian and Non-Newtonian fluids, Navier-Stokes equations and some exact solutions, Boundary conditions	5	T.B. Chapter 4
Dimensional Analysis and Similarity: Buckingham Pi theorem, Non-dimensionalization of Navier-Stokes equations	4	T.B. Chapter 5
Incompressible Inviscid flows: Euler equation, Bernoulli equation, Stream function, Velocity potential, Elementary inviscid flows: uniform, source, sink, vortex, Superposition	4	R.T 1, Chapter 6, Class notes
Internal Flow: Laminar and turbulent flows in pipes and ducts	5	T.B. Chapter 6
External Flow: Flow past Immersed Bodies, Introduction to Boundary layer theory, Drag and Lift	5	T.B. Chapter 7
Computational Fluid Dynamics: Introduction to CFD	2	Class notes

using Open Source codes		

6. Evaluation Scheme:

EC No.	Evaluation Component	Duration	Weightage	Date, Time & Venue	Nature of Component
1.	Mid sem. Exam.	1.5 Hrs	25%	**9/10 2:00 - 3:30 PM**	C.B.
2	Tutorial	---	20%	As per timetable	O.B.
3.	Quiz	---	15%	Will be announced in class	C.B.
4.	Compre. Exam.	3 Hrs	40%	**3/12 FN**	C.B.+O.B.

7. Tutorials: There will be total 6 evaluative tutorials. Three will be conducted before mid. sem. exam (out of which best 2 will be considered) and 3 will be conducted after mid. Sem. (again best 2 will be considered). **There will be no makeup in any circumstances for evaluative tutorials.**

8. Objective quizzes: There will be two objective quizzes: One based on the syllabus before mid sem. exam. and other based on syllabus after mid. sem. **No makeup in any circumstances for these objective quizzes.**

9. Chamber Consultation Hour: Will be announced by instructors individually in the class.

10. Make up Policy: Make-up will be granted only to genuine cases. For cases related to illness, proper documentary evidence is essential. Prior permission is necessary if student is out of station on the test date. **No make-up for tutorial tests and quiz components.**

11. Notices: Notice, if any, concerning the course will be displayed on the Notice Board of Mechanical Engineering Department as well through emails. The students should check their mails regularly.

12. Open Book Exams: No hand written notes will be allowed. Only the prescribed text book will be allowed.

Instructor In-charge
ME F 212/ MF F 212