COURSE SYLLABUS – ChE 331

COURSE TITLE	*ENGLISH CODE/NO*	*ARABIC CODE/NO*	*CREDITS*				
			Th.	*Pr.*	*Tr.*	*Tu.*	*Total*
Momentum Transfer	ChE 331	هـ كم ٣٣١	3	--	--	1	3
Pre-requisites:	MATH 203, MATH 204, ChE 201						
Course Role in Curriculum	*Required or Elective:*		Required				
	A pre-requisite for:		ChE 332, ChE 333				

Catalogue Description:
Fluid static, Mass, momentum, and energy balance on finite and differential systems. Laminar and turbulent flow in pipes. Fluid flow in porous media. Introduction to boundary layer theory. Fluid flow applications.

***Textbooks*:**
James Welty, Charles,Wicks, Gregory L. Rorrer, Robert E. Wilson, Fundamentals of Momentum, Heat and Mass Transfer, Publisher: John Wiley & Sons; 6th Edition (2015)

***Supplemental Materials*:**
Bruce R. Munson, Theodore H. Okiishi, Wade W. Huebsch and Alric P. Rothmayer, Fluid Mechanics, n Wiley & Sons; 7th Edition (2013)

***Course Learning Outcomes*:**

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

1.	**Identify** the key fluid properties used in the analysis of fluid behavior.
2.	**Use** the concept of viscosity, vapor pressure, and surface tension.
3.	**Estimate** the pressure at various locations in a fluid at rest.
4.	**Explain** the development, uses, and limitations of the Bernoulli equation.
5.	**Select** an appropriate finite control volume to solve a fluid mechanics problem.
6.	**Apply** conservation of mass and energy and Newton`s second law of motion to the contents of a finite control volume to get important answers.
7.	**Analyze** certain types of flow using the Navier-Stockes equations.
8.	**Apply** the Buckigham pi theory
9.	**Develop** a set of dimensionless variables for a given flow situation
10.	**Discuss** the main properties of laminar and turbulent pipe flow.
11.	**Explain** the fundamental characteristics of a boundary layer, including laminar, transitional and turbulent regimes.
12.	**Select** an appropriate class of turbomachines for a particular application.

Topics to be Covered:		***Duration in Weeks***
1.	Introduction to Momentum Transfer	2
2.	Fluid Statics and Elementary Fluid Dynamics	2
3.	Finite Control Volume Analysis	4
4.	Differential Analysis of Fluid Flow	1
5.	Dimensional analysis, Similitude and Modeling	2
6.	Viscous Flow in Pipe	1
7.	Flow over Immersed Bodies	1
8.	Turbomachines	1

Key Student Outcomes addressed by the course: (Put a √ sign)

(a)	an ability to apply knowledge of mathematics, science, and engineering	
(b)	an ability to design and conduct experiments, as well as to analyze and interpret data	
(c)	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	
(d)	an ability to function on multidisciplinary teams	
(e)	**an ability to identify, formulate, and solve engineering problems**	√
(f)	an understanding of professional and ethical responsibility	
(g)	**an ability to communicate effectively**	√
(h)	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	
(i)	a recognition of the need for, and an ability to engage in life-long learning	
(j)	a knowledge of contemporary issues	
(k)	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	

Key Student Outcomes assessed in the course: (e) and (g)

Class Schedule:

- Lecture: three 1.0 hour sessions per week
- Tutorials: one 3.0 hours session per week

Instructor:	Dr. Sharif Fakhruz Zaman
Last updated :	January 2015