

Spring 2019

FED 101-012: Fundamentals of Engineering Design for Chemical Engineers

Irina Molodetsky

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Fundamentals of Engineering Design
FED 101
2 credits

Class meetings: FED 101-002 Thursday, 10:30 am -12:50 pm

Room 411 Tiernan Hall (Computer Lab)\Room 206 Tiernan Hall (FED Lab)

Instructor: Dr. Irina Molodetsky

Room 350 Tiernan Hall

Office hours: Tuesday, 1-5:00pm;

Please, contact by email for additional meeting

Email: Irina.Molodetsky@njit.edu

FED 101 is a combination of the laboratory experiments and lecture components

In this class you will learn:

- Introduction to measurements, data analysis (Excel) and data reporting (Excel; PowerPoint, Microsoft Word)
- Different unit systems and units conversion
- Conceptual understanding of relationship between energy and pressure in the fluid
- The main elements of the flow system. Applications in Chemical Engineering
- How to measure the flow rate and relationship between the mass flowrate, volumetric flow rate and average flow velocity
- How to measure a static pressure in the fluid
- How to predict and measure pressure drops in the flow system
- How to design and build a scale-down model of the flow system

Details about assignments and grading policies are discussed in the “Introduction” lecture.

Policy on Academic Integrity

Academic Integrity is the cornerstone of higher education and is central to the ideals of this course and the university. Cheating is strictly prohibited and devalues the degree that you are working on. As a member of the NJIT community, it is your responsibility to protect your educational investment by knowing and following the academic code of integrity policy that is found at:

<http://www5.njit.edu/policies/sites/policies/files/academic-integrity-code.pdf>.

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university. If you have any questions about the code of Academic Integrity, please contact the Dean of Students Office at dos@njit.edu”

www.njit.edu/academics/pdf/academic-integrity-code.pdf

If you need accommodations due to a disability please contact Chantonette Lyles, Associate Director of Disability Support Services, Fenster Hall Room 260 to discuss your specific needs. A Letter of Accommodation Eligibility from the Disability Support Services office authorizing your accommodations will be required.

Course Schedule

		Introduction. Schedule and grading policy
W1	Concepts	<ul style="list-style-type: none"> • Pressure. Hydrostatic pressure
	Instruments and Engineering Measurements	<ul style="list-style-type: none"> • How to measure static pressure in the fluid • Bourdon gauge. Absolute pressure and gauge pressure
	Lab	<ul style="list-style-type: none"> • Orientation. Safety rules and lab safe practices
W2	Quiz1	
	Concepts	<ul style="list-style-type: none"> • Average fluid velocity, \bar{v} • Volumetric flow rate, Q • Mass flow rate, \dot{m}
	Instruments and Engineering Measurements	<ul style="list-style-type: none"> • Flowmeters • Calibration • Design of Experiment “Flowmeter calibration”
	Lab	<ul style="list-style-type: none"> • Construction “Flowmeter calibration”
W3	Quiz2	
	Dara Analysis	<ul style="list-style-type: none"> • Working with Excel. • Statistical errors. Accuracy. Precision. • Making graphs in Excel
	Lab	<ul style="list-style-type: none"> • Laboratory experiment “Flowmeter calibration”
W4	Quiz3	
	Concepts	<ul style="list-style-type: none"> • Units and units conversions • Primary units, SI, English. Dimension units
	Problems solving	<ul style="list-style-type: none"> • Ideal gas. Equation of State of Ideal gas. • Units
	Lab	Completion of “Flowmeter calibration”

W5	Quiz4	
	Concepts	<ul style="list-style-type: none"> • Pressure-Energy relationship • Ideal flow system.
	Instruments and Engineering Measurements	<ul style="list-style-type: none"> • Centrifugal pump. Pump Head • Design of Experiment “Pump Characterization”
	Lab	Construction of “Pump Characterization”
W6	Quiz5	
	Problems solving	Discussion and problem solving related to Pump characterization experiment
	Lab	Lab experiment “Pump Characterization”
	HW	Practice take-home test 1
W7	Quiz6	
	Problems solving	Team exercises
	Lab	Completion “Pump Characterization”
	HW	Practice take-home test 2
W8	TEST	
		Introduction of the final project. P&ID
W9	Quiz7	
	Concepts	<ul style="list-style-type: none"> • Single flow through a packed column • Laminar and turbulent flows. • Ergun equation: pressure drop calculations (discussion of parameters: effective particle size; void fraction, surface area, g_c conversion factor)
	Lab	Demo of the packed column
W10	Quiz8	
	HW	Prediction of the Pressure drops. Discussion of the assignment
	Lab	Construction of the flow system
W11	Quiz9	
	Concept	Dynamic and kinematic viscosity
	Lab	Construction and measurements of the pressure drops
	HW	300-500 words
W12	Quiz 10	

	Lab	Construction and measurements of the pressure drops
	Data Analysis	Comparison predicted and experimental pressure drops

Grading (changes may apply)

- A 90 and above
- B+ 85 and above
- B 80 and above
- C+ 75 and above
- C 60 and above
- D 50 and above
- F below 50