Department of Chemical Engineering

Boğazici University

ChE 417, Fall 2018: Microfluidics and its applications
Counted towards Option 4 – process engineering

Instructor: A. Kerem Uğuz, Associate Professor x-4617
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You are responsible on announcements and course materials at Moodle
Office hour: Monday 11:00 – 12:00
Open door policy. If unable to see me, please send an e-mail to set up an appointment

T.A.: TBA
Meeting: M 4, Th 1-2 (Attendance is mandatory)
Catalog: Microfluidic systems, micro manufacturing, micro-mechanical systems. Scaling analysis and motion at microscale. Driving flow in microchannels by pressure gradients, electric field and surface tension. Mass transport and particles in microchannels. Applications such as micro reactors, electrophoresis, micro sensors, microscale mixing and separation
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References:
1. J. Berthier and P. Silberzan, Microfluidics for Biotechnology, Artech House, 2010
2. Nam-Trung Nguyen, Steven T. Wereley, Fundamentals and Applications of Microfluidics, Artech House, 2006
3. Brian Kirby, Micro-and Nanoscale Fluid Mechanics Transport Microfluidic Devices, Cambridge University Press, 2010 (online access)
4. Microfluidics / edited by Stéphane Colin. NJ: Wiley, 2010
5. Others that will be discussed in class

Objectives:
1. Learn microfabrication techniques
2. Learn dimensionless numbers, microflows and capillarity
3. Learn digital microfluidics and electrokinetic phenomena
4. Learn various applications of microfluidics

Content:
- **a.** What is microfluidics?
- **b.** Research topics in microfluidics
- **c.** Fabrication of microfluidics devices
- **d.** Soft lithography
- **e.** Mass and momentum balances
- **f.** Friction and pressure drop
- **g.** Scaling analysis
- **h.** Examples: microneedle, t-sensor, electrowetting,
- **i.** Surface tension and wetting: Bubbles and droplets
- **j.** Diffusion and advection: DNA amplification, mixing, dispersion
- **k.** Electroosmosis, electrophoresis, PCR
- **l.** Biochemical reactions, biorecognition

Grading (tentative): 20 or 25% Homework/(un)announced Quiz
20 or 25% Project
25% MT
30% Final

Phones: They need to be put on silent.

Academic Honesty: *Students are bounded by academic honesty. Cheating is a violation of academic honesty. The result is failing the course.*