**ATILIM UNIVERSITY**
**DEPARTMENT OF MANUFACTURING ENGINEERING**
**2015 – 2016 FALL SEMESTER**
**MFGE 315 HEAT AND MASS TRANFER**
**COURSE OUTLINE**

**Instructor** : **Asst. Prof. Dr. Levent ÇOLAK (lcolak@baskent.edu.tr)**
**Office/Tel/Web** : **D - 321 / 246 66 66 - 1355 / http://www.baskent.edu.tr/~lcolak**
**Course Hours** : **Monday 15:30 - 17:20 (1033) & Wednesday 15:30 - 17:20 (1033)**
**Text Book** : **Fundamentals of Heat and Mass Transfer 7th ed.**
**F.P. Incropera, P. De Witt, T.L. Bergman, A.S. Lavine, WILEY, 2012**
**Supplements** : 1- Heat Transfer 10th ed., **J.P. HOLMAN, Mc Graw HILL**
2- Heat and Mass Transfer 4th ed., **Yunus A. ÇENGEL, Mc GRAW HILL, 2011**
3- Heat Transfer 2th ed., **D.PITTS, L.SISSOM, Schaum's Outlines, McGraw HILL**

| Week | Date | Subjects and Related Sections |
|---|---|---|
| #1 | 14 Sep. – 18 Sep. | **Introduction,** basic concepts and definitions, conduction, convection, radiation, thermal resistance, conservation of energy, units and dimensions. **(Chpt. 1)** |
| #2 | 21 Sep. – 25 Sep. | **Introduction to conduction,** Conduction rate equation, thermal properties of matter, thermal conductivity**,** heat diffusion equation, boundary and initial conditions **(Chpt. 2)** |
| #3 | 28 Sep. – 02 Oct. | **One dimensional steady state conduction,** plane wall and radial systems, temperature distribution, thermal resistance, composite wall, contact resistance, overall heat transfer coefficient **(Chpt. 3.1 – 3.4)** |
| #4 | 05 Oct. – 09 Oct. | **One dimensional steady state conduction,** conduction with thermal energy generation, plane wall & radial systems **(Chpt.3.5)** |
| #5 | 12 Oct. – 16 Oct. | **One dimensional steady state conduction,** heat transfer from extended surfaces, fin performance, fin efficiency, overall surface efficiency **(Chpt. 3.6)** |
| #6 | 19 Oct. – 23 Oct. | **Two dimensional steady state conduction,** seperation of variables method, shape factor, finite difference equations, energy balance method **(Chpt. 4.1 – 4.6)** |
| #7 | 26 Oct. – 30 Oct. | **Rewiew and problem solving,** on one and two dimensional steady state conduction, **(Chapters 1, 2 & 3)** |
| #8 | 02 Nov. – 06 Nov. | **Transient conduction,** lumped capacitance method, spatial effects, exact and approximate solutions for plane wall and radial systems **(Chpt. 5.1 – 5.8)** |
| #9 | 09 Nov. – 13 Nov. | **Introduction to convection,** boundary layers, local and average convection coefficients, laminar and turbulent flow, dimensionless parameters, Reynolds analogy **(Chpt. 6.1 – 6.3 & 6.6 – 6.7)** |
| #10 | 16 Nov. – 20 Nov. | **External Flow,** Convection coefficient calculations for paralel flow over flat plates, cross flow over cylinders and spheres, flow across banks of tubes **(Chpt. 7.1 – 7.6)** |
| #11 | 23 Nov. – 27 Nov. | **Internal Flow,** Convection coefficient calculations for internal flow pipes and channels, mean velocity, friction factor and velocity profile in fully developed flow, thermal considerations and energy balance **(Chpt. 8.1 – 8.6)** |
| #12 | 30 Nov. – 04 Dec. | **Free Convection,** Convection coefficient calculations for free convection over vertical, inclined and horizontal planes, cylinders and spheres, combined free and forced convection **(Chpt. 9.1 – 9.6 & 9.9)** |
| #13 | 07 Dec. – 11 Dec. | **Rewiew and problem solving,** on forced convection for external and internal flows and for free convection, **(Chapters 6, 7, 8 & 9)** |
| #14 | 14 Dec. – 18 Dec. | **Radiation,** Fundamental concepts, radiation intensity, blackbody radiation, emission, absorption, reflection and transmission, Kirchoff's law, gray surface **(Chpt. 12.1 – 12.8)** |
| #15 | 21 Dec. – 23 Dec. | **Radiation exchange between surfaces,** View factor, blackbody radiation exchange, radiation exchange between opaque, diffuse, gray surfaces in an enclosure **(Chpt. 13.1 – 13.3)** |

**GRADING**

| Lab Project & Homeworks | Quizes | Mid-Term Exams | Final Exam | Total Grade |
|---|---|---|---|---|
| **10 %** | **15 %** | **40 %** | **35 %** | **100 %** |

**Note:** Midterm exam dates (MT # 1 and MT # 2) will be announced later. % 70 attendance is compulsory, students who could not attend at least % 70 of the courses can not enter to final and make-up exams and will take F2 grade.