



# MSE 324 CASTING AND SOLIDIFICATION SPRING 2016-2017



<b>INSTRUCTOR</b>	Assist. Prof. Dr. İlkey Kalay <b>Office:</b> N-B15 <b>E-mail:</b> ikalay@cankaya.edu.tr <b>Office Hours:</b> Friday 9:20-11:10* *Use e-mails as much as possible out of office hours
<b>TA</b>	Ezgi Butev <b>Office:</b> N-C09 <b>E-mail:</b> ebutev@cankaya.edu.tr
<b>SCHEDULE</b>	<b>Lecture:</b> Wednesday, 14:20-16:10 Friday, 11:20-12:10

## COURSE DESCRIPTION

This course is a three-credit course emphasizing the concepts of liquid and solid, solidification of pure metals, conditions for nucleation, homogeneous and heterogeneous nucleation, rate of nucleus formation, interface structure, morphological instability of a solid-liquid interface, perturbation analysis, solidification of alloys, undercooling, solidification of eutectics, constitutional undercooling, growth in pure metal and alloys, distribution coefficient, macrostructure development, classification of alloys according to their freezing range, centerline feeding resistance, the rate of solidification, heat transfer in solidification, segregation, single crystal growth, zone refining, Rapid solidification processing; general characteristics, production methods, microstructural effects.

## ANNOUNCEMENTS

Check course website, <http://mse324.cankaya.edu.tr/> frequently for announcements about the course, lecture notes, homework assignments and etc.

## TEXTBOOK

1. D. Micheal Stefanescu, Science and Engineering of Casting Solidification, Kluwer Academic/Plenum Publishers, 2002, ISBN: 978-0-471-90616-2
2. W. Kurz, D. J. Fisher, Fundamentals of Solidification, Enfield Publishing & Distribution Company, 1998, ISBN: 978-0878498048

## REFERENCE BOOKS

1. M. E. Glicksmann, Principles of Solidification- An Introduction to Modern Casting and Crystal Growth Concepts, Springer, 2011, ISBN: 978-1441973436

## GRADING

<b>Midterm I</b>	25 %
<b>Midterm II</b>	25 %
<b>Homework+Quiz</b>	10%
<b>Final Examination</b>	40 %
<b>TOTAL</b>	100 %*

\*Minimum of 70 % attendance in class is mandatory.

## COURSE OUTLINE

<b>Week</b>	<b>Topics Covered</b>
1	Concepts of Liquid and Solids. Importance of Solidification in Technology
2	Solidification of Pure Metals.
3	Homogenous Nucleation. Heterogeneous Nucleation
4	Solidification of Alloys. Undercooling. Solidification of Eutectics.
5	Constitutional Undercooling.
6	Growth in Pure Metals. Growth in Alloys.
7	Distribution Coefficient. Macrostructure Development.
8	Classification of Alloys According to Their Freezing Range. Centerline Feeding Resistance.
9	Rate of Solidification.
10	Heat Transfer in Solidification. Segregation, single crystal growth, zone refining
11	Solidification Shrinkage. Riser Design and Placement.
12	Riser Calculation Methods. Design of runner and Bernoulli equation
13	Hot tearing and casting defects
14	Sand casting and other casting techniques

**Attendance:** Minimum of 70 % attendance in class is mandatory.