MEF UNIVERSITY

COURSE INFORMATION FORM

Faculty	**Faculty of Engineering**	
Program	**B.Sc. in Civil Engineering**	**Elective**
	B.Sc. in Computer Engineering	**Elective**
	B.Sc. in Electrical-Electronics Engineering	**Elective**
	B.Sc. in Industrial Engineering	**Elective**
	B.Sc. in Mechanical Engineering	**Required**
Semester	**Fall 2015-2016**	

Course Code	ME 306			
Course Title in English	Heat Transfer			
Course Title in Turkish	Isı Geçişi			
Language of Instruction	English			
Type of Course	Flipped Classroom/Laboratory			
Level of Course	Undergraduate			
Course Category (by % of Content)	Basic Science	Basic Engineering	Engineering Design	General Education
	20	80	-	-
Semester Offered	Fall			
Contact Hours per Week	Lecture: 3 hours	Recitation: -	Lab:-	Other:-
Estimated Student Workload	160 hours per semester			
Number of Credits	6 ECTS			
Grading Mode	Standard Letter Grade			
Pre-requisites	THER 204			
Expected Prior Knowledge	Prior knowledge in thermodynamics, fluid mechanics and differential equations is expected.			
Co-requisites	None			
Registration Restrictions	Only Undergraduate Students			
Overall Educational Objective	To introduce the fundamentals of heat transfer mechanisms and their practical applications.			
Course Description	This course provides a comprehensive introduction to some fundamental aspects of heat transfer and their applications to engineering problems. The following topics are covered: Heat transfer mechanisms. The general heat conduction equation. Steady one-dimensional heat conduction. Thermal resistance networks. Steady heat conduction in cylinders and spheres. Critical thickness of insulation. Heat transfer from finned surfaces. Transient heat conduction in lumped systems. Fundamentals of convection. The velocity and thermal boundary layers. Dimensionless numbers and similarity. Forced convection in external and internal flows. Natural Convection. Fundamentals of thermal radiation. Black body radiation and the Stefan-Boltzmann law. Emissivity, absorptivity and reflectivity of surfaces. Kirchoff laws. Heat transfer by radiation. The view factor. Radiation heat transfer from black, gray and diffuse surfaces.			
Course Description in	Bu derste; ısı geçişinin temel kavramları şu konu başlıkları altında kapsamlı bir şekilde			

Turkish	incelenmektedir: Isı geçişi biçimleri. Genel ısı iletim denklemi. Bir-boyutlu daimi ısı iletimi. Termal direnç şebekeleri. Silindir ve kürelerde daimi ısı iletimi. Kritik izolasyon kalınlığı. Kanatçıklı yüzeylerde ısı geçişi. Toplu parametreli sistemlerde zamana bağlı ısı iletimi. Taşınım ile ısı geçişinin temelleri. Hız ve sıcaklık sınır tabakaları. Boyutsuz sayılar ve benzeşim. Dış ve iç akışlarda zorlanmış taşınım ile ısı geçişi. Doğal taşınım ile ısı geçişi. Isıl ışınımın temelleri. Siyah cisim ışınımı ve Stefan-Boltzmann yasası. Yüzeylerin yayma, yutma ve yansıma katsayıları. Kirchoff yasaları. Işınım ile ısı geçişi. Görüş katsayısı. Siyah, gri ve yayınıklı yüzeylerde ışınımla ısı geçişi.
Course Learning Outcomes and Competences	Upon successful completion of the course, the learner is expected to: 1. know the appropriate heat transfer mechanisms, 2. solve steady one-dimensional heat conduction problems by thermal resistance networks, 3. calculate transient heat transfer rates in lumped systems, 4. use appropriate correlations for forced and natural convection for the evaluation of the heat transfer coefficient, 5. to apply radiation laws to calculate the heat transfer rate from black, gray and diffuse surfaces.

Relation to Student Outcomes and Competences: N=None S=Supportive H=Highly Related

Relationship of the Course with the Student Outcomes and Competences	**Level**	**Assessed by**
	N/S/H (Related Learning Outcomes and Activities)	Exam, Project, HW, Lab, Presentation, etc.
(a) an ability to apply knowledge of mathematics, science, and engineering.	H (1,2,3,4,5)	Exams, Quizzes
(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.	H (1,2,3,4,5)	Exams, Quizzes
(f) an understanding of professional and ethical responsibility.		
(g) an ability to communicate effectively.	S	Flipped Classroom Practice
(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.		

Prepared by and Date	Prof. Dr. Canfuad DELALE / September 2016	
Name of Instructor	Prof. Dr. Canfuad DELALE	
Course Contents	Week	Topic

	1.	Heat transfer mechanisms, the general heat conduction equation.
	2.	Steady one-dimensional heat conduction, thermal resistance networks.
	3.	Steady heat conduction in cylinders and spheres, critical thickness of insulation, heat transfer from finned surfaces.
	4.	Transient heat conduction in lumped systems.
	5.	Fundamental of convection
	6.	The velocity and thermal boundary layers, dimensionless numbers and similarity.
	7.	Forced convection in external flows.
	8.	Forced convection in internal flows.
	9.	Natural convection.
	10.	Fundamentals of thermal radiation, black body radiation.
	11.	The Stefan-Boltzmann law.
	12.	Emissivity, absorptivity and reflectivity of surfaces, Kirchoff's laws.
	13.	Heat transfer by radiation, the view factor.
	14.	Radiation heat transfer from black, gray and diffuse surfaces.
	15.	Final Examination Period.
	16.	Final Examination Period.

Required/Recommended Readings	Frank M. White, Fluid Mechanics, 8th Edition, McGraw-Hill, 2015
Teaching Methods	Contact hours using "Flipped Classroom" as an active learning technique
Homework and Projects	-
Laboratory Work	Bernoulli's Equation and Pipe Flow experiments will be carried out by students
Computer Use	-
Other Activities	-

Assessment Methods

Types of assessment:

	Number	Ratio (%)
Midterm Exams	2	30 (each contributing 15%)
Quizzes	2	10 (each contributing 5%)
Flipped Learning Practice	14	20
Final Exam	1	40
Total		100

Course Administration

Instructor's office and phone number: A Block 5th floor, 0 212 395 36 51
office hours: Tuesday 14.00-15.00
email address: delalec@mef.edu.tr

Rules for attendance: Minimum of 70% attendance required.

Missing a quiz: Provided that proper documents of excuse are presented, each missed quiz by the student will be given a grade which is equal to the average of all of the other quizzes. No make-up will be given.

Missing a midterm: Provided that proper documents of excuse are presented, each missed midterm by the student will be given the grade of the final exam. No make-up will be given.

Missing a final: Faculty regulations.

A reminder of proper classroom behavior, code of student conduct: YÖK Regulations

Statement on plagiarism: YÖK Regulations
http://3fcampus.mef.edu.tr/uploads/cms/webadmin.mef.edu.tr/4833_2.pdf

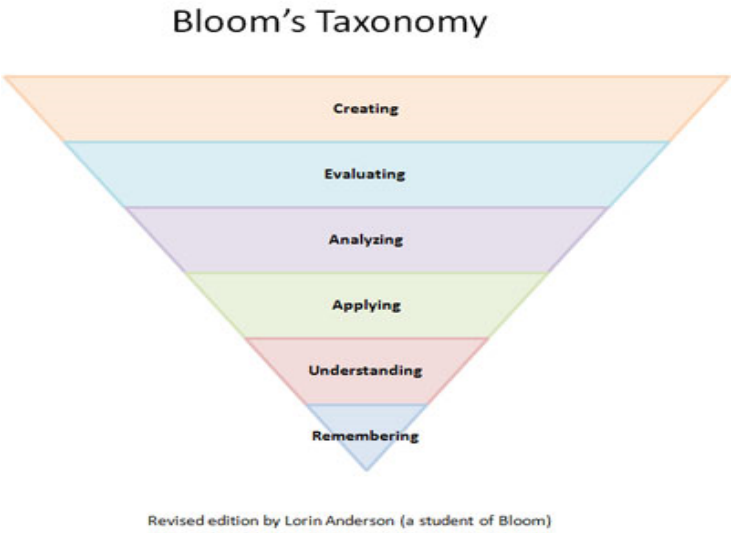
ECTS Student Workload Estimation

Activity	No/Weeks	Hours			Calculation	Explanation
	No/Weeks per Semester (A)	Preparing for the Activity (B)	Spent in the Activity Itself (C)	Completing the Activity Requirements (D)		
Flipped Learning	14	2	2	3	98	A*(B+C+D)
Quizzes	2	4	2		12	A*(B+C+D)
Midterm(s)	2	8	3		22	A*(B+C+D)
Final Examination	1	20	2		22	A*(B+C+D)
Total Workload					154	
Total Workload/25					6,16	
ECTS					**6**	

PROGRAM CRITERIA

1. Breadth in mechanical engineering practice, analysis and design with 18 required courses in mechanical engineering, and depth in one or more fields with 4 mechanical engineering electives.
2. Knowledge of chemistry and calculus-based physics with depth in at least one of these; ability to apply advanced mathematics through multivariate calculus and differential equations; familiarity with statistics and linear algebra.
3. Ability to work professionally in both thermal and mechanical systems areas, including the design and realization of such systems.

Key verbs for cognitive domain in writing learning outcomes and competences:



Key Verbs:
Remembering: defines, describes, identifies, knows, labels, lists, matches, names, outlines, recalls, recognizes, reproduces, selects, states.
Understanding: comprehends, converts, defends, distinguishes, estimates, explains, extends, generalizes, gives an example, infers, interprets, paraphrases, predicts, rewrites, summarizes, translates.
Applying: applies, changes, computes, constructs, demonstrates, discovers, manipulates, modifies, operates, predicts, prepares, produces, relates, shows, solves, uses.
Analyzing: analyzes, breaks down, compares, contrasts, diagrams, deconstructs, differentiates, discriminates, distinguishes, identifies, illustrates, infers, outlines, relates, selects, separates.
Evaluating: appraises, compares, concludes, contrasts, criticizes, critiques, defends, describes, discriminates, evaluates, explains, interprets, justifies, relates, summarizes, supports.
Creating: categorizes, combines, compiles, composes, creates, devises, designs, explains, generates, modifies, organizes, plans, rearranges, reconstructs, relates, reorganizes, revises, rewrites, summarizes, tells, writes.

Key verbs for affective domain in writing learning outcomes and competences:

Receiving Phenomena: asks, chooses, describes, follows, gives, holds, identifies, locates, names, points to, selects, sits, erects, replies, uses.
Responding to Phenomena: answers, assists, aids, complies, conforms, discusses, greets, helps, labels, performs, practices, presents, reads, recites, reports, selects, tells, writes.
Valuing: completes, demonstrates, differentiates, explains, follows, forms, initiates, invites, joins, justifies, proposes, reads, reports, selects, shares, studies, works.
Organizing: adheres, alters, arranges, combines, compares, completes, defends, explains, formulates, generalizes, identifies, integrates, modifies, orders, organizes, prepares, relates, synthesizes.
Internalizing values: acts, discriminates, displays, influences, listens, modifies, performs, practices, proposes, qualifies, questions, revises, serves, solves, verifies.