ÇANKAYA UNIVERSITY
Engineering
Course Definition Form

This form should be used for either an elective or a compulsory course being proposed and curricula development processes for an undergraduate curriculum at Çankaya University, Faculty of Engineering. Please fill in the form completely and submit the printed copy containing the approval of the Department Chair to the Dean's Office, and mail its electronic copy. Upon the receipt of *both copies*, the printed copy will be forwarded to the Faculty Academic Board for approval. Incomplete forms will be returned to the Department. The approved form is finally sent to the President's office for approval by the Senate.

Part I. Basic Course Information

Department Name	Mechanical Engineering				**Dept. Numeric Code**		15
Course Code	**ME 313**	**Number of Weekly Lecture Hours**	**4**	**Number of Weekly Lab/Tutorial Hours**	**0**	**Number of Credit Hours**	**4**
Course Web Site	http://me313.cankaya.edu.tr/				**ECTS Credit**		4.00

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Heat Transfer
Turkish Name	Isı Transferi

Course Description
Provide a brief overview of what is covered during the semester. This information will appear in the printed catalogs and on the web online catalog. Maximum 60 words.

The course covers the following subjects; introduction to heat transfer, heat transfer mechanisms, dimensional analysis, steady heat conduction, thermal resistances, fins, transient conduction, lumped capacitance method, product solutions, numerical methods in steady heat conduction and in transient heat conduction, forced convection; boundary layers, laminar and turbulent flow, convective transfer boundary layer equations, dimensionless parameters, Reynolds analogy, external forced convection, empirical correlations, internal flow correlations, natural convection, thermal radiation, radiation heat transfer between black bodies, between diffuse gray surfaces, radiation exchange with emitting and absorbing gases

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st **ME 211**	2nd	3rd	4th
	☐ Consent of the Instructor	☐ Senior Standing	☐ Give others, if any.	
Co-requisites (if any)	1st	2nd	3rd	4th
Course Type *Check all that are applicable*	☒ Must course for dept.	☐ Must course for other dept.(s)	☐ Elective course for dept.	☐ Elective course for other dept.(s)

Course Classification
Give the appropriate percentages for each category.

Category	Mathematics and Natural Sciences	Engineering Sciences	Engineering Design		
Percentage	30.00	45.00	25.00		

Part II. Detailed Course Information

Course Objectives
Explain the aims of the course. Maximum 100 words.

The course is designed to give third year mechanical engineering students the fundamental physics of heat transfer by conduction, convection and radiation. Students are instructed in the analysis and solution of basic heat transfer problems, as supplemented by practical tables, charts and empirical correlations.

Learning Outcomes
Explain the learning outcomes of the course. Maximum 10 items.

1. Ability to explain the mechanisms of heat transfer
2. Comprehend conduction, convection and radiation heat transfer principles
3. Ability to formulate and solve steady and unsteady problems in one or more dimensions in conduction or convection heat transfer
4. ~~Ability to use analogy between fluid friction and heat transfer~~
5. ~~Familiarity~~ Student will be familiar with temperature measuring and other instruments and ability to use

Textbook(s)
List the textbook(s), if any, and other related main course materials.

Author(s)	Title	Publisher	Publication Year	ISBN
Foundatıons of Heat Transfer, 6th Ed., F.P. Incropera and D.P. DeWitt, T.L Bergman and A.S.Lavıne JohnWiley and Sons, New York, 2013				

Reference Books
List the reference books as supplementary materials, if any.

Author(s)	Title	Publisher	Publication Year	ISBN

Teaching Policy
Explain how you will organize the course (lectures, laboratories, tutorials, studio work, seminars, etc.)

Dersin formatı; sınıf içi yüz yüze ders anlatımları, okuma ,araştırma ödevleri ve bilgisayar laboratuvar ödevleri . Öğrenciler, Matlab veya Maple dillerinden birini iyi bilmeli. Haftalık ödevlerin, derste anlatılan konuların anlaşılmasını desteklemesi, güçlendirmesi ve genişletmesi beklenmektedir Her hafta 4 saat ders işlenmektedir.

Laboratory/Studio Work
Give the number of laboratory/studio hours required per week, if any, to do supervised laboratory/studio work, and list the names of the laboratories/studios in which these sessions will be conducted.

No

Computer Usage
Briefly describe the computer usage and the hardware/software requirements in the course.

Matlab or Maple programming language

Course Outline

List the topics covered within each week.

Week	Topic(s)

1. Introduction Heat transfer mechanisms, dimensional analysis, conduction, thermal conductivity, convection and radiation, simultaneous heat transfer mechanisms.
2. Introction to conduction. General heat conduction equation, boundary and initial conditions
3. One dimensional steady state conduction. Steady heat conduction in plane walls, thermal contact resistance, generalized thermal resistance networks, heat conduction in cylinders and spheres. Critical radius of insulation, heat transfer from finned surfaces; fin equation, fin efficiency, fin effectiveness.
4. Two-dimensional steady state heat conduction. Shape Factors. Numerical Methods
5. Unsteady Heat Transfer by Transient Conduction
6. Fundamentals of convection, classification of fluid flows, velocity boundary layer, thermal boundary layer, laminar and turbulent flows.
7. External Flow. Derivation of differential convection equations, solutions of convection equations for a flat plate, friction and convection coefficients, and analogies between momentum and heat transfer. Drag force and heat transfer in external flow, parallel flow over flat plates, flow across cylinders and spheres, flow across tube banks.
8. External Flow. Derivation of differential convection equations, solutions of convection equations for a flat plate, friction and convection coefficients, and analogies between momentum and heat transfer. Drag force and heat transfer in external flow, parallel flow over flat plates, flow across cylinders and spheres, flow across tube banks.
9. Internal Flow .Mean velocity, mean temperature, the entry region, constant surface heat flux and temperature boundary conditions, laminar flow in tubes, turbulent flow in tubes.
10. Internal Flow .Mean velocity, mean temperature, the entry region, constant surface heat flux and temperature boundary conditions, laminar flow in tubes, turbulent flow in tubes.
11. Free convection. Physical mechanism, natural convection over surfaces, and inside enclosures, combined natural and forced convection
12. Radiation: Processes and properties .Blackbody radiation, radiation intensity, radiative properties, Kirchhoff's law, atmospheric and solar radiation, view factor and view factor relations.
13. Radiation exchange between surfaces. Radiation heat transfer between black surfaces, between diffuse gray surfaces, radiation shields, radiation exchange with emitting and absorbing gases.
14. Radiation exchange between surfaces. Radiation heat transfer between black surfaces, between diffuse gray surfaces, radiation shields, radiation exchange with emitting and absorbing gases.

Grading Policy

List the assessment tools and their percentages that may give an idea about their relative importance to the end-of-semester grade.

Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage	Assessment Tool	Quantity	Percentage
Quizes	8	25	Midterms	2	30	Final Exam	1	40
Attendance	14	5						

ECTS Workload

List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	4.00	56.00
Attending Labs/Recitations (*weekly basis*)			
Preparation beforehand and finalizing of notes (*weekly basis*)	14	0.50	7.00
Collection and selection of relevant material (*once*)	1	1.00	1.00
Self study of relevant material (*weekly basis*)	14	1.00	14.00
Homework assignments	5	2.00	10.00
Preparation for Quizzes	5	1.00	5.00
Preparation for Midterm Exams (*including the duration of the exams*)	1	3.00	3.00
Preparation of Term Paper/Case Study Report (*including oral presentation*)			
Preparation of Term Project/Field Study Report (*including oral presentation*)			

Preparation for Final Exam (*including the duration of the exam*)	1	4.00	4.00
		TOTAL WORKLOAD / 25	100.00/25
		ECTS Credit	**4**

Total Workloads are calculated automatically by formulas. To update all the formulas in the document first press CTRL+A and then press F9.

Program Qualifications vs. Learning Outcomes
Consider the below program qualifications determined in terms of learning outcomes of all the courses in the curriculum and capabilities. Look at the learning outcomes of this course given above. Relate these two using the Likert Scale by marking with X in one of the five choices at the right..

No	Program Qualifications	Contribution				
		0	1	2	3	4
1	Adequate knowledge in mathematics, science and engineering subjects pertaining to engineering; ability to use theoretical and applied information in these areas to model and solve complex engineering problems.				~~3~~	4
2	Ability to identify and define complex engineering problems; ability to select and apply proper analysis tools and modeling techniques for formulating and solving such problems.				~~3~~	4
3	Ability to design a complex system, a process or product under realistic constraints and conditions in such a way as to meet the desired requirements; ability to apply modern design methods for this purpose.				**3**	
4	Ability to devise, select and use modern techniques to analyze and solve complex problems for engineering practice; ability to use information technologies effectively.		**1**	~~2~~		
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.		**1**		~~3~~	
6	Ability to work efficiently in intra-disciplinary and multidisciplinary teams by collaborating effectively; ability to work individually.	**0**	~~1~~			
7	Ability to communicate effectively in Turkish and in English both orally and in writing; knowledge of at least one foreign language; ability to write report, to read report, to prepare design and production reports, to give presentation, to give instruction and receive instruction, effectively.	**0**				
8	Awareness of life-long learning; ability to access information, to follow developments in science and technology, and to keep continuous self-improvement.	~~0~~	**1**			
9	Awareness of professional and ethical responsibility; knowledge in standarts used in engineering applications.	**0**				
10	Knowledge in project management, risk management and change management; awareness of entrepreneurship and innovation; knowledge in sustainable development.	**0**				
11	Knowledge in global and social effects of engineering practices on health, environment, safety and contemporary issues; awareness of the legal consequences of engineering solutions.	**0**				

Contribution Scale to a Qualification: **0**-None, **1**-Little, **2**-Medium, **3**-Considerable, **4**-Largest

Part III New Course Proposal Information
State only if it is a new course

Is the new course **replacing** a former course in the curriculum**?**	Yes ☐	No ☐	Former Course's Code	Former Course's Name
Is there any similar course which has content **overlap** with other courses offered by the university**?**	Yes ☐	No ☐	Most Similar Course's Code	Most Similar Course's Name
Frequency of Offerings *Check all semesters that the course is planned to be offered.*	☐ Fall	☐ Spring	☐ Summer	
First Offering	Academic Year 2019		Semester ☐ Fall	☐ Spring

Maximum **Class Size** Proposed		Student **Quota** for Other Departments		Approximate **Number of Students** Expected to Take the Course	

Justification for the proposal
Maximum 80 words

Part IV Approval

	Faculty Member *Give the Academic Title first.*	Signature	Date
Proposed by	Dr. Öğr. Üyesi Ece Aylı		6/19/2019

Departmental Board Meeting Date		Meeting Number		Decision Number	
Department Chair	Prof. Dr. Haşmet TÜRKOĞLU	Signature		Date	

Faculty Academic Board Meeting Date		Meeting Number		Decision Number	
Dean	Prof. Dr. Sıtkı Kemal İDER	Signature		Date	

Senate Meeting Date		Meeting Number		Decision Number	

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