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 463**	**Number of Weekly Lecture Hours**	**3**	**Number of Weekly Lab/Tutorial Hours**	**1**	**Number of Credit Hours**	**3**
Course Web Site	http://me463.cankaya.edu.tr/					**ECTS Credit**	5.00

Course Name *This information will appear in the printed catalogs and on the web online catalog.*	
English Name	Computational Fluid Dynamics
Turkish Name	Sayısal Akışkanlar Dinamiği

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.

Navier-Stokes equations in integral form, boundary conditions,Unstructured grid generation, Finite Volume method, convective and diffusive fluxes, Eulerbackward/forward time integration, Turbulence and its modeling, zero, one and two equation turbulence models, analyzing the heat transfer and fluid dynamics problems with CFD techniques.

Prerequisites (if any) *Give course codes and check all that are applicable.*	1st **ME 331**	2nd **ME 313**	3rd **ME 303**	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	40.00	30.00		

Part II. Detailed Course Information

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

1) To introduce computational fluid dynamics (CFD) principles.
2) To teach the application of CFD to fluid mechanics and heat transfer problems.
3) To form the theoretical basis relevant to the subject.
4) To teach the application of CFD to various engineering problems using commercial software FLUENT.

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

1. Ability to mathematically model thermo-fluid problems to be solved using a CFD technique
2. Ability to solve thermo-fluid problems by selecting suitable models and numerical methods
3. Knowledge about the basics and limitations of CFD methods and CFD software
4. Ability to analyze the results of CFD simulations and communicate the results in oral and written form.

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

Author(s)	Title	Publisher	Publication Year	ISBN
An Introduction to Computational Fluid Dynamics by H.K. Versteeg and W. Malalasekera Computational Fluid Dynamics by John D. Anderson				

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

Author(s)	Title	Publisher	Publication Year	ISBN
Computational Fluid Dynamics by Klaus A. Hoffmann, Steve T. Chiang				

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

There are 3 hours of lectures each week two of them will be performed with using computer.

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.

There are 2 hours of laboratory work.

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

ANSYS Fluent software is used in the lectures and in the term projects.

Course Outline

List the topics covered within each week.

Week	Topic(s)

1. Introduction to computational fluid dynamics (CFD)
2. Navier-Stokes equations
3. Finite Volume Method
4. Finite Volume Method
5. Errors. Boundary conditions.
6. Grid Generation
7. Methods for dealing with complex geometries.
8. Turbulence Models
9. Tutorial 1- Cooling of ElectronicEquipment
10. Tutorial 2- Flow over a cylinder
11. Tutorial 3- Flow over a NACA profile
12. Tutorial 4- Ahmet Body
13. Tutorial 5- Supersonic and compressible flow modelling
14. Project Presentations

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
Midterm Exam	1	30	Final Exam	1	40	Term Project	1	30

ECTS Workload

List all the activities considered under the ECTS.

Activity	Quantity	Duration (hours)	Total Workload (hours)
Attending Lectures (*weekly basis*)	14	1.00	14.00
Attending Labs/Recitations (*weekly basis*)	14	2.00	28.00
Preparation beforehand and finalizing of notes (*weekly basis*)	14	0.50	7.00
Collection and selection of relevant material (*once*)	6	2.00	12.00
Self study of relevant material (*weekly basis*)	14	2.00	28.00
Homework assignments	7	1.00	7.00
Preparation for Quizzes			
Preparation for Midterm Exams (*including the duration of the exams*)	1	10.00	10.00
Preparation of Term Paper/Case Study Report (*including oral presentation*)	1	20.00	20.00
Preparation of Term Project/Field Study Report (*including oral presentation*)			
Preparation for Final Exam (*including the duration of the exam*)	1	10.00	10.00
		TOTAL WORKLOAD / 25	136.00/25
		ECTS Credit	**5**

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**	
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.					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.	**0**				
4	Ability to devise, select and use modern techniques to analyze and solve complex problems for engineering practice; ability to use information technologies effectively.					4
5	Ability to design and conduct experiments, gather data, analyze and interpret results for investigating engineering problems.	**0**				
6	Ability to work efficiently in intra-disciplinary and multidisciplinary teams by collaborating effectively; ability to work individually.			**2**		
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.			**2**		
8	Awareness of life-long learning; ability to access information, to follow developments in science and technology, and to keep continuous self-improvement.			**2**		
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	25	Student **Quota** for Other Departments		Approximate **Number of Students** Expected to Take the Course	25

Justification for the proposal
Maximum 80 words

Part IV Approval

	Faculty Member *Give the Academic Title first.*	Signature	Date
Proposed by	Dr. Öğr. Üyesi Ülkü Ece AYLI İNCE		7/1/2019

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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