COM.AIDED HEAT TECH.CALCULATIONS

1	Course Title:	COM.AIDED HEAT TECH.CALCULATIONS
2	Course Code:	MAK4208
3	Type of Course:	Optional
4	Level of Course:	First Cycle
5	Year of Study:	4
6	Semester:	8
7	ECTS Credits Allocated:	4.00
8	Theoretical (hour/week):	2.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	2
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Prof. Dr. ERHAN PULAT
15	Course Lecturers:	
16	Contact information of the Course Coordinator:	pulat@uludag.edu.tr , 0 224 2941982 Uludağ Üniversitesi, Makina Müh. Bölümü, Oda No:217, Görükle, 16059, Bursa.
17	Website:	
18	Objective of the Course:	1. Analyzing heat technique subjects and solve the related problems using computer 2. Theoretical analysis of the heat technique subjects. 3. Explaining how a computer software can be prepared for heat technique problems. 4. Introducing some computer software and teaching how to use them. 5. Performing a different project for each student.
19	Contribution of the Course to Professional Development:	It is to increase the ability to use Computational Fluid Dynamics technology in engineering analysis and design related to thermal systems.
20	Learning Outcomes:	

	1	Learn basic principles of computer aided analysis methods, computational fluid dynamics and heat transfer, conservation equations.
	2	Learn numerical solutions of partial differential equations, discritization techniques and finite element method, convergence and stability.
	3	Learn model building, meshing, boundary conditions, obtaining solution, analysis and discussion of results.
	4	Learn preprocessing, solving, and postprocessing stages in ANSYS/FLOTRAN.
	5	Model and analyze flow and heat transfer problems by using ANSYS/FLOTRAN.
	6	Learn the capabilities and restrictions of computer aided analysis and the role of experiments in the analysis and design. Verification and validation in computational studies.
	7	Present computational study effectively.

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21	Course Content:

Course Content:

Week	Theoretical	Practice
1	Introduction to CFD. Advantageous of CFD. Verification and validation in CFD. Application of CFD method to industrial and engineering problems. CFD technology.	
2	Introduction to ANSYS/Fluent CFD package. Discritization methods and element types in ANSYS/Fluent and analysis of 2D flow and heat transfer problems.	Running of the program. Introducing preprocessing, solution, and postprocessing steps. Choosing analysis type, flow type, and element type.Running of the program. Introducing preprocessing, solution, and postprocessing steps. Choosing analysis type, flow type, and element type.
3	Description of example problem. File structure of ANSYS/Fluent.	Step by step analysis of example problem. 2D modelling of example problem. Meshing of the model and some important points in meshing. Application of boundary conditions.
4	Convergence and stability. Entering fluid properties. Manual meshing and smart meshing. Mesh independent solution. Presentation of mesh independent solution. Presentation by using Excel. Geometry …	Continuation of the example problem. Obtaining solution. Using of convergence monitor. Files in the program. Visualization of the results by using postprocessing capabilities. The effects of some parameters such as viscosity on the solution. Mesh independent solution. …
	… modelling and wall function approach.	
	… preparation.	
6	Some common mistakes during the analysis, brief information about the causes and … of the some problems encountered by students during the anlysis.	Starting of the project study of the students
	… of JPEG, TIFF, or PNG files.	for different mesh numbers and comparison of the results. …
8	Coupled analysis of 2-dimensional flow and …	
9	… analysis in ANSYS/Fluent software. Discretization methods and element types in ANSYS/Fluent, analysis of 2-dimensional heat conduction problems.	… solution and postprocessing steps. Selection of analysis type, flow type and element type.
10	Distribution and explanation of the sample problem.	Step-by-step analysis of the sample problem. 2-dimensional modeling of the sample problem. Some important points in networking and dividing the model into networks. Application of boundary conditions.
11	Making detailed explanations about the sample problem and analysis together with the student questions.	Continuing modeling of the sample problem.
12	Briefly explaining the heat conduction in steady regime and transient regime.	Completion of the preprocessing part of the sample problem.

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	2.00	28.00
Practicals/Labs	14	2.00	28.00
Self study and preperation	14	1.00	14.00
Homeworks	2	7.00	14.00
Projects	2	14.00	28.00
Field Studies	0	0.00	0.00
Midterm exams	0	0.00	0.00
Others	0	0.00	0.00
Final Exams	1	8.00	8.00
Total Work Load			120.00
Total work load/ 30 hr			4.00
ECTS Credit of the Course			4.00

13	Adaptation of the general equation of heat conduction in steady and transient regime according to the given problem.	Giving information about some common mistakes made during analyzes and their causes and sources. Discussing some of the problems faced by the students during the analysis.
14	Evaluation of steady and transient regime results.	Using program files to control some parameters. Print out the results.

22	Textbooks, References and/or Other Materials:	1. ANSYS Fluent Theory Guide, Release 15.0, November 2013 2. Using Computational Fluid Dynamics, C. Shaw, Prentice Hall, 1992, U.K. 3. An Introduction to Computational Fluid Dynamics, 2nd Ed., H. K. Versteeg and W. Malalasekera, Pearson-Prentice Hall, 2007, Malaysia. 4. J. Tu, G.-H. Yeoh, C. Liu, Computational Fluid Dynamics A Practical Approach, 3rd Ed., Elsevier, 2018, U.K.
23	Assesment	

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	0	0.00
Quiz	0	0.00
Home work-project	2	40.00
Final Exam	1	60.00
Total	3	100.00
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		Project, Final Exam

24	**ECTS / WORK LOAD TABLE**

25 CONTRIBUTION OF LEARNING OUTCOMES TO PROGRAMME QUALIFICATIONS

	PQ1	**PQ2**	**PQ3**	**PQ4**	**PQ5**	**PQ6**	**PQ7**	**PQ8**	**PQ9**	**PQ10**	**PQ11**	**PQ12**	**PQ13**	**PQ14**	**PQ15**	**PQ16**
ÖK1	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK3	0	5	4	5	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	0	3	3	5	0	0	0	0	0	0	0	0	0	0	0	0
ÖK5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0
ÖK6	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK7	0	0	0	0	0	0	0	4	3	0	0	0	0	0	0	0
ÖK8	0	4	4	5	0	0	0	0	0	0	0	0	0	0	0	0

LO: Learning Objectives PQ: Program Qualifications

Contribution Level:	1 very low	2 low	3 Medium	4 High	5 Very High