AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title		Turbulence Modelling and Applications							
Course Code		MCE532		Couse Level		Second Cycle (Master's Degree)			
ECTS Credit	8	Workload	200 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course		The fundamentals of turbulence and solution procedures of turbulent flows. Recognition of different turbulence models							
Course Content		Fundamentals of turbulent flows. The statistical description of turbulence. Algebraic models. The models based on Reynolds averaged Navier Stokes (RANS) equations. Reynolds stress equation models. Direct numerical simulation (DNS). Large eddy simulation (LES).							
Work Placement		N/A							
Planned Learning Activities and Teaching Methods				Explanation (Presentation), Discussion, Individual Study, Problem Solving					
Name of Lecturer(s)		Prof. Ayşe YÜKSEL OZAN							

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	25
Final Examination	1	25
Assignment	2	20
Term Assignment	1	30

Recommended or Required Reading	
1	Turbulence, J. O. Hinze,McGraw-Hill , 2005.
2	A First Course in Turbulence, H. Tennekes, MIT pres, 1999
3	Blazek, J., 2001, Computational Fluid Dynamics: Principles and Applications, Elsevier, United Kingdom
4	Course Notes

Week	Weekly Detailed Course Contents	
1	Theoretical	What is turbulence? The features of turbulent flows.
2	Theoretical	Unsteadiness and transition to turbulence
3	Theoretical	Equations of turbulent flows and closure problem
4	Theoretical	Turbulence Modelling
5	Theoretical	Composing mesh in turbulence flow domain, an example in Gambit
6	Theoretical	Zero, one and two equation turbulence models
7	Theoretical	Determination of turbulence model for a sample case and FLUENT practice (1)
8	Theoretical	Determination of turbulence constants
9	Intermediate Exam	Midterm Exam
10	Theoretical	Determination of wall functions
11	Theoretical	Reynolds Stress Models
12	Theoretical	Direct Numerical Simulation (DNS)
13	Theoretical	Large Eddy Simulation (LES)
14	Theoretical	Determination of turbulence model for a sample case and FLUENT practice (2)
15	Theoretical	Submission of term paper and its presentation
16	Final Exam	FINAL Exam

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	14	0	3	42
Assignment	2	7	1	16
Term Project	2	58	0	116
Midterm Examination	1	10	2	12

Final Examination	1	12	2	14
			Total Workload (Hours)	200
			[Total Workload (Hours) / 25*] = **ECTS**	8
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	Knows the nature of turbulent flows
2	Knows Turbulent flow equations, such as continuity, Navier Stokes and Energy equations
3	Knows Reynolds Stress and the other type turbulence flow models
4	Knows the modeling of turbulent flow domain and define the relation between the wall boundary conditions and turbulence flow domain
5	Knows how to choose the turbulence model for different type of flow conditions
6	Have experience about turbulence modeling with a commercial code

Programme Outcomes *(Civil Engineering Master)*	
1	To be able to develop expertise knowledge in a Civil engineering area founded on their graduate competence.
2	To be able to use the theoretical and practical expertise knowledge gained in their specialty area.
3	To be able to use the information, problem solving and / or practical skills from the field, in interdisciplinary studies.
4	To be able to create new knowledge by integrating their knowledge area with the knowledge coming from different disciplines; and solve problems that need expertise by using scientific research methods
5	To be able to solve the problems related to his/her area by using appropriate research methods
6	To be able to devise a problem in their specialty area, develop a solution methodology, solve the problem, and interpret the results and take action if necessary
7	To be able to criticize the knowledge in their specialty area, guide the learning process, and independently direct high level studies
8	To be able to systematically communicate the recent developments in their specialty area and their own studies to groups both inside and outside their specialty area, orally, in writing and visually
9	To be able to use computer software at a level required by their specialty area with drawing upon information and communication technology at a high level
10	To be able to introduce scientific, technological, social and cultural advancements in the field of civil engineering and to contribute to the process of being an information of the society and to sustain it.
11	To be conscious of professional and ethical responsibility and contribute to the establishment of this consciousness.
12	To be able to protect social, scientific, and ethical values during collection, interpretation, and dissemination stages of the data associated with their specialty area; instruct and supervise these values
13	To be able to use at least one foreign language in a level to follow current developments related to the field.

Contribution of Learning Outcomes to Programme Outcomes *1:Very Low, 2:Low, 3:Medium, 4:High, 5:Very High*

	L1	L2	L3	L4	L5	L6
P1	5	4	5	4	5	5
P2	4	5	4	5	4	4
P3	5	4	5	4	5	5
P4	4	5	4	5	4	4
P5	5	4	5	4	5	5
P6	4	5	4	5	4	4
P7	5	4	5	4	5	5
P8	4	5	4	5	4	5
P9	5	4	5	4	5	5
P10	4	5	4	5	4	4
P11	5	4	5	4	5	4
P12	4	5	4	5	5	5
P13	5	4	5	4	5	5