AYDIN ADNAN MENDERES UNIVERSITY
COURSE INFORMATION FORM

Course Title	Computational Fluid Dynamics								
Course Code	MME624		Couse Level	Third Cycle (Doctorate Degree)					
ECTS Credit	8	Workload	200 *(Hours)*	Theory	3	Practice	0	Laboratory	0
Objectives of the Course	The widespread availability of engineering work stations together with efficient solution algorithms enable the use of commercial CFD codes by graduate engineers for academic research and design tasks in industry. The ready to use codes that are on the market may be extremely powerful but their operation still requires a high level of understanding in numerical methods for obtaining meaningful results in complex situations.								
Course Content	Conservation laws of fluid motion and boundary conditions, Turbulence, Turbulence models, The finite volume method for diffusion problems, The finite volume method for convection-diffusion problems, The upwind differencing, and higher order differencing schemes for convection-diffusion problems, Solution algorithms for pressure-velocity coupling in steady flows, Solution of discretized equations, The finite volume method for unsteady flows, Discretisation of transient convection-diffusion equations, Implementation of boundary conditions, Boundary conditions related to pressure								
Work Placement	N/A								
Planned Learning Activities and Teaching Methods	Explanation (Presentation), Experiment, Discussion, Case Study, Project Based Study, Individual Study, Problem Solving								
Name of Lecturer(s)									

Prerequisites & Co-requisities	
Language Requisite	Yes

Assessment Methods and Criteria		
Method	Quantity	Percentage (%)
Midterm Examination	1	15
Final Examination	1	60
Quiz	4	15
Assignment	5	5
Term Assignment	1	5

Recommended or Required Reading	
1	Versteeg, H.K., and Malalasekera, W., Computaional Fluid Dynamics (The Finite Volume Approach) Prentice Hall,Pearson Education Limited, 1995.
2	Patankar, S. V., Numerical Heat Transfer and Fluid Flow, Hemisphere Publishing Corporation, New York, 1980.
3	James, M.L., Smith, G.M., Wolford,J.C., Apllied Numerical Methods for Digital Computations, Harper Collings Publisher, 1992.
4	Roache, P. J., Computational Fluid Dynamics, Hermosa Publishers, 1976.
5	Ferziger, J. H. and Peric, M.: Computational methods for fluid dynamics , 3rd ed. Springer, New York 2002

Week	Weekly Detailed Course Contents	
1	Theoretical	Introduction, conservation laws of fluid motion and boundary conditions
2	Theoretical	Turbulence
3	Theoretical	Turbulence models
4	Theoretical	The finite volume method for diffusion problems
5	Theoretical	The finite volume method for convection-diffusion problems
6	Intermediate Exam	Midterm 1
7	Theoretical	The upwind differencing, and higher order differencing schemes for convection-diffusion problems
8	Theoretical	Solution algorithms for pressure-velocity coupling in steady flows
9	Theoretical	Solution of discretized equations
10	Theoretical	The finite volume method for unsteady flows
11	Theoretical	Discretisation of transient convection-diffusion equations
12	Intermediate Exam	Midterm 2
13	Theoretical	Implementation of boundary conditions

14	Theoretical	Boundary conditions related to pressure, symmetry, and periodic boundary conditions

Workload Calculation				
Activity	Quantity	Preparation	Duration	Total Workload
Lecture - Theory	12	0	3	36
Lecture - Practice	1	0	20	20
Assignment	5	0	19	95
Individual Work	1	0	40	40
Midterm Examination	2	0	3	6
Final Examination	1	0	3	3
			Total Workload (Hours)	200
			[Total Workload (Hours) / 25*] = **ECTS**	8
**25 hour workload is accepted as 1 ECTS*				

Learning Outcomes	
1	Ability to understand turbulence models
2	Ability to solve finite volume problems
3	Ability to solve discretised equation problems
4	Ability to imply boundary condition and solve its problems
5	Ability to solve algorithms problems in steady flows

Programme Outcomes *(Mechanical Engineering (English) Doctorate)*	
1	1. In Mathematics, natural sciences and mechanical engineering, department has the sufficient infrastructure; the ability to use the theoretical and practical information for engineering solutions
2	2. The ability to identify, define, and solve the formula for complex engineering problems; the ability to select and apply for the appropriate analytical methods and modelling techniques
3	3. To meet desired needs of a system, system component, or process, analysing and designing skill under realistic constraints; in this respect, the ability to apply the methods of modern design
4	4. The ability to use and choose modern techniques and tools for required engineering applications and; the ability to use information technology effectively
5	5. The ability to design the experiment, collect the data for the experiment and interpret to analysing results
6	6. The ability to use computer software and hardware information, access to information and other information sources
7	7. The ability to work individually and with multidisciplinary teams effectively, taking responsibility self-confidence for complex situations
8	8. The ability to communicate with foreign colleagues by having high level of foreign language knowledge in the field of engineering
9	9. Monitoring the science and technology developments and the ability to renew itself with innovative ideas constantly
10	10. Professional and ethical responsibility awareness
11	11. Having an adequate information and awareness in the subjects of occupational safety, occupational health, social security rights, quality control and management issues of environmental protection
12	12. The ability to appreciate the effects of engineering solutions and applications in universal and social dimensions
13	13. The ability to be enlightened to the experts or non-expert audience groups on the issues related with engineering problems and solutions written and oral
14	14. The ability to have adequate knowledge and skills in the project development and application, manage the activities planning, including the projects to the employees having the responsibility of the project by increasing vocational awareness

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

	L1	L2	L3	L4	L5
P1	3	5	4	5	3
P2	3	5	3	4	4
P3	3	5	3	4	5
P4	3	3	5	3	5
P5	4	4	3	4	3
P6	3	4	3	5	3
P7	4	3	5	3	5
P8	3	4	5	4	3
P9	3	4	3	5	3

P10	4	5	3	4	5
P11	3	5	4	5	3
P12	3	5	3	5	4