Arab Academy for Science, Technology & Maritime Transport
College of Engineering & Technology
Mechanical Engineering (Mechatronics) Program

University/Academy: Arab Academy for Science, Technology & Maritime Transport
Faculty/Institute: College of Engineering & Technology
Program: B.Sc. Mechanical Engineering

Form no. (12)
Course Specification

1- Course Data

Course Code: **ME 465**	Course Title: **Computational Fluid Dynamics**		Academic Year/Level: **4th** year / **8th** semester
Specialization: **Mechanical**	No. of Instructional Units	Lecture	Practical
	3 credits	**2 hrs.**	**2 hrs.**

2- Course Aim

- The aim of this course is to provide good understanding of computational fluid dynamic techniques using the finite difference, finite element and finite volume methods and to assure familiarity with modern computer software.

3- Intended Learning Outcomes

e- Knowledge and Understanding	**Through knowledge and understanding, students will be able to:** K1) Concepts and theories of mathematics and sciences, appropriate to the discipline. K5) Methodologies of solving engineering problems, data collection and interpretation.
f- Intellectual Skills	**Through intellectual skills, students will be able to:** I1) Select appropriate mathematical and computer-based methods for modeling and analyzing problems. I11) Analyze results of numerical models and assess their limitations.
g- Professional Skills	**Through professional and practical skills, students will be able to:** P1) Apply knowledge of mathematics, science, information technology, design, business context and engineering practice integrally to solve engineering problems P5) Use computational facilities and techniques, measuring instruments, workshops and laboratory equipment to design experiments, collect, analyze and interpret results P6) Use a wide range of analytical tools, techniques, equipment, and software packages pertaining to the discipline and develop required computer programs.
h- General Skills	**Through general and transferable skills, students will be able to:** Apply and integrate knowledge, understanding and skills of different subjects to solve real problems in industries.

4- Course Content

Week No.1 Introduction to Computational Fluid Dynamics

Week No.2 The Finite Difference Method (FDM)

Week No.3 The Finite Difference Method (FDM)

Week No.4	Solution of inviscid flow problems using the FDM with MATLAB
Week No.5	Solution of inviscid flow problems using the FDM with MATLAB
Week No.6	The Finite Element Method (FEM)
Week No.7	Solution of fluid flow problems using the FEM with MATLAB (PDE Tool) / 7th week evaluation
Week No.8	Solution of fluid flow problems using the FEM with MATLAB (PDE Tool) (Cont.)
Week No.9	The Finite Volume Method (FVM)
Week No.10	Solution of fluid flow problems using the FVM with MATLAB
Week No.11	Solution of fluid flow problems using the FVM with MATLAB
Week No.12	Thermofluid problems using the software FLUENT – / 12th week evaluation
	/ 12th week evaluation
Week No.13	Mesh Generation using the Software Gambit.
Week No.14	Examples using the FLUENT solver
Week No.15	Examples using the FLUENT solver (Cont.)
Week No.16	Final Examination

5- Teaching and Learning Methods

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

6-Teaching and Learning Methods for Students with Special Needs

- Lectures
- Tutorials
- Reports & sheets
- Laboratories
- Seminars

Academic Support:

- The general academic advisor appoints an academic supervisor for handicapped students.
- Continuous follow ups are made for handicapped students after each assessment to evaluate their academic level of achievement

7- Student Assessment

a-Procedures used	1-Written Examinations to assess The Intended Learning Outcomes. 2-Class Activities (Reports, Discussions, ------) to assess The Intellectual and general Skills.	
b- Schedule:	Assessment 1 Assessment 2 Assessment 3 Assessment 4	7th Week Assessment 12th Week Assessment Continuous Assessments 16th Week Final Written Exam
c- Weighing of Assessment	7th Week Evaluation 12th Week Evaluation Final-term Examination Oral Examination Practical Examination Semester Work Total	30 % 20 % 40 % 00 % 00 % 10 % 100%

8- List of References:

a- Course Notes	N/A
b- Required Books (Textbooks)	• Computational Fluid Dynamics Lecture notes
c- Recommended Books	• Ferziger J.H. & Peric M. "Computational Methods for fluid Dynamics", Springer Verlag, 1999. • Versteeg H. & Malalasekera W. " An introduction to computational fluid dynamics (The finite volume method) ", McGraw Hill, 1995. • Mathews J.H. & Fink K.D. "Numerical methods using MATLAB" , Prentice Hall, 1999.
d- Periodicals, Web Sites, etc.	N/A

Course coordinator: **Program Manager:**