ECTS COURSE INFORMATION FORM

Faculty	**Faculty of Engineering**	
Program	**B.Sc. in Civil Engineering**	**Required**
	B.Sc. in Computer Engineering	**Elective**
	B.Sc. in Electrical-Electronics Engineering	**Elective**
	B.Sc. in Industrial Engineering	**Elective**
	B.Sc. in Mechanical Engineering	**Required**

Course Code	CME 302			
Course Title in English	Computational Methods in Engineering			
Course Title in Turkish	Mühendislikte Hesaplamalı Yöntemler			
Language of Instruction	English			
Type of Course	Flipped Classroom			
Level of Course	Undergraduate			
Course Category (by % of Content)	Basic Science	Basic Engineering	Engineering Design	General Education
	-	100	-	-
Semester Offered	Spring			
Contact Hours per Week	Lecture: 3 hours	Recitation: -	Lab: -	Other: -
Estimated Student Workload	135 hours per semester			
Number of Credits	5 ECTS			
Grading Mode	Standard Letter Grade			
Pre-requisites	MATH 115 Calculus I and COMP 107 Computer Programming (Matlab)			
Expected Prior Knowledge	Prior knowledge of linear algebra, of differentiation and integration of single-valued functions and of ordinary differential equations is expected.			
Co-requisites	None			
Registration Restrictions	Only Undergraduate Students			
Overall Educational Objective	To acquire a basic knowledge and understanding of numerical methods necessary for computations in engineering.			
Course Description	This course introduces computational methods for engineering applications using Matlab software. Topics covered include: approximations and errors associated with numerical analysis; roots of equations; numerical solution of linear algebraic equations; least-squares regression and interpolation; numerical differentiation and integration; numerical solution of ordinary differential equations.			
Course Description in Turkish	Bu derste, mühendislik uygulamalarında kullanılan hesaplamalı metotlar Matlab yazılımı kullanılarak incelenmektedir. Ders şu konu başlıklarını içermektedir: sayısal analiz ile ilgili hata; denklemlerin kökleri; lineer cebirsel denklemlerinin sayısal çözümü; en küçük kareler yöntemi ve interpolasyon; sayısal türev ve integral; adi diferansiyel denklemlerin sayısal çözümü.			
Course Learning Outcomes and Competences	Upon successful completion of the course, the learner is expected to: 1. determine roots of single-valued functions using various numerical methods; 2. solve systems of equations using various numerical methods; 3. perform curve fitting using least-squares regression and interpolation; 4. perform numerical differentiation and integration for various problems; 5. find numerical solutions for ordinary differential equations of typical applications; 6. implement various computational methods using an engineering software; 7. perform an internet search or literature review and acquire knowledge for numerical methods/methodologies for solving complex engineering problems.			

Relationship of the Course with the Student Outcomes	Level	Learning Outcome(s)	Assessed by
Student Outcomes	N=None S=Supportive H=High		Exam, Project, HW, Experiment, Presentation, etc.
(1) an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	H	1,2,3,4,5	Exams, Classroom Practices
(2) an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors			
(3) an ability to communicate effectively with a range of audiences			
(4) an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts			
(5) an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives			
(6) an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	H	6	Projects (Codes/Demos Part)
(7) an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	S	7	Project (Internet Search/Literature Review Part)

Prepared by and Date	Assoc. Prof. Dr. Hasan Körük / January 2020	
Semester	Spring 2019-2020	
Name of Instructor	Assoc. Prof. Dr. Hasan Körük	
Course Contents	Week	Topic
	1.	Introduction to computational methods in engineering. Mathematical modeling and engineering problem solving. Programming and software
	2.	Approximations and errors associated with numerical analysis
	3.	Roots of equations
	4.	Roots of equations
	5.	Roots of equations
	6.	Numerical solution of linear algebraic equations
	7.	Numerical solution of linear algebraic equations
	8.	Numerical solution of linear algebraic equations. Least-squares regression
	9.	Least-squares regression
	10.	Interpolation
	11.	Numerical differentiation
	12.	Numerical integration
	13.	Numerical solutions of ordinary differential equations
	14.	Numerical solutions of ordinary differential equations
	15.	Final Exam/Project/Presentation Period
	16.	Final Exam/Project/Presentation Period
Required/Recommended Readings	Numerical Methods for Engineers, 7th Edition, S.C. Chapra, R.P. Canale, McGraw-Hill, 2015.	
Teaching Methods	Contact hours using "Flipped Classroom" as an active learning technique.	
Homework and Projects	Projects to implement various numerical methods using Matlab software will be assigned.	

	In-class exercises will be done throughout the semester.
Laboratory Work	-
Computer Use	Intense use of Matlab software is needed.
Other Activities	-
Assessment Methods	**Assessment** / **Number** / **Ratio (%)** Midterm Exam / 2 / 60 (30 + 30) Project / 2 / 25 (15 + 10) Classroom Practice / 8-12 / 15 Total / / 100
Course Administration	**Instructor's office and phone number**: 563 (A Block - 5th Floor) / 0212 395 36 54 **office hours:** Monday 10:00-12:00 **email address:** korukh@mef.edu.tr **Rules for attendance:** Minimum of 70% attendance required. Classroom participation contributes to 12% of the final grade. **Missing a midterm**: Provided that proper documents of excuse are presented, make-up will be given. **A reminder of proper classroom behavior, code of student conduct**: YÖK Regulations. **Statement on plagiarism**: YÖK Regulations.

ECTS Student Workload Estimation

Activity	No/Weeks	Hours			Calculation	Explanation
	No/Weeks per Semester (A)	Preparing for the Activity (B)	Spent in the Activity Itself (C)	Completing the Activity Requirements (D)		
Lecture/Flipped Classroom	14	1	3	0,5	63	A*(B+C+D)
Quizzes					0	
Midterm(s)	2	15	2		34	A*(B+C+D)
Projects	2	15	2	2	38	A*(B+C+D)
Final Examination						A*(B+C+D)
Total Workload					135	
Total Workload/25					5,4	
ECTS					**5**	