ADVANCED ENGINEERING MATHEMATICS

1	Course Title:	ADVANCED ENGINEERING MATHEMATICS
2	Course Code:	MAK5001
3	Type of Course:	Compulsory
4	Level of Course:	Second Cycle
5	Year of Study:	1
6	Semester:	1
7	ECTS Credits Allocated:	6.00
8	Theoretical (hour/week):	3.00
9	Practice (hour/week):	0.00
10	Laboratory (hour/week):	0
11	Prerequisites:	None
12	Language:	Turkish
13	Mode of Delivery:	Face to face
14	Course Coordinator:	Doç. Dr. MURAT REİS
15	Course Lecturers:	Prof. Dr. Osman Kopmaz
16	Contact information of the Course Coordinator:	okopmaz@uludag.edu.tr +90 224 294 19 62 Uludağ Üniversitesi, Mühendislik Mimarlık Fakültesi, Makine Mühendisliği Bölümü, Görükle, 16059 Bursa
17	Website:	
18	Objective of the Course:	Teach advanced mathematical methods which are used in solving engineering problems.
19	Contribution of the Course to Professional Development:	
20	Learning Outcomes:	
	1	Students who attend this course learn advanced topics and methods of mathematics.
	2	They can model engineering problems, and solve them using mathematical methods.
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21	Course Content:	

Course Content:

Week	Theoretical	Practice
1	Review of ordinary differential equations. Series solutions of differential equations. Frobenius method.	
2	Special differential equations. Bessel and modified Bessel differential equations. Classical and modified Bessel functions of first and second kind. 1st take-home.	

3	Legendre differential equation and Legendre polynomials. General expansion theorem. Orthogonality and completeness. Orthogonal functions.	
4	Fourier series. Fourier integrals and transform. Laplace transforms. 2nd take-home.	
5	Partial differential equations. Deriving equations in engineering problems. One dimensional wave equation. D'Alembert solution.	
6	Method of separation of variables. Initial and boundary value problems. Eigenvalue problems. Eigenvalues and eigenfunctions. Examples from vibrations theory and heat transfer. 3rd take-home.	
7	Series solutions. Classification of second order partial differential equations. Elliptic, hyperbolic and parabolic equations. Characteristic curves.	
8	Repeating courses and midterm exam	
9	Calculus of variations. Variations. Variation problems in integral form. Euler-Lagrange equations.	
10	Application examples. Constrained variation problems.	
11	Variational principles of mechanics. Lagrange equations of motion. Hamilton principle. 4th take-home.	
12	Functions of one complex variable. Limit, continuity and derivatives of a complex function. Analyticity. Cauchy-Riemann conditions. Cauchy and Cauchy-Morera theorems.	
13	Series expansions of complex functions. Taylor, Maclaurin and Laurent series. Theorem of residues. 5th take-home.	
14	Applications of residue theorem. Calculation of improper integrals. Obtaining inverse Laplace transforms.	

22	Textbooks, References and/or Other Materials:	C.R. Wylie - L. C. Barrett, Advanced Engineering Mathematics, McGraw Hill Publ. Comp. E. Kreyszig, Advanced Engineering Mathematics, J. Wiley Publ. Comp. B. Karaoğlu, Fizik ve Mühendislikte Matematik Yöntemler, Seçkin Yayıncılık.
23	Assesment	

TERM LEARNING ACTIVITIES	**NUMBER**	**WEIGHT**
Midterm Exam	1	25.00
Quiz	0	0.00
Home work-project	5	25.00
Final Exam	1	50.00
Total	7	100.00
Contribution of Term (Year) Learning Activities to Success Grade		50.00
Contribution of Final Exam to Success Grade		50.00
Total		100.00

Measurement and Evaluation Techniques Used in the Course	

24 ECTS / WORK LOAD TABLE

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	3.00	42.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	14	7.00	98.00
Homeworks	5	15.00	75.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	2.50	2.50
Others	0	0.00	0.00
Final Exams	1	2.50	2.50
Total Work Load			220.00
Total work load/ 30 hr			7.33
ECTS Credit of the Course			6.00

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	4	4	4	0	0	0	4	0	0	0	0	0	0	0	0	0
ÖK2	4	4	4	0	0	0	4	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