

ENERGY AND VARIATIONAL METHODS IN MECHANICS

1	Course Title:	ENERGY AND VARIATIONAL METHODS IN MECHANICS	
2	Course Code:	INS5218	
3	Type of Course:	Optional	
4	Level of Course:	Second Cycle	
5	Year of Study:	1	
6	Semester:	2	
7	ECTS Credits Allocated:	7.50	
8	Theoretical (hour/week):	3.00	
9	Practice (hour/week):	0.00	
10	Laboratory (hour/week):	0	
11	Prerequisites:		
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. M.ÖZGÜR YAYLI	
15	Course Lecturers:	Prof. Dr. Babür DELİKTAŞ	
16	Contact information of the Course Coordinator:	bdeliktas@uludag.edu.tr 224 2900744 Uludağ Univ. Müh.Mim Fak. İnşaat Müh. Böl. Görükle, Bursa	
17	Website:	http://insaat.uludag.edu.tr	
18	Objective of the Course:	<ul style="list-style-type: none"> • Ability to improve on the use of finite element method in solving multidimensional problems. • To gain the ability to interpret the results obtained by the finite element method with a multidisciplinary perspective. 	
19	Contribution of the Course to Professional Development:	<ul style="list-style-type: none"> • To be able to solve multidimensional engineering problems using finite element methods. • Understanding the interdisciplinary interaction that problems are related to • Solving problems encountered during time-dependent engineering analysis by using research methods • To be able to develop new approaches for solving unforeseen complex problems while solving problems. 	
20	Learning Outcomes:		
		1	• To be able to solve multidimensional engineering problems using finite element methods.
		2	• Understanding the interdisciplinary interaction that problems are related to
		3	• Solving problems encountered during time-dependent engineering analysis by using research methods
		4	• To be able to develop new approaches for solving unforeseen complex problems while solving problems.
		5	
		6	
		7	
		8	
		9	
		10	
21	Course Content:		
		Course Content:	

Week	Theoretical	Practice
1	Introduction, Element Formulation by Direct Method	
2	Element Combining Methods	
3	Boundary Conditions	
4	Energy Methods in Element Formulation	
5	Weighted Residuals Method and Programming of the Method	
6	Weighted Residual Method in Elastostatics	
7	Element Mass Matrices	
8	Consistent External Load Vector	
9	Eigenvalue Problems	
10	Fundamentals of Time Integration	
11	Time Integration in Parabolic and Hyperbolic Systems	
12	Plate Type Elements	
13	Introduction to Major Deformation Problems	
14	Shear effects and Element Lockout	
22	Textbooks, References and/or Other Materials:	<ul style="list-style-type: none"> • J. N. Reddy, An Introduction to the Finite Element Method, McGraw-Hill, 2006 • T. J.R. Hughes, The Finite Element Method: Linear Static and Dynamic Finite Element Analysis, Dover, 2000 • O.C. Zienkiewicz, R. L. Taylor, J.Z. Zhu, The Finite Element Method: Its Basis and Fundamentals, Elsevier Butterworth-Heinemann, 6th Ed. , 2005 • S.S.Rao, The Finite Element Method in Engineering, Elsevier Butterworth-Heinemann, 5th Ed. , 2005
23	Assesment	
TERM LEARNING ACTIVITIES		NUMBER
		WEIGHT
Midterm Exam		1
Quiz		0
Home work-project		0
Final Exam		1
Total		2
Contribution of Term (Year) Learning Activities to Success Grade		40.00
Contribution of Final Exam to Success Grade		60.00
Total		100.00
Measurement and Evaluation Techniques Used in the Course		Understanding the principles of applied mathematics 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	12.00	168.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	12.00	12.00
Others	0	0.00	0.00
Final Exams	1	3.00	3.00
Total Work Load			225.00
Total work load/ 30 hr			7.50
ECTS Credit of the Course			7.50

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	5	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK2	5	5	3	0	5	5	0	0	0	0	0	0	0	0	0	0
ÖK3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ÖK4	0	0	0	0	0	0	0	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			