ADVANCED MATRIX METHODS IN EARTHQUAKE ENGINEERING

1	Course Title:	ADVANCED MATRIX METHODS IN EARTHQUAKE ENGINEERING	
2	Course Code:	INS5018	
3	Type of Course:	Optional	
4	Level of Course:	Third Cycle	
5	Year of Study:	1	
6	Semester:	2	
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:		
12	Language:	Turkish	
13	Mode of Delivery:	Face to face	
14	Course Coordinator:	Prof. Dr. M.ÖZGÜR YAYLI	
15	Course Lecturers:	Prof. Dr. M. Özgür YAYLI	
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:	-Representation of equilibrium equations in matrix form in bearing elements and systems under various loads (static and dynamic loads) -Performing internal force, strain and displacement calculations of bearing elements and systems with matrix methods • To gain the ability to set up an algorithm to apply the matrix-displacement method for practical solution of bearing elements and systems under the effects of different forces and under different behavior patterns.	
19	Contribution of the Course to Professional Development:	• Ability to solve frame type building systems under static loads by matrix displacement method • Ability to perform free vibration analysis of load-bearing systems and establish an algorithm • Ability to apply the mode superposition method and set up an algorithm for automatic calculation	
20	Learning Outcomes:		
		1	• Ability to solve frame type building systems under static loads by matrix displacement method
		2	• Ability to perform free vibration analysis of load-bearing systems and establish an algorithm
		3	• Ability to apply the mode superposition method and set up an algorithm for automatic calculation
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21	Course Content:

Course Content:

Week	Theoretical	Practice
1	Introduction to matrix methods, purpose, definitions, basic matrix operations	
2	Relations between edge forces and edge displacements in finite elements, changing axes	
3	Direct matrix replacement method	
4	Special supports, symmetrical systems, support transverse displacements, rods resting on elastic foundation, rods where second-order effects are taken into account, etc.	
5	Two and three dimensional elements	
6	Two and three dimensional elements (continued)	
7	Calculation of nonlinear systems, Nonlinear systems in terms of material, nonlinear systems in terms of geometry change, Nonlinear systems in terms of material and geometry change	
8	Calculation of structural systems according to	
9	Forced vibrations, numerical integration techniques	
10	properties of vibration modes	
12	Detailed examples of the application of the superposition method of modes	
14	Writing continuity equations in matrix power	

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	4.00	56.00
Homeworks	14	3.00	42.00
Projects	14	1.00	14.00
Field Studies	0	0.00	0.00
Midterm exams	1	3.00	3.00
Others	14	1.00	14.00
Final Exams	1	3.00	3.00
Total Work Load			177.00
Total work load/ 30 hr			5.80
ECTS Credit of the Course			6.00

22	Textbooks, References and/or Other	• Prof. Dr. Erkan Özer ve Prof.Dr. Faruk Karadoğan (by Prof. Dr. Erkan Özer and Prof.Dr. Faruk Karadogan) • Çakıroğlu, A., Özden, F., Özmen, G. Yapı Sistemlerinin Programları, Cilt I ve Cilt II, ITÜ Kütüphanesi, Sayı 1005, 1992. • Prezemieniecki, J.S. Theory of Matrix Structural Analysis, Dover Pub. ISBN 04866-49482,1985. • Bathe, K.J. Finite Element Procedures, Prentice-Hall, 1996. • Hart, G.C., Wong, K. Structural Dynamics for Structural Engineers, J.Wiley, 2000. • Meek, J.L. Matrix Structural Analysis, McGraw-Hill, ISBN 0070413169, 1971. • Clough, R.W., Penzien, J. Dynamics of Structures, McGraw-Hill, 1996.
23	Assesment	

TERM LEARNING ACTIVITIES	NUMBER	WEIGHT
Midterm Exam	1	40.00

Quiz	0	0.00
Home work-project	0	0.00
Final Exam	1	60.00
Total	2	100.00
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**

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	5	3	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**