GENERAL METROLOGY

1	Course Title:	GENERAL METROLOGY	
2	Course Code:	MAK4412	
3	Type of Course:	Optional	
4	Level of Course:	First Cycle	
5	Year of Study:	4	
6	Semester:	8	
7	ECTS Credits Allocated:	3.00	
8	Theoretical (hour/week):	2.00	
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. A.ALPER ÖZALP	
15	Course Lecturers:	Yrd. Doç. Dr. Eser KARLIK	
16	Contact information of the Course Coordinator:	e-posta : aozalp@uludag.edu.tr tel : 224 294 19 81	
17	Website:		
18	Objective of the Course:	To provide 4th year Mechanical Engineering Students knowledge on the measurement techniques and data processing methods for applications on fluid mechanics and heat transfer; to introduce basic concepts and philosophy of electrical/electronics metrology and to emphasize the importance of metrology in engineering and industrial applications; to present electrical measurement standards and techniques.	
19	Contribution of the Course to Professional Development:		
20	Learning Outcomes:		
		1	The concept of measurement and measurement systems will be defined.
		2	Information on liquid manometers and barometers will be given.
		3	Basic principles of flowrate measurement with cross-section change in closed conduits will be given.
		4	Basic principles of pyrometers and liquid crystal techniques will be given.
		5	Understanding of reference measurement standards, measurement systems and uncertainity calculations used in metrology laboratories of manufacturing and quality control departments of plants will be provided.
		6	Usage of measurement analysis methods in research, development and measurement system design will be provided.
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21	Course Content:		

	Course Content:	
Week	Theoretical	Practice
1	Definition of Measurement, Generalization of Measurement Systems.	
2	Pressure Measurement.	
3	Liquid Manometers. Barometers.	
4	Flow Measurement.	
5	Flowrate Measurement with Cross-Section Change in Closed Conduits.	
6	Temperature Measurements with Pyrometers.	
7	Temperature Measurements with Liquid Crystals.	
8	Repeating courses and midterm exam	
9	Statistical analysis of measurement errors: Average, deviation, standard deviation, Gauss distribution	
10	Static and dynamic characteristics in electrical/electronics measurements: Accuracy, sensitivity, resolution, linearity/nonlinearity, transfer function, delay time, dynamic nonlinearity	
11	Grounding, screening and noise	
12	Direct current (DC) measurements: Resistor measurements, Voltmeter-ammeter method, Wheatstone bridge	
13	Alternative current (AC) measurements: Devices used in measurements, characteristics of measurement equipments, measuring AC signals by rectifying	
14	Electromagnetic compatibility and electromagnetic interference measurements: Interference sources, measurement standards, test and measurement methods.	
22	Textbooks, References and/or Other Materials:	Ölçme Tekniği, Osman F. GENCELİ, Birsen Yayınevi, İstanbul, 1995. Akışkanlar Mekaniği, Habib UMUR, 2010. Elektrik-Elektronik Ölçmeleri ve İş Güvenliği, M. NACAR, Teknik Kitabevi, 2009.
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	

24 ECTS / WORK LOAD TABLE

Activites	Number	Duration (hour)	Total Work Load (hour)
Theoretical	14	2.00	28.00
Practicals/Labs	0	0.00	0.00
Self study and preperation	13	4.00	52.00
Homeworks	0	0.00	0.00
Projects	0	0.00	0.00
Field Studies	0	0.00	0.00
Midterm exams	1	2.00	2.00
Others	2	4.00	8.00
Final Exams	1	2.00	2.00
Total Work Load			92.00
Total work load/ 30 hr			3.07
ECTS Credit of the Course			3.00

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	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0
ÖK2	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0
ÖK3	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0
ÖK4	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0
ÖK5	5	0	5	5	5	0	0	0	0	0	0	0	0	0	0	0
ÖK6	5	0	5	5	5	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