COURSE INFORMATION

Course Code	AAM 553	Course Name	Nanotechnology and Smart Materials for Aerospace Engineering					
Type of Course	**Level of Course**	**Semester**	**Language**	**Theory**	**Application (Practice)**	**Laboratory**	**Local Credits**	**ECTS**
Elective	Graduate	-	English	3	0	0	3	6

Department	: Aerospace Engineering
Prerequisites/Requirements for Admission	: -
Mode of Delivery	: 100% Online
Course Coordinator	: Assoc. Prof. Mecit YAMAN
Course Lecturer(s)	: Assoc. Prof. Mecit YAMAN
Course Assistant(s)	:
Course Description/Aim	: A fundamental appreciation of the promise (and perils) of nanotechnology and the new materials technology, their theoretical underpinnings, engineering applications with emphasis on aerospace engineering, and economic and political considerations.
Course Contents	: Nanotechnology, smart materials, historical, economic and political aspects, sustainability issues, quantum theory and underpinnings, synthesis and characterization, manufacturing and synthesis techniques, composite material applications, CFRP applications, large scale sensors and applications, thermoplastics applications, 3D printing, knitting, fiber drawing.
Recommended Optional Program Components	:
Compulsory Attendance	: 70%

Course Learning Outcomes

#	Learning outcome	Teaching Methods/Techniques	Assessment method(s)
At the end of this course; students will be able to:			
1	Develop a theoretical understanding of the basis of smart materials technology	Theoretical Lecture, Solving Exercises	Exams
2	Obtain knowledge of the spectrum of applications made possible with nanotechnology and smart materials, with an emphasis on aerospace applications.	Theoretical Lecture, Solving Exercises	Exams
3	Evaluate economic and political issues around materials including sustainability.	Theoretical Lecture, Solving Exercises	Exams

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Weekly Detailed Course Content

Week	Content	Recommended Resource(s)	Time (Hours)
1	Five themes of the course: Global, current, multidimensional, interactive/open ended, R&D oriented. UN sustainability targets.	Lecture notes, lecture website	3
2	An overview of the future of flight technologies	Lecture notes, lecture website, The Economist magazine, Nature Publishing group journals	3
3	Historical perspective and a modern material need	Textbook, The Economist magazine, Nature Publishing group journals	3
4	Quantum mechanics and the theoretical basis of new materials technology	Textbook, The Economist magazine, Nature Publishing group journals	3
5	No easy solution for aerospace materials	The Economist magazine, Nature Publishing group journals	3
6	Synthesis and characterization techniques	Textbook	3
7	Fiber drawing and large-scale sensors	The Economist magazine, Nature Publishing group journals	3
8	Case study 1: Toughening in the ironclad diabolical beetle/Midterm	The Economist magazine, Nature Publishing group journals	3
9	Case study 2: Giga-voxel computational morphogenesis for structural design	The Economist magazine, Nature Publishing group journals	3
10	High performance alloy design	The Economist magazine, Nature Publishing group journals	3
11	Materials for space exploration and settlement	The Economist magazine, Nature Publishing group journals	3
12	Giant setup for additive printing, multimaterial 3D printing	The Economist magazine, Nature Publishing group journals	
13	Sustainability and a neuro backend for nanotechnology	Lecture notes	3
14	Review	The Economist magazine, Nature Publishing group journals	3
15	Final Exam		
16	Final Exam		

Sources

Course Notes / Textbooks	Lecture website https://sites.google.com/site/topicsinengineering The Economist magazine, www.economist.com Nature Publishing group journals, www.nature.com WD Callister Jr., DG Rethwisch, Callister's Materials Science and Engineering, Wiley, 2020. AP Mouritz, Introduction to aerospace materials, Woodhead Publishing Limited, 2012. DA Skoog, FJ Holler, SR Crouch, Principles of Instrumental Analysis, Cengage Learning, 2017.

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Supplemental Readings	Mark Miodownik, Stuff matters, Houghton Mifflin Harcourt, 2014 Mark Miodownik, Eşyanın tabiatı, Domingo, 2019

Evaluation System

Work Placement	Number	Percentage of Grade (%)
Attendance	1	10
Quizzes		
Homework		
Presentation		
Laboratory/Practice		
Report(s)		
Graduate Thesis/Project		
Seminar		
Projects		
Midterm exam(s)	1	30
Others	3	25
Final exam	1	35
Total		100
Percentage of semester work		65
Percentage of final exam		35
Total		100

Workload Calculation

Activity	Number	Time (hours)	Total Workload (hours)
Course Hours	14	3	42
On-line Activity Hours	14	3	42
Individual study	14	4	56
Midterm exam(s)	1	20	20
Final exam	1	20	20
Homework			
Presentation			
Project			
Total			180
ECTS Credit *(Total/30)*			6

Contribution of Learning Outcomes to Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
LO1	3	3	5	4	4	3	2	2	3
LO2	3	3	5	4	4	3	2	2	3
LO3	3	3	5	4	4	3	2	2	3

Contribution Level: 1: “Very low”, 2: “Low”, 3: “Medium”, 4: “High”, 5: “Very High”
LO: Learning Outcome of the Course
PO: Program Outcome