AERO 203 – AEROSPACE MATERIALS

Course Code	Course Name	Semester	
AERO 203	Aerospace Materials	Fall ☒ Spring ☐ Summer ☐	
Hours		**Credit**	**ECTS**
Theory	**Practice** / **Lab**	3	4
3	0 / 0		

Course Details	
Department	Aerospace Engineering
Course Language	English
Course Level	Undergraduate ☒ Graduate ☐
Mode of Delivery	Face to Face ☒ Online ☐ Hybrid ☐
Course Type	Compulsory ☒ Elective ☐
Course Objectives	To introduce commonly used aerospace materials in industry. To describe the material properties of metallic and ceramic materials, alloys and polymeric composites. To introduce manufacturing methods and process technologies for aerospace materials. To learn how to characterize the mechanical and thermal properties of aerospace materials. To understand structure-property relations and failure modes. To gain knowledge in non-destructive evaluation methods and testing. To learn how to select materials for aerospace applications.
Course Content	This course gives an introductory to widely used materials in aerospace industry. Metallic and ceramic materials, alloys and polymeric materials properties will be discussed in details with characterization and testing methods. Advanced material design and key points in aerospace material design will be studied with case histories and written reports.
Course Method/ Techniques	Lecture ☒ Question & Answer ☐ Presentation ☒ Discussion ☐
Prerequisites/ Corequisites	
Work Placement(s)	

Textbook/References/Materials

- Mouritz, A. P. (2012). *Introduction to Aerospace Materials*. Woodhead Publishing Limited.
- Callister Jr, W. D., & Rethwisch, D. G. (2020). *Materials Science and Engineering*. John Wiley & Sons.

Course Category				
Mathematics and Basic Sciences	☐		Education	☐
Engineering	☒		Science	☐
Engineering Design	☐		Health	☐
Social Sciences	☐		Profession	☐

Weekly Schedule

No	Topics	Materials/Notes
1	Introduction to aerospace materials	
2	Materials and material requirements for aerospace structures and engines	
3	Strengthening of metal alloys	
4	Mechanical and durability testing of aerospace materials	
5	Production and casting of aerospace metals	
6	Processing and machining of aerospace metals	
7	Aluminium alloys for aircraft structures	
8	**Midterm Exam**	
9	Titanium alloys for aerospace structures and engines	
10	Magnesium alloys for aerospace structures	
11	Steels for aircraft structures	
12	Superalloys for gas turbine engine	
13	Polymers for aerospace structures	
14	Manufacturing of fibre–polymer composites for aerospace structers and engines	
15	Review	
16	**Final Exam**	

Assessment Methods and Criteria		
In-term studies	**Quantity**	**Percentage**
Attendance	14	10
Lab		
Practice		
Fieldwork		
Course-specific internship		
Quiz/Studio/Criticize	1	10
Homework		
Presentation / Seminar		
Project		
Report		
Seminar		
Midterm Exam	1	30
Final Exam	1	50
	Total	**100%**
Contribution of Midterm Studies to Success Grade		50
Contribution of End of Semester Studies to Success Grade		50
	Total	**100%**

ECTS Allocated Based on Student Workload			
Activities	**Quantity**	**Duration (Hrs)**	**Total Workload**
Course Hours	14	3	42
Lab			
Practice			
Fieldwork			
Course-specific Work Placement			
Out-of-class study time	14	3	42
Quiz/Studio/Criticize	1	2	2
Homework			
Presentation / Seminar			
Project			
Report			
Midterm Exam and Preparation for Midterm	1	10	10
Final Exam and Preparation for Final Exam	1	10	10
Total Workload			**106**
Total Workload / 25			**4**
ECTS Credit			**4**

Course Learning Outcomes	
No	**Outcome**
L1	Identify and classify materials commonly used in aerospace applications and explain their unique properties.
L2	Analyze material requirements for various aerospace structures and engines, considering factors such as performance, durability, and weight.
L3	Explain the methods for strengthening metal alloys and their significance in aerospace applications.
L4	Describe the production, casting, and processing techniques for aerospace metals and evaluate their influence on material properties.
L5	Compare and contrast the properties and applications of aluminum, titanium, magnesium alloys, and steels in aerospace structures.
L6	Evaluate the properties of polymers and fibre–polymer composites and their applications in aerospace structures and engines.
L7	Demonstrate an understanding of the manufacturing and machining processes for both metals and composite materials used in aerospace.

Contribution of Course Learning Outcomes to Program Competencies/Outcomes

Contribution Level: 1: Very Slight, 2: Slight, 3: Moderate, 4: Significant, 5: Very Significant

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**P8**	**P9**	**P10**	**P11**	**Total**
L1			3	4	4							
L2			5	4	5							
L3			4	4	4							
L4			4	4	4							
L5			4	4	4							
L6			4	4	4							
L7			4	5	4							
											Total	