

BACHELOR IN AEROSPACE ENGINEERING	CREDITS: 6 ECTS	COURSE: 2020/21
LECTURE COURSE : AEROSPACE MATERIALS II (251 - 15338)	YEAR: 2	SEMESTER: 2nd

Ses sion		PART	Topic	Master Class / Tutorial Class	Professor.	TITLE	DESCRIPTION
1	1 Feb	PRESENTATION OF LECTURE COURSE	1	MC	JMT	Introduction to Aerospace Materials II	Introduction to the course. Course structure and Evaluation. Classification of engineering metallic materials
2	3/4 Feb	1. METALLIC MATERIALS	2	TC	JMT/SM	Solidification of Metals	Solidification of Metals. Generation of the Microstructure
3	8 Feb	1. METALLIC MATERIALS	2	MC	JMT	Metal Casting Processes	Metal Casting Processes. Cast Structures Defects in Castings.
4	10/11 Feb	1. METALLIC MATERIALS	3	TC	JMT/SM	Metal Forming Fundamentals	Work hardening. Recovery, Recrystallization and Grain Growth.
5	15 Feb	1. METALLIC MATERIALS	3	MC	JMT	Metal Forming Processes	Metal forming processes. Effect of metal forming processes on properties and microstructure
6	17/18 Feb	1. METALLIC MATERIALS	3	TC	JMT/SM	Other processing methods for metallic materials	Additive Manufacturing Powder Metallurgy
7	22 feb	1. METALLIC MATERIALS	4	MC	JMT	Heat Treatments I	TTT diagrams: ITT and CCT. Heat Treatments: Quenching, Tempering, Annealing, Normalizing. Hardenability
8	24/25 Feb	1. METALLIC MATERIALS	4	TC	JMT/SM	Heat Treatments II	TTT diagrams: ITT and CCT. Heat Treatments. Problems.
9	1 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	5	MC	JMT	Mechanisms of deformation and fracture I: Fracture	Introduction to Fracture. Types of Fracture. Fracture modes. Fracture mechanics. Stress concentration. Griffith's theory. Stress intensity factor. Fracture. Fracture toughness and Impact test Brittle Ductile transition. DEADLINE FOR SIGNING UP VOLUNTARY PRESENTATIONS 01/03/2021
10	3/4 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	5	TC	JMT/SM	Mechanisms of deformation and fracture I: Fracture	Problems. TEST 1 (Topic 1 – 4)

11	8 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	6	MC	JMT	Mechanisms of deformation and fracture II: Fatigue	Introduction to Fatigue. High cycle fatigue. Low cycle fatigue. Effect of variable cycles. Fatigue crack growth
12	10/11 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	6	TC	JMT/SM	Mechanisms of deformation and fracture II: Fatigue	Fatigue. Structural features of fatigue Designing against fatigue failure. Problems.
13	15 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	7	MC	JMT	Thermomechanical behaviour : Creep	Creep. Creep curve. Effect of stress and temperature on creep. Creep stages. Problems.
14	17/18 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	8	TC	JMT/SM	Corrosion and Wear: Corrosion (Voluntary presentations by students)	Corrosion. Basic electrochemical corrosion. Types of corrosion. Corrosion control and prevention. High temperature corrosion
15	22 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	8	MC	JMT	Corrosion and Wear: Wear	Friction. Wear. Friction and wear tests. Lubricants. Wear and friction in metal-working processes. Materials selection for tribological system.
16	24/25 Mar	2. BEHAVIOUR IN SERVICE CONDITIONS.	11	TC	JMT/SM	Joining Processes (Voluntary presentations by students)	Introduction to joining processes. Welding. Welding processes for aerospace applications.
17	7/8 Apr	3. APPLICATIONS	9	TC	JMT/SM	Ti alloys (Voluntary presentations by students)	Introduction to Ti. Fundamentals of Ti and Ti alloys. Classification of Ti alloys. TEST 2 (Topics 5-9)
18	12 Apr	3. APPLICATIONS	9	MC	JMT	Ti alloys	Production processes and manufacturing. Phase transformations in Ti alloys. Characteristics of Ti alloys. Heat Treatments for Ti alloys. Applications of Ti in aerospace
19	14/15 Apr	3. APPLICATIONS	10	TC	JMT/SM	Al- alloys (Voluntary presentations by students)	History of Aluminum Applications Aluminium Obtaining. Designation of Aluminium Alloys Hardening mechanisms.
20	19 Apr	3. APPLICATIONS	10	MC	JMT	Al- alloys	Non Heat treatable Wrought Aluminium Alloys Heat treatable Wrought Aluminium Alloys. Cast Aluminium alloys. Applications in aerospace. Aluminium Processing and Joining
21	21/22 Apr	3. APPLICATIONS	12	TC	JMT/SM	Special Steels (Voluntary presentations by students)	Special ultra high strength steels, PH stainless steels. Maraging Steels.
22	26 Apr	3. APPLICATIONS	13	MC	JMT	Surface Treatments	Main surface treatments: Galvanizing; Electrodeposition; Organic Coatings; CVD; PVD: Thermal Spraying. Thermochemical Treatments. Thermal Barrier Coatings

23	28/29 Apr	3. APPLICATIONS	15	TC	JMT/SM	Non-destructive Testing (Voluntary presentations by students)	Common NDT method. Visual Inspection. Liquid Penetrants Magnetic Particle. Eddy Current. Radiographic. Ultrasonic Acoustic Emissions. Non-destructive testing. Method comparison.
24	5/6 May	3. APPLICATIONS	14	TC	JMT/SM	Alloys for high Temperature applications: Superalloys	Superalloys: Microstructure, strengthening Mechanisms. Properties Applications.
25	10 May	3. APPLICATIONS	14	MC	JMT	Alloys for high Temperature applications: Intermetallics	Intermetallics: Nickel Aluminides. Titanium aluminides. Manufacturing properties and applications. Thermal Barrier coatings
26	12/17 May	REVISION		TC	JMT/SM	REVISION	TEST 3 (Topics 10 – 15)