



COURSE: Stability and Integrity of Aerospace Structures		
DEGREE: Aerospace Engineering	YEAR: 3rd	TERM: 2nd

La asignatura tiene 29 sesiones que se distribuyen a lo largo de 14 semanas. Los laboratorios pueden situarse en cualquiera de ellas. Semanalmente el alumno tendrá dos sesiones, excepto en un caso que serán tres

WEEKLY PLANNING									
WEEK	SESSION	DESCRIPTION	GROUPS (mark X)		SPECIAL ROOM FOR SESSION (Computer class room, audio-visual class room)	Indicate YES/NO If the session needs 2 teachers	WEEKLY PROGRAMMING FOR STUDENT		
			LECTURES	SEMINARS			DESCRIPTION	CLASS HOURS	HOMEWORK HOURS (Max. 7h week)
1	1	INTRODUCTION/SCOPE OF COURSE - Review of pre-requisite concepts STRUCTURAL STABILITY COLUMNS (1/2) - Elastic buckling of ideal columns. - The Euler curve. - Critical buckling stress. - End constraint effects - Inelastic buckling of columns. - The Euler-Engesser curve.	X				Reading the corresponding book chapters Study and personal work	1,6	7
	2	Exercises		X			Solve the proposed problems	1,6	

2	3	STRUCTURAL STABILITY COLUMNS (2/2) - Real effects on column stability: Imperfections - Offset loads - Initial curvature - Local Buckling and Crippling - Crippling stress - The Johnson-Euler curve.	X			Reading the corresponding book chapters Study and personal work	1,6	6
2	4	Exercises		X		Solve the proposed problems	1,6	
3	5	STRUCTURAL STABILITY PLATES (1/2) - Elastic buckling of plates - Under compression loads - Under shear loads - Under bending loads - Under combined loading	X			Reading the corresponding book chapters Study and personal work	1,6	7
3	6	Exercises		X		Solve the proposed problems	1,6	
4	7	STRUCTURAL STABILITY PLATES (2/2) - Plastic effects in plate buckling - Effect of panel curvature - Panel failure - Failure of compression panels - Failure of shear panels. Diagonal Tension.	X			Reading the corresponding book chapters Study and personal work	1,6	6
4	8	Exercises		X		Solve the proposed problems	1,6	
5	9	QUIZ 1 STRUCTURAL INTEGRITY FATIGUE (1/3) - Introduction to Fatigue - Examples of the detrimental effect of fatigue on aerospace structures	X			Reading the corresponding book chapters Study and personal work	1,6	7
5	10	LABORATORY 1		X		Experimental Lab Session: Diagonal Tension	1,6	

6	11	STRUCTURAL INTEGRITY FATIGUE (2/3) - Constant Amplitude Fatigue - SN Curves - Endurance limit - Stress ratio effects - Statistical variability (Scatter) - Stress concentrations	X			Reading the corresponding book chapters Study and personal work	1,6	6
6	12	Exercises		X		Solve the proposed problems	1,6	
7	13	STRUCTURAL INTEGRITY FATIGUE (3/3) - Variable Amplitude Fatigue - Definition of cycle - Cycle counting - Cumulative damage rules - Residual stresses and their effect - Design criteria	X			Reading the corresponding book chapters Study and personal work	1,6	6
7	14	Exercises		X		Solve the proposed problems	1,6	
8	15	STRUCTURAL INTEGRITY LINEAR ELASTIC FRACTURE MECHANICS (1/2) - Energy release rate. Griffith failure criteria. - Stress Intensity Factors. Irwin failure criteria. - Determination of Stress Intensity Factors.	X			Reading the corresponding book chapters Study and personal work	1,6	7
8	16	Exercises		X		Solve the proposed problems	1,6	
9	17	STRUCTURAL INTEGRITY LINEAR ELASTIC FRACTURE MECHANICS (2/2) - Plastic zone size. - Fracture Toughness and failure prediction. - Thickness effects on Fracture Toughness. - The plane strain Fracture Toughness test. - Limits of applicability of Linear Elastic Fracture Mechanics.	X			Reading the corresponding book chapters Study and personal work	1,6	7
9	18	Exercises		X		Solve the proposed problems	1,6	

10	19	<p>STRUCTURAL INTEGRITY FATIGUE CRACK GROWTH AND DAMAGE TOLERANCE ANALYSIS</p> <ul style="list-style-type: none"> - Fatigue crack growth rate curve. - Definition and determination - Stress ratio effects - Paris Law and other analytical representations - Life prediction. - Closed form integration for constant Beta and Paris Law - Retardation effects - Design Criteria - The role of inspection - Typical life reduction factors 	X				<p>Reading the corresponding book chapters Study and personal work</p>	1,6	6,66
10	20	Exercises		X			Solve the proposed problems	1,6	
11	21	<p>QUIZ 2</p> <p>STRUCTURAL DYNAMICS (1/4)</p> <ul style="list-style-type: none"> -Systems with 1 DOF - Review of the harmonic oscillator - Modeling: stiffness and damping 	X				<p>Reading the corresponding book chapters Study and personal work</p>	1,6	7
11	22	LABORATORY 2		X			Numerical Problem on Damage Tolerance	1,6	
12	23	<p>STRUCTURAL DYNAMICS (2/4)</p> <ul style="list-style-type: none"> - General forced response - Impulse response function - Response to arbitrary input - Transfer functions - Base excitation and vibration isolation - Vibration absorption 	X				<p>Reading the corresponding book chapters Study and personal work</p>	1,6	7
12	24	Exercises		X			Solve the proposed problems	1,6	

13	25	STRUCTURAL DYNAMICS (3/4) - Systems with multiple DOF - Natural frequencies and modes - Modal analysis - Damped cases: Modal & proportional damping	X				Reading the corresponding book chapters Study and personal work	1,6	7
13	26	Exercises		X			Solve the proposed problems	1,6	
14	27	STRUCTURAL DYNAMICS (4/4) - Continuous systems - Longitudinal vibration of a rod - Bending vibration of a beam - Damping in continuous systems	X				Reading the corresponding book chapters Study and personal work	1,6	7
14	28	Exercises		X			Solve the proposed problems	1,6	
14	29	QUIZ 3	X				Study and personal work	1,6	-
Subtotal 1								48,33	93,66
Total 1 (Hours of class plus student homework hours between weeks 1-14)								142	

15		Tutorials, handing in, etc							10
16		Assessment						3	15
17									
18									
Subtotal 2								3	25
Total 2 (Hours of class plus student homework hours between weeks 15-18)								28	

TOTAL (Total 1 + Total 2. Maximum 180 hours)								170	
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