Universidad Carlos III de Madrid

SUBJECT: INTRODUCTION TO STRUCTURAL ANALYSIS		
DEGREE: AEROSPACE ENGINEERING	YEAR: 2nd	TERM: 2nd

WEEKLY PROGRAMMING

	SESSION	DESCRIPTION	GROUP		In Special room for session	Session with 2 professors	WEEKLY PROGRAMMING WEEK FOR STUDENT		
			LECTURE	SEMINAR			DESCRIPTION	CLASS HOURS	HOME WORK HOURS
1	1	**CHAPTER 1. INTRODUCTION TO SOLID MECHANICS** **Subject 1 Kinematic of deformable bodies** Motion: Basic concepts, Strain Tensor, Infinitesimal strain, Geometrical meaning of the components of infinitesimal strain tensor, Principal Strains, Equations of compatibility	X			NO	Previous reading of proposed themes Personal work about lesson	1.67	7
1	2	Exercises resolution related with Subject 1		X		NO	Personal work about Subject 1 Proposed exercises. Discussion	1.67	
2	3	**Subject 2 Equilibrium in deformable bodies** Body and surface forces, Concept of stress, Stress tensor, Stress equations of equilibrium, Stationary stresses	X			NO	Previous reading of proposed themes Personal work about lesson	1.67	7
2	4	Exercises resolution related with Subject 2		X		NO	Personal work about Subject 2 Proposed exercises. Discussion	1.67	
3	5	**Subject 3: Constitutive equations** Behaviour laws, Hyperelastic behaviour, Linear elastic behaviour Material symmetries, Physical meaning of the constants	X			NO	Previous reading of proposed themes Personal work about lesson	1.67	7
3	6	Exercises resolution related with Subject 3		X		NO	Personal work about Subject 3 Proposed exercises. Discussion	1.67	

4	7	**CHAPTER 2. ELASTICITY** **Subject 4:Formulation of the equations** Elasticity equations, Boundary and contact conditions. Theorem of Virtual Works, Clapeyron theorem, Theorem of Minimum Potential Energy, Reciprocity Theorems, General Principles	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
4	8	Exercises resolution related with Subject 4		X		NO	Personal work about Subject 4 Proposed exercises. Discussion	1.67	
5	9	**Subject 5: Failure criteria** Failure by yielding, Haig-Westergaard representation, Von Mises-Hencky-Nadai yield criterion, Tresca-Guest yield criterion, Alternate yield criteria, Equivalent stress and safety factor	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
5	10	Exercises resolution related with Subject 5		X		YES	Personal work about Subject 5 Proposed exercises. Discussion	1.67	
6	11	**CHAPTER 2. ELASTICITY** **Subject 6: Two dimensional theory of Elasticity** Plain Stress and Plain Strain, Plane Elasticity in term of displacement, Plane Elasticity in terms of stresses, Methods of solutions, Mohr´s circle in 2D	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
6	12	Exercises resolution related with Subject 6		X		NO	Personal work about Subject 6 Proposed exercises. Discussion	1.67	
7	13	**CHAPTER 3. Strength of Materials** **Subject 7: Reaction and internals forces** External degrees of freedom in a mechanical system, external link in a mechanical system, external degree of static indeterminacy	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
7	14	Exercises resolution related with Subject 7		X		NO	Personal work about Subject 7 Proposed exercises. Discussion	1.67	
8	15	**Subject 8. Reaction and internals forces (II)** Internal link, internal degree of static indeterminacy, computation of reactions	X			NO	Previous reading of proposed themes Study and personal work on the lecture **Continuous assessment test** ***The date of the continuous assessment test may be changed. Any changes will be communicated via Aula Global***	1.67	7
8	16	Exercises resolution related with Subject 8		X		NO	Personal work about Subject 8 Proposed exercises. Discussion	1.67	
9	17	**Subject 9:** Definition of a beam, Types of loads acting in beams, Internal forces and moments in beams, Equilibrium equations of beams, Internal forces and moments equations	X			YES	Previous reading of proposed themes Study and personal work on the lecture	1.67	7

9	18	Exercises resolution related with Subject 9		X		NO	Personal work about Subject 9 Proposed exercises. Discussion	1.67	
10	19	**Subject 10: Bending and shear in beams** Normal stresses in beams due to axial and bending forces, Neutral axis, Shear hypothesis, sections with symmetries	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
10	20	Exercises resolution related with Subject 10		X		NO	Personal work about Subject 10 Proposed exercises. Discussion	1.67	
11	21	**Subject 11: Torsion in beams** Saint-Venant´s theory, Prandtl approach, Coulombs model	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
11	22	Exercises resolution related with Subject 11		X		NO	Personal work about Subject 11 Proposed exercises. Discussion	1.67	
12	23	**Subject 12: Deflections of beams** Deflections by integration of the internal forces- and moment-equations (Navier-Bresse equations), Moment-area method(Mohr´s theorems),	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
12	24	Exercises resolution related with Subject 12		X		NO	Personal work about Subject 12 Proposed exercises. Discussion	1.67	
13	25	**Subject 13: Hyperstatic system** Kinematic definitions, Introduction to the force (or flexibility) method. Application to hyperstatic continuum beams	X			NO	Previous reading of proposed themes Study and personal work on the lecture	1.67	7
	26	Exercises resolution (Colective tutorial)					Personal work about Subject 13 Proposed exercises. Discussion	1.67	
AL								43.42+91	
		Tutorials, handing in, etc						0	3
		Assessment						3	
								140.40	

LABORATORIES CLASSES PROGRAMMING						
				WEEKLY PROGRAMMING SESSION FOR STUDENT		
SESSIONS	WEEK	DESCRIPTION	LABORATORY	DESCRIPTION	CLASS HOURS	HOME WORK HOURS
1 and 2	4 and 5 ***The date of the laboratory session may be changed. Any changes will be communicated via Aula Global***	Applying the knowledge of theoretical concepts, the students will design, using a Finite Element software, a structural element to assure that the stresses and deflections are below de the maximum values. At the end of the semester students will submit, through Aula Global 2, a report which will include a description of the design and calculus of the structural element.	To be determined ***The classroom will be communicated via Aula Global***	- Work in groups -Analysis of data -Report writing	2	11
3	8 ***The date of the laboratory session may be changed. Any changes will be communicated via Aula Global***	The objective of the class is to design and build two beams to carry the greatest transverse load with the lowest weight. The beams will be tested in the department laboratory on the lab session. For each beam the weight and maximum load will be measured At the end of the semester students will submit, through Aula Global 2, a report which will include a description of the design and calculus of the two beams, and a discussion of the test results justifying the failure mode and the observed differences between experiment and calculus.	1.0B04	- Work in groups -Designing and building of two beams made from balsa wood and paper. -Analysis of data -Report writing	2	11
4	12 ***The date of the laboratory session may be changed. Any changes will be communicated via Aula Global***	Applying the knowledge of the concepts of Strength materials, the students will estimate the displacement in a structural element in the laboratory. At the end of the semester students will submit, through Aula Global 2, a report which will include a description of the design and calculus of the structural element.	To be determined ***The classroom will be communicated via Aula Global***	- Work in groups -Designing and building of two beams made from balsa wood and paper. -Analysis of data -Report writing	2	11

TOTAL	179.42

**La planificación semanal de la docencia de la asignatura podrá sufrir alguna modificación menor. Dichos cambios serán comunicados por el profesor de la asignatura a través del entorno Aula Global al inicio del curso.*
*** El aula de esta práctica es provisional. La asignación definitiva del aula será comunicada por el profesor de la asignatura a través del entorno Aula Global*