(B) Course information in english

General course information:

Course title:	Strength of Materials I	**Course code:**	ΓΚ0402
Credits:	6	**Work load (hours):**	125

Course level:	Undergraduate	Graduate	D
Course type:	Mandatory	Selective	D
Course category:	Basic	Orientation	D

Semester:	3	**Hours per week:**	4

Course objectives (capabilities pursued and learning results):

The course is introductory to continuum mechanics. Physical concepts like stress tensor, strain tensor, constitutive equations, energy density, body forces and elastic constants are described. The topics that are developed include equilibrium, kinematics and compatibility equation. The linear elastic analysis of beams is also presented. Finally, students apply the theory of Strength of materials and use tensor calculus in order to find stresses and strains in structures subjected to simple loads.

Prerequisites:

- Linear Algebra and Analytic Geometry
- Calculus I & II
- Solid Mechanics

Instructor's data:

Name:	Dimitrios SAVVAS
Level:	Teaching Staff
Office:	Civil Engineering Faculty University of Thessaly Pedion Areos, 38334 Volos, Greece
Tel.–email:	dsavvas@uth.gr
Other tutors:	-

Specific course information:

	Course contents	Hours	
		Course attendance	Preparation
1	**Introduction**: The continuum concept. General principles for the analysis of statically indeterminate problems. Examples of statically indeterminate problems: plane truss structures, frame structures.	4	3
2	**Cartesian tensors**: Definition of tensors, tensor calculus, invariants of a tensor, transformation of tensors, eigenvalues and eigenvectors of a tensor.	8	6
3	**Strain alalysis**: Small deformation theory, Infinitesimal strain tensors, Relative displacements, Linear rotation tensor. Axial and shear deformations. Principal strains, strain invariants. Plane strain, Mohr's circles for strain. Compatibility equations for linear strains.	10	7
4	**Stresses**: External and internal forces in deformable bodies. The stress vector and the stress tensor. Stress on an Oblique Plane Under Axial Loading. Equilibrium equations for forces and moments, Cauchy's stress principle and symmetry of stress tensor. Principal stresses, stress invariants. Plane stress condition, Mohr's circle for stress. Simple stress conditions: simple tension-compression, two-axial tension-compression, hydrostatic pressure, simple shear. Deviatoric stress tensor.	10	7
5	**Elastic constitutive equations**: Stress-strain relations for isotropic linear elastic materials. Elastic constants: Young's modulus, Poisson ratio, Shear modulus, Bulk modulus, relations between elastic constants. Generalized Hooke's Law.	8	6
6	**Elastostatic problems**: Formulation of the elastostatic problem, Theorem of Superposition, Uniqueness of solutions, St. Venant's Princliple. Navier-Cauchy equations, Beltrami-Mitchell equations.	8	6

Additional hours for:			
Class project	**Examinations**	**Preparation for examinations**	**Educational visit**
		13	

Suggested literature:

- Tsamasphyros G.,1990, Mechanics of Deformable Medium I, Pubisher Symmetria.
- Freudenhal A.M.,1966, Introduction to Mechanics of Solids,John Wiley and Sons.
- Lass H.,1950,Vector and Tensor Analysis, Dover.

Teaching method *(select and describe if necessary*-**weight***):*		
Teaching		70%
Seminars	D	…….%
Demonstrations	D	…….%
Laboratory	D	.....%
Exercises		30%
Visits at facilities	D	…….%
Other *(describe):* …….	D	…….%
Total		100%

Evaluation method *(select)*-**weight:**				
	written	*%*	*Oral*	*%*
Homework	D		D	
Class project	D		D	
Interim examination	D		D	
Final examinations		100%	D	
Other *(describe):* ……	D		D	