

Countries	Institutions	Common Module Mechanics and Material Science <i>European Common Technical Semester for Defence and Security</i>	ECTS 3.0
Romania Poland Greece France Bulgaria	Military Technical Academy "Ferdinand I" Military University of Technology Hellenic Air Force Academy French Air Force Academy "Vasil Levski" National Military University		

Service Technical/ALL	Minimum Qualification of Instructors
Language English	<ul style="list-style-type: none"> Officers or civilian Lecturers: <ul style="list-style-type: none"> English: Common European Framework of Reference for Languages (CEFR) Level B2 or min. NATO STANAG 6001 Level 3. Expertise in relevant topics. Relevant academic publications.

Prerequisites for international participants	Goal of the Module
<ul style="list-style-type: none"> English: Common European Framework of Reference for Languages (CEFR) Level B1 or NATO STANAG Level 2. At least 1 year of national (military) higher education. Basic knowledge in technical systems for security and defence 	<ul style="list-style-type: none"> Discover and understand the basic principles of Mechanics and Material Science. Learn about the geometrical characteristics of materials, the stress-strain relationship, the schematisation of real, physical elements and the loads acting them. Learn to evaluate sectional stresses and geometric characteristics of various cross-sections. Deepen the knowledge through practical applications, including modelling tools.

Learning outcomes	Know- ledge	<ul style="list-style-type: none"> Describe the basic concepts related to the mechanics of various systems, statically determinate or indeterminate and the basic concepts related to the strength of materials: stresses, strains and their relation. Identify the basic equations needed for a system to be in equilibrium and the determination of its stress diagrams. Describe the terminology allowing the student to express opinions, arguments and feedback in the field of Mechanics and Material Science;
	Skills	<ul style="list-style-type: none"> Compute the geometrical characteristics of a given cross-section, the axial stress, shear stress and bending moment diagrams in a given system. Apply the modelling tools to determine the axial stress, shear stress and bending moment diagrams in a given system and to interpret the results.
	Respon- sibility and autonomy	<ul style="list-style-type: none"> Analyse and represent various systems of bodies having different supports and being subjected to different types of actions. Promoting logical, convergent and divergent reasoning, practical applicability and evaluation in decision-making.

Verification of learning outcomes:
<ul style="list-style-type: none"> Observation: Students are evaluated during each session in order to document their understanding of the basic concept of programming languages applied in defence and security technology applications Project: Teamwork project and project defence. Test: Final examination at the end of the module.

Module details		
Main Topic	Recommended WH	Details
Introduction to Mechanics and Strength of Materials	6	Lecturer (2h) <ul style="list-style-type: none"> - the aim of the course, basic assumptions, and short history. - specific problems related to Mechanics and Strength of Materials. - classification of bodies. Applications (4h): <ul style="list-style-type: none"> - internal forces and external forces. - stresses, specific deformations, characteristic curves. - mechanical properties of materials.
Geometric characteristics	6	Lecturer (2h) <ul style="list-style-type: none"> - static moments and moments of inertia and radii of gyration. - resistance modulus. - variation of the moments of inertia when changing the reference system. Main directions and moments of inertia Applications (4h): <ul style="list-style-type: none"> - computing the geometric characteristics for various cross-section shapes (I, T, L).
Elements of Statics of Systems	6	Lecturer (4h) <ul style="list-style-type: none"> - physical model vs. mathematical model. - actions and reactions. - supports convention. Applications (2h): <ul style="list-style-type: none"> - statically determinate/ indeterminate systems. - diagrams.
Axial stress	6	Lecturer (4h) <ul style="list-style-type: none"> - tensions, specific deformations, displacements. Applications (2h): <ul style="list-style-type: none"> - calculus relations.
Shear stress and bending moment	6	Lecturer (2h) <ul style="list-style-type: none"> - shearing small section elements and the duality of tangential stresses. - simple bending, tensions, specific deformations, displacements. - calculus relations Applications (4h): <ul style="list-style-type: none"> - computations and representations of the axial stress, shear stress and bending moment diagrams for various systems. - computations and representations of the axial stress, shear stress and bending moment diagrams for a truss.
Schematisation of elements and actions. Calculation of reactions.	6	Applications (6h): <ul style="list-style-type: none"> - schematisation of static determinate and indeterminate systems of actions and supports. - equilibrium equations and calculation of the reactions.
Modeling a static system and obtaining the stress diagrams	6	Applications (6h): <ul style="list-style-type: none"> - defining material properties. - choosing and defining section properties. - choosing and modelling the right support conditions for a system. - obtaining and interpreting the stress diagrams.
Total WH	42	
Additional hours (WH) to increase the learning outcomes		

Self-Studies and syndicate work	33	<ul style="list-style-type: none"> Enhancing knowledge by studying specific documents. Preparation for the group project. Teamwork for the group project. Those hours comprise the work of students in laboratories and exercises to improve skills and consolidate knowledge.
Total WH	75	

List of Abbreviations:

B1, B2 CEFR Levels
 CEFR Common European Framework of Reference for Languages
 ECTS European Credit Transfer and Accumulation System
 GUI Graphical User Interface
 ODE Ordinary Differential Equations
 WH Working Hour