INTERNATIONAL TECHNICAL SEMESTER

42nd Meeting of the Implementation Group for the European Initiative for the Exchange of Young Officers (inspired by Erasmus)

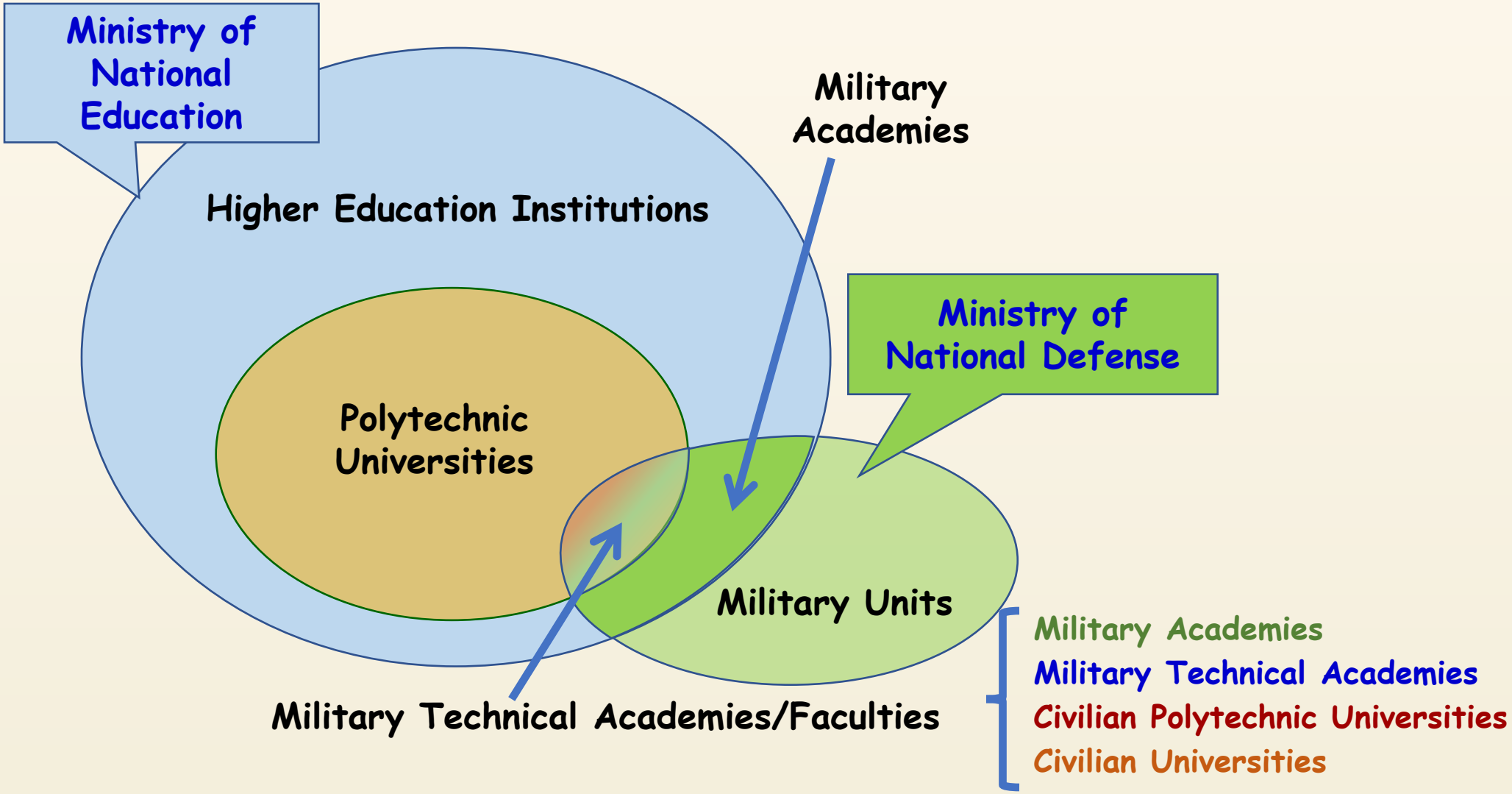
23 - 24 May 2019

AUSTRIA

INTERNATIONAL TECHNICAL SEMESTER

CHALLENGES

1. Military Technical Academies/Faculties have as mission the training of **engineer officers**.



INTERNATIONAL TECHNICAL SEMESTER

CHALLENGES

2. Military Technical Academies/Faculties develop and conduct higher education study programs organized in undergraduate, master and/or PhD studies in **a high number of fields and specializations**:

- Armament, Ammunition and Missiles Engineering;
- Aerospace Engineering;
- Automotive Engineering;
- Military Engineering;
- Civil Engineering;
- Geomatics;
- Electronic Engineering;
- Telecommunication and Information Technology;
- Computers and Information Technology;
- System Engineering, etc.





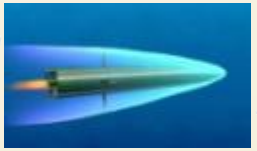
















INTERNATIONAL TECHNICAL SEMESTER

CHALLENGES

3. Bachelor's programs of study structure (Military Technical Academy "Ferdinand I"):

Military science courses	Topography, Warfare and Cybersecurity, Weapon Systems Military Training etc
Specialty courses	Artillery Engineering, Aerospace Engineering Automotive Engineering, Telecommunication Engineering Computer Science Engineering etc
Courses in the field of study	Basic in Mechanical Engineering courses Basic in Electronic and Computer Science courses etc
Complementary courses	Intercultural Communication, English, French, Sport etc
Basic engineering courses	Mathematics, Physics, Chemistry, Computer programming languages etc

Difficulties to establish **common courses** for **all engineering branches** in order to organize an **International Technical Semester**.

INTERNATIONAL TECHNICAL SEMESTER

Types of International Technical Semester

A. Basic International Technical Semester (30 ECTS, 10 modules)

Military science part (2÷3 modules)	6÷9 ECTS
Complementary part (2÷3 modules)	6÷9 ECTS
Basic engineering part (4÷6 modules)	12÷18 ECTS

Remarks:

- the same ITS for all engineering branches;
- the same ITS could be organized in many partner academies;
- this type of ITS will be useful only for the students/cadets from the first years of study (bachelor);
- the technical specific courses (specialty courses) will not be included in the ITS;
- the experimental/numerical courses couldn't be included in the ITS;
- teachers and staff from technical departments will not be involved in ITS.

INTERNATIONAL TECHNICAL SEMESTER

Types of International Technical Semester

B. International Technical Semesters with optional technical part (30 ECTS, 10 modules)

Military science part (2÷3 modules)	6÷9 ECTS
Complementary part (2÷3 modules)	6÷9 ECTS
Optional technical part (2÷3 modules)	6÷9 ECTS
Basic engineering part (2÷3 modules)	6÷9 ECTS

Remarks:

- students from all the engineering branches could take part in ITS;
- each partner could organize the same ITS with different active modules;
- teachers/staff from all the technical departments will be involved in ITS in the home institution or in the partner institutions.

Examples of optional technical modules:

- weapon systems modules
- aerospace engineering modules
- automotive engineering modules
- computer science modules
- telecommunication modules
- civil engineering modules
- etc

INTERNATIONAL TECHNICAL SEMESTER

Types of International Technical Semester

C. Interdisciplinary International Technical Semester (30 ECTS, 10 modules)

Military science part (2÷3 modules)	6÷9 ECTS
Interdisciplinary scientific project	6÷9 ECTS
Basic engineering part (2÷3 modules)	6÷9 ECTS
Complementary part (2÷3 modules)	6÷9 ECTS

Remarks:

- students from all the engineering branches could take part in ITS;
- each partner could organize the same ITS with different interdisciplinary scientific projects;
- students/cadets from different branches will work together on the same project;
- teachers/staff from all the technical departments could be involved in ITS in the home institution or in the partner institutions.

Examples of interdisciplinary scientific projects:

- *multiple launch rocket systems effectiveness* (aerodynamics, ballistics, mechanics, computer science, etc)
- *blast effect and mitigation* (mechanics, military engineering, ammunition)
- *structural and aerodynamic analysis of composite wing* (aerodynamics, mechanics)

INTERNATIONAL TECHNICAL SEMESTER

Partners for International Technical Semester

1. Military University of Technology Warsaw, Poland

POC: Col. **Mariusz Gontarczyk** (mariusz.gontarczyk@wat.edu.pl)

- **Faculty of Cybernetics**
  - *Computer Science, Cryptology and Cybersecurity*
- **Faculty of Electronics**
  - *Electronics and Telecommunications*
- **Faculty of Civil Engineering and Geodesy**
  - *Construction, Geodesy and Cartography*
- **Faculty of Mechanical Engineering**
  - *Biocybernetic and Biomedical , Mechanical Engineering*
- **Faculty of Logistics**
  - *Logistics*
- **Faculty of Mechatronics and Aviation**
  - *Safety, Weapons, Aviation and Mechatronic Engineering*
- **Faculty of New Technologies and Chemistry**
  - *Chemistry and Materials Engineering*
- **Institute of Optoelectronics**
  - *Space and Satellite Engineering*

INTERNATIONAL TECHNICAL SEMESTER

Partners for International Technical Semester

2. Military Technical Academy "Ferdinand I" of Bucharest, Romania

POC: Capt.cdr. **Cristian-Emil Moldoveanu** (cristian.moldoveanu@mta.ro)
L.Col. **Alin-Constantin Sava** (alin.sava@mta.ro)

➢ **Faculty of Integrated Weapon Systems , Military Engineering and Mechatronics**

- *Armament, artillery equipment and fire control systems,*
- *Aircraft armaments, missile, ammunition and rescue systems,*
- *Ammunition, rockets, explosives and powders,*
- *Energetic materials and NBC defense,*
- *Constructions and Fortifications, Roads, Bridges and Military Infrastructures,*
- *Topogeodesy and topogeodetic support automation (geomatics) ,*
- *Technical systems for landmine barriers, destruction and camouflage)*

➢ **Faculty of Aircraft and Military Vehicles**

- *Aircraft and aircraft engines*
- *Avionic equipment and installations*
- *Armored vehicles automobiles and tractors*
- *Command and control systems and equipment for auto-vehicles*)

➢ **Faculty of Communications and Electronic Systems for Defense and Security**

- *Communications for Defense and Security*
- *Equipment and Military Electronic Systems*
- *Equipment and Military Electronic Systems – Aviation Radio-Electronics*

➢ **Faculty of Information Systems and Cybersecurity**

- *Computer Sciences and Information Systems for Defense and National Security/Cybersecurity*

INTERNATIONAL TECHNICAL SEMESTER

Partners for International Technical Semester

3. "Vasil Levski" Military National University, Bulgaria

POC: Col. **Coni Conev** (coni19@abv.bg)

- **Artillery, Air Defense and CIS Faculty, Shumen**
  - *Artillery and Anti-Aircraft Missile, Weapons, Optics and Arms*
  - *Communications and IT Systems*

4. Portuguese Air Force Academy, Lisbon, Portugal

POC: Maj. **Luis Félix** (LFFelix@emfa.pt)

- *Aeronautics Engineering*
- *Electronic Engineering*
- *Infrastructures*

5. Italian Air Force Academy, Pozzuoli, Italy

POC: L.Col. **Dario de Dominicis** (dario.dedominicis@aeronautica.difesa.it)
Maj. **Gennaro Cerullo** (gennaro.cerullo@aeronautica.difesa.it)
Lt.Col. **Mauro Nazzi** (mauro.nazzi@aeronautica.difesa.it)
Col. **Antonio Massimo** (antonio.massimo@aeronautica.difesa.it)

- *Aerospace Engineering,*
- *Electronic Engineering*
- *Civil Engineering*
- *ICT Engineering*.

INTERNATIONAL TECHNICAL SEMESTER

Partners for International Technical Semester

6. Hellenic Air Force Academy, Athens, Greece

POC: Maj. **Ilias Papadopoulos** (erasmus.hafa@haf.gr)
Assoc. **Prof. Ioannis Templalexis** (i.templalexis@yahoo.gr)

- *Aeronautic Engineering*
- *Electronic and Telecommunications Engineering*
- *Infrastructures*

- other partners ….?

Type of partners *(provide information about the level of implication in ITS)*

- implement the ITS in the home institution
- staff from the home institution will support other partners in implementing the ITS
- students/cadets will take part in ITS
- other ….?

PILOT
INTERNATIONAL SEMESTER
"DEFENCE AND SECURITY TECHNICAL SYSTEMS"

18th March – 30th June 2019

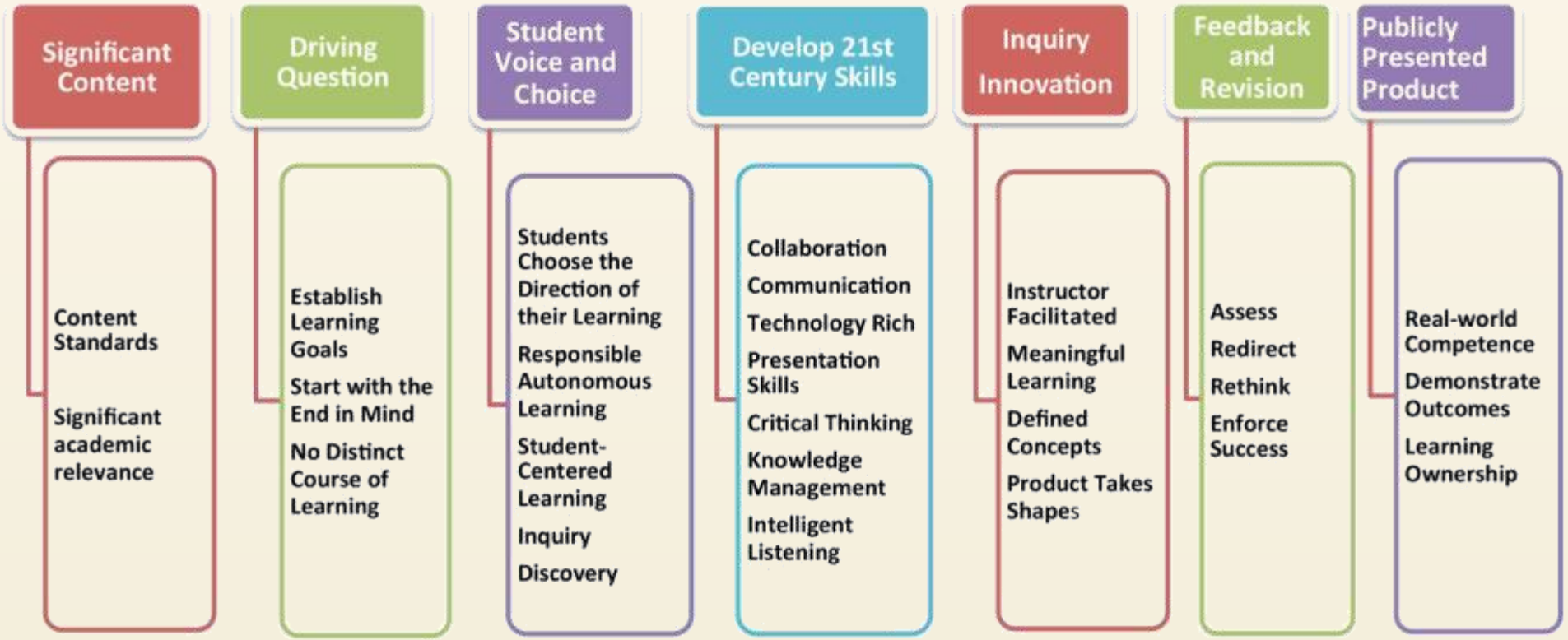
Military Technical Academy „Ferdinand I" of Bucharest, Romania

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

TEACHING OBJECTIVES

➢The **teaching objective of the International Semester** is to prepare the participants for the acquisition of professional and transversal competencies that allow them to ***develop projects in the field of technical defence and security systems*** in international, multidisciplinary and multicultural teams.

PROJECT BASED LEARNING



INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

COMPETENCIES

➢ **Professional competencies**:

- analysis of the constructive-functional principles of technical systems;
- modeling and simulation of phenomena and processes specific to technical systems;
- designing the main components and/or manufacturing technologies for technical systems;
- testing, assessing and ensuring the quality of technical systems for defence and security;
- management of technical defence and security projects.

➢ **Transversal competencies**:

- responsible execution of professional tasks based on documentation, logical reasoning, practical applicability, evaluation, self-evaluation and optimal decision;
- performing activities and employing specific teamwork roles on different responsibilities, as well as assigning tasks for subordinate levels based on communication, cooperation, mutual respect, and using the feedback to improve their own work and the spirit of initiative;
- professional communication in a multidisciplinary, multicultural and international context.

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"

18th March – 30th June 2019

CURRICULUM

No.	COURSES	ECTS
1.	Project Management	2
2.	Methods and Tools of Modeling and Simulation of Technical Systems	2
3.	Sensors, Acquisition and Data Processing Systems	2
Basic engineering part		**6**
4.	Intercultural and Professional Communication	2
5.	Romanian Language for International Students/ English Language – Specialized Technical Terminology	2
Complementary part		**4**
6.	Complements of Engineering	2
7.	Scientific Project Elaboration	18
Interdisciplinary scientific project		**20**
8.	Armament Systems	2
9.	Electronic Warfare and Cyber Security Elements	2
Military science part		**4**
TOTAL		**34**

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

BASIC ENGINEERING PART

Project Management

No.	Main topic	Working hours	Details
Course			
C1	Defining and using project management process	2	- defining projects - understanding the project management process - establishing objectives and goals
C2	Project planning and estimating	2	- Gantt charts - resource allocation
C3	Project teams	2	- team management, motivation, retention - the role, responsibilities and skills of the team members
C4	Project risk management	2	- risk identification - risk management tactics, including risk avoidance, risk transfer, risk reduction and risk mitigation
C5	Progress monitoring, project control, and reporting	2	- the stages of the project control lifecycle - monitoring and control of project - impact on the project of changes to project plan
TOTAL		**10**	
Seminar			
S1	Project planning	2	- use of Gantt charts - apply the resource allocation for a project
S2	Project team management	2	- establish the role and responsibilities of the team members
S3	Project risk management	2	- risk identification - risk management tactics, including risk avoidance, risk transfer, risk reduction and risk mitigation
S4	Progress monitoring	2	- monitoring and control of project
S5	Project reporting	2	- project reporting
S6	Final evaluation	2	- final evaluation
TOTAL		12	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"

18th March – 30th June 2019

BASIC ENGINEERING PART

Methods and Tools of Modeling and Simulation of Technical Systems

No.	Main topic	Working hours	Details
Course			
C1	Introduction to *Methods and Tools of Modeling and Simulation of Technical Systems*	2	-physical model versus mathematical model; basic notions about static and dynamic actions with examples; - aspects of the finite element method; examples of modeled systems in various branches of engineering.
C2	Motion simulation of systems	2	- systems with 1 dynamic degree of freedom (DDoF); systems with multiple dynamic degrees of freedom (
C3	Models for structural systems	2	- linear, surface and volume elements; frame systems; dual systems; principles for choosing the correct system model.
C4	Models for actions – static case	2	- permanent loads; variable loads; engineering codes: Eurocodes and the Romanians norms.
C5	Models for actions – dynamic case	2	- introductory notions about earthquake engineering and the seismic activity at a global level; causes and effects of Earthquakes: seismic waves models; seismic motion simulation and seismic response of systems; - design spectra.
TOTAL		**10**	
Laboratory			
L1	Introduction to finite element method software solutions	2	- the software solutions for modelling and analyzing various technical systems; ETABS solution and SAP solution.
L2	Modeling the system	2	- defining material properties; choosing and defining sections properties; choosing and modeling the right support conditions for a system; modeling a multistory concrete frame building.
L3	Modeling the actions on the system	2	- defining the load cases; defining the load combinations; introduction the dynamic force with two methods. Discussion.
L4	Analyzing the system	2	- verifying/ controlling the model; optimizing the model; analyzing the model and obtaining: axial force diagram, shear force diagram, bending moment diagram, displacements; discussions.
L5	Individual project theme	2	- each student will receive a structural system to model.
L6	Final evaluation	2	- final evaluation.
TOTAL		**12**	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

BASIC ENGINEERING PART

Sensors, Acquisition and Data Processing Systems

No.	Main topic	Working hours	Details
Course			
C1	Sensors fundamentals. Data acquisition.	2	Sensors characteristics. Most common used sensors in defence systems. Data Acquisition Systems.
C2	Applications in defence systems I	2	Automotive and Aerospace Applications. Electronic Defence Systems Applications. Intrusion Detection Systems for Perimeter Security Applications.
C3	Applications in defence systems II	2	Robotics Applications. Defence Wearable Sensors.
C4	Advanced integrated on board data displaying systems for aircrafts – EFIS, EICAS	2	Main architectures; Data streams: acquisition, processing, displaying; Data aggregation: symbols, complex pages, contextual grammars for data displaying.
C5	Data acquisition and aggregation for on board satellite radio-navigation systems for aircrafts	2	Satellite radio-navigation systems architectures – satellite segment; Satellite radio-navigation systemsarchitectures – command and control segment; Data streams – content; Errors – assessment and handling.
TOTAL		**10**	
Laboratory			
L1	Sensing	2	Sensor and Signals; Signal Conditioning
L2	Signal Processing	2	Analog to Digital Conversion; Sampling
L3	On board data acquisition, processing and displaying in real environment	2	On board data acquisition, processing and displaying: rotary wings autonomous platforms architectures.
L4	On board data acquisition, processing and displaying in real environment	2	On board data acquisition, processing and displaying: fixed wings autonomous platforms architectures.
L5	On board and ground aircraft communications	2	Communication streams for autonomous aerial platforms; Command and control stream; Telemetry stream; Audio-video stream.
L6	Final evaluation	2	Final evaluation
TOTAL		12	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

COMPLEMENTARY PART

Intercultural and Professional Communication

No.	Main topic	Working hours	Details
Course			
C1	Foundations of Intercultural and Professional Communication	2	The Global Perspective of Intercultural Communication; Why Communicate across Cultures? - The Self Awareness Imperative; The Technological Imperative; The Peace Imperative; The Ethical Imperative
C2	Culture, Military Communication, Context and Power	2	Military Communication in Intercultural Contexts; What Constitutes a Culture? The Relationship Between Culture and Communication; The Relationship Between Communication and Context; The Relationship Between Communication and Power
C3	Identity and Intercultural Communication	2	Social and Cultural Identities; Personal Identity; Multicultural People; Identity, Stereotypes and Prejudices
C4	Language, Globalization and Nonverbal Codes	2	Cultural Variations in Communication Style; Multilingualism; The Power "Effects" of Labels ; The Universality of Nonverbal Behavior; Nonverbal Military Communication
C5	Intercultural Relationships and Conflict	2	Cross-Cultural Differences; Strategies and Tactics for Dealing with Conflict; Productive Versus Destructive Conflict - Competition Versus Cooperation
TOTAL		**10**	
Seminar			
S1	Application: Communication across Cultures	2	Obstacles of Perception ; Obstacles in Verbal Processes ; Obstacles in Nonverbal Processes
S2	Application: How Communication Reinforces Culture	2	- Communication as Resistance to the Dominant Cultural System
S3	Application: Identity Development Issues in the Military	2	Gender Identity; Sexual Identity; Age Identity; Racial and Ethnic Identities; Religious Identity; Class Identity; - National Identity; Regional Identity
S4	Application: Language and Cultural Group Identity	2	Code Switching; Language Politics and Policies; Military Terminology Challenges
S5	Application: Managing Intercultural Conflict	2	Gender, Ethnicity, and Conflict in the Army; Mediation
S6	Colloquium	2	Project presentation
TOTAL		12	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

PARTICIPANTS

No.	University	No. of cadets	No. of students	Total
1.	Military University of Technology in Warsaw, Poland	5	-	**5**
2.	„Vasil Levski" National Military University , Bulgaria	1	-	**1**
3.	IUT „Paul Sabatier", Toulouse, France	-	6	**6**
4.	Military Technical Academy „Ferdinand I" of Bucharest, Romania	3	-	**3**
TOTAL		**9**	**6**	**15**

Armament System Team

-1 cadet WAT Warsaw
- 1 cadet NMU Shumen
-2 students IUT Toulouse
-1 cadet MTA Bucharest

Military Engineering Team

-2 cadets WAT Warsaw
-2 students IUT Toulouse
-1 cadet MTA Bucharest

Aviation Team

-2 cadets WAT Warsaw
-2 students IUT Toulouse
-1 cadet MTA Bucharest

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

PARTICIPANTS

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"

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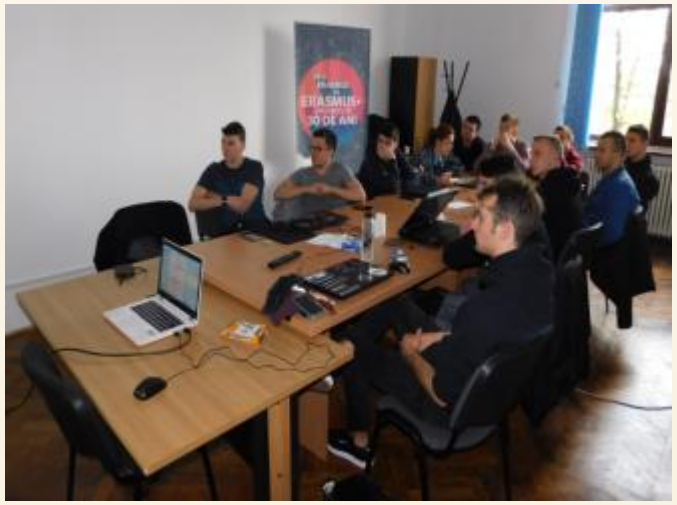
INTERDISCIPLINARY SCIENTIFIC PROJECTS



INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS

Armament System Team

-1 cadet WAT Warsaw
- 1 cadet NMU Shumen
-2 students IUT Toulouse
-1 cadet MTA Bucharest

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS
"MULTIPLE LAUNCH ROCKET SYSTEMS EFFECTIVENESS"

No.	Main topic	Working hours	ECTS	Details
1	Basics of multiple launch rocket systems	10	2	- multiple launch rocket systems; - unguided missiles.
2	Aerodynamics and external ballistics of an unguided missile	70	5	- mathematical model of forces and moments acting on a missile in flight; - CFD simulation of a flow around a missile; - modeling and simulation of the unguided missile trajectory.
3	Multiple launch rocket system oscillations	70	5	- mathematical model of a multiple launch rocket system; - numerical simulation of a multiple launch rocket system oscillation;
4	Delivery accuracy	70	5	- accuracy of the rockets; - vulnerability assessment of the targets ; - modeling and simulation of the rocket delivery accuracy.
5	Project presentation	6	1	- final project presentation
TOTAL		226	18	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS

"BLAST EFFECTS AND MITIGATION"

Military Engineering Team

-2 cadets WAT Warsaw
-2 students IUT Toulouse
-1 cadet MTA Bucharest

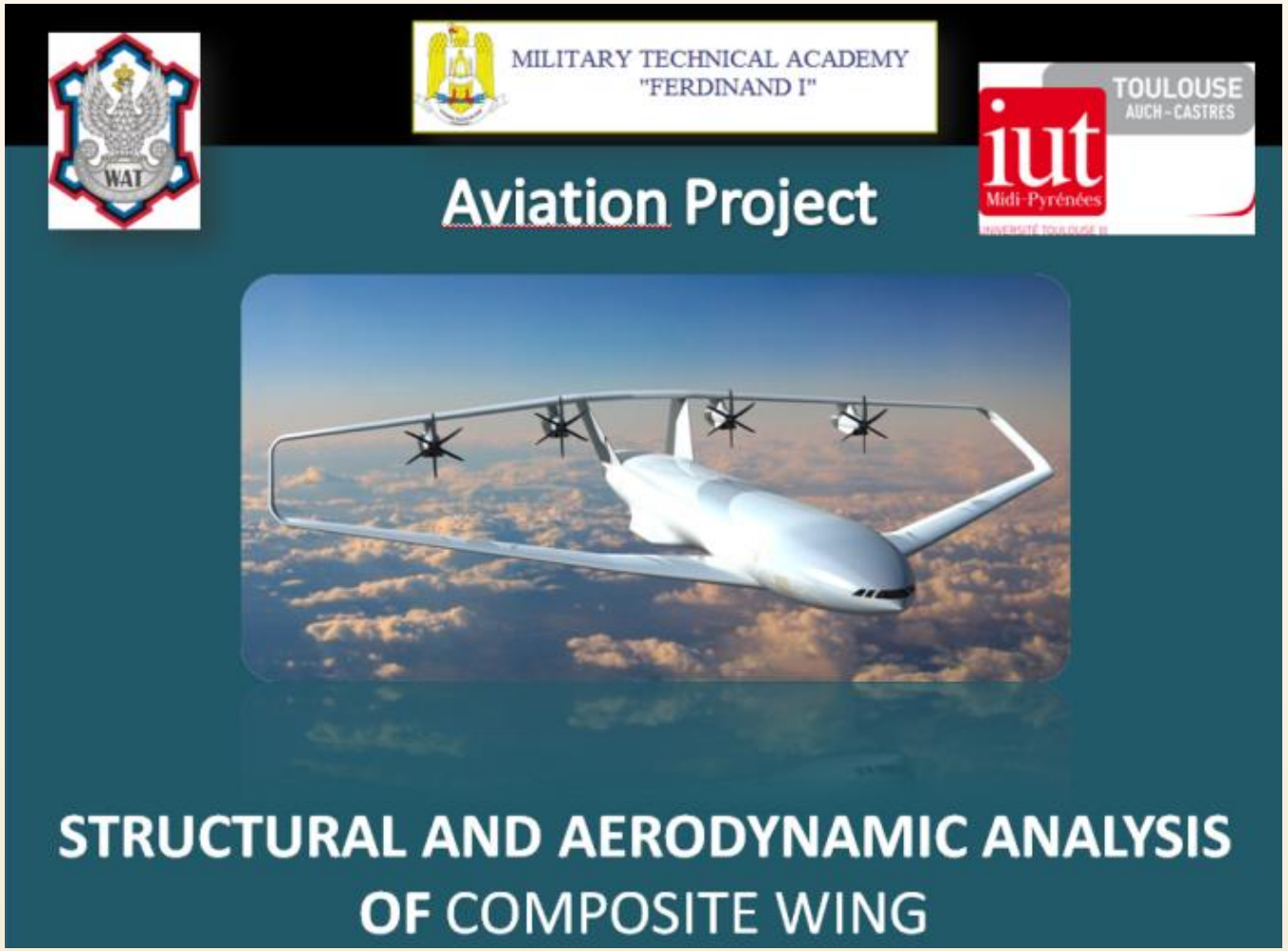
INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS
"BLAST EFFECTS AND MITIGATION"

No.	Main topic	Working hours	ECTS	Details
1	**Basics of blast effects**	10	**2**	- blast waves; - blast effects; - mitigation of blast waves.
2	**Blast waves**	70	5	- blast wave parameters. Rankine-Hugoniot relations. Normal and oblique shock. Reflected shock. Mach stem. - modeling and simulation of shock wave propagation; - experimental tests of shock waves propagation.
3	**Dynamic blast loads**	70	5	- dynamic blast loads; - dynamic pressure, drag pressure. - modeling and simulation of blast loads on structures;
4	**Blast mitigation**	70	5	- modeling and simulation of blast effects mitigation using porous material panels; - experimental tests regarding the blast wave mitigation using porous material panels
5	**Project presentation**	6	1	- final project presentation
TOTAL		226	**18**	

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS



Aviation Team

-2 cadets WAT Warsaw
-2 students IUT Toulouse
-1 cadet MTA Bucharest

INTERNATIONAL SEMESTER "DEFENCE AND SECURITY TECHNICAL SYSTEMS"
18th March – 30th June 2019

INTERDISCIPLINARY SCIENTIFIC PROJECTS
"STRUCTURAL AND AERODYNAMIC ANALYSIS OF COMPOSITE WING"

No.	Main topic	Working hours	ECTS	Details
1	Basics of composite wing	20	2	- Aerodynamics. Airfoil and wing. - Composite material. Strength of materials review, orthotropic materials, lamina calculus.
2	Composite materials	90	7	- mathematical model of lamina. - CAD modeling of lamina and laminate; - FEM simulation of laminate behaviour; - experimental determination of mechanical characteristics.
3	Aerodynamics	110	8	- mathematical model of forces and moments acting on wing; - CAD modeling of airfoil and wing; - CFD simulation of a flow around an airfoil; - CFD simulation of a flow around a wing; - experimental determination of aerodynamics characteristics.
4	Project presentation	6	1	- final project presentation
TOTAL		226	18	

INTERNATIONAL TECHNICAL SEMESTER

NEXT STEPS

INTERNATIONAL TECHNICAL SEMESTER

1. **Define a new LoD International Technical Semester (42nd IG Meeting – May 2019)**
   - LoD chairman
2. **List of partners (EUMACS – June 2019)**
   - Points of contact
   - Short description of the partner institution
   - Explain the education system for technical officers program of study (bachelor/master)
   - Previous experiences in organizing and implementing Erasmus/international projects
   - List of courses proposed to be included in International Technical Semester
3. **Defining the international technical semester structure (EUMACS – June 2019)**
   - Propose new types of ITS
   - Choose the best structure of ITS
4. **Defining the modules of international technical semester (EUMACS – June 2019)**
   - Propose modules for each part of ITS (basic engineering part, complementary part, military science part, etc)
   - Choose the modules which will be prepared during the project
5. **Defining activities /intellectual output included in the project (43rd IG Meeting – September 2019)**
   - International networks of teaching staff within each module
   - Transnational meetings
   - Didactic materials
   - Summer schools, Multiplier events, etc

INTERNATIONAL TECHNICAL SEMESTER

6. Erasmus+/bilateral agreements between partners (before 43rd IG Meeting – September 2019)

7. Defining the role of each partner in the project (43rd IG Meeting – September 2019)

8. Draft of KA203 Application form (44th IG Meeting – December 2019)

9. Signature of the Strategic Partnership agreement (44th IG Meeting – December 2019)

10. Final form of KA203 Application form (45th IG Meeting – February 2020)

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THANK YOU FOR YOUR ATTENTION!