Erasmus + course on Aerospace Engineering level 1 in the fall semester 2024/2025 at the Faculty of Mechatronics, Armament, and Aerospace

Name of the course	ECTS	Semester	Cycle	Language
Foreign language	2 ECTS;	Fall	Bachelor	English
Metrology	2 ECTS;	Fall	Bachelor	English
Physics	4 ECTS;	Fall	Bachelor	English
Electrical Engineering and Electronics	6 ECTS;	Fall	Bachelor	English
Engineering Mechanics	6 ECTS;	Fall	Bachelor	English
Strength and Materials Science Laboratory	2 ECTS;	Fall	Bachelor	English
Mathematics	5 ECTS;	Fall	Bachelor r	English
Human Factor	1 ECTS;	Fall	Bachelor	English
Aviation Law and Regulations	2 ECTS;	Fall	Bachelor	English

Foreign language:

Structural-grammatical material: revision, expansion and systematisation of the following topics: grammatical tenses/ tenses of narration; active/passive voice; de-pendent speech; conditionals; question formation; collocations; com-pound sentences; word order in a sentence; modal verbs; phrasal verbs. Conceptual-functional material: requests; suggestions; offers; advice; consent/refusal; negations; agree/disagree; ex-pressing opinion, cause/effect; reason/purpose; wishes, apology; summary; choice of register/style, specialized language

Metrology 2 – WMTLYCSI-Me-2:

Measurement of electrical quantities. Measurement of geometrical quantities Measurement of non-electrical quantities by electrical methods. Measurement of transducers in mechatronic systems.

Physics 2 – WMTLYCSI-P-2:

Discussing the basic concepts and laws governing electric current. Introducing the concepts of magnetic field and the quantities describing it and comparing with electrostatic and gravitational fields. Discussing the electromagnetic field and its laws. Introducing the basic concepts of optics. Discussing the corpuscular-wave dualism of radiation. Discussing the structure of atom including quantum concepts. Introducing the concept of corpuscular-wave dualism of matter. Discussing the principle of laser construction and features of laser light. Learning the fundamentals of solid state physics, introducing a band model, discussing basic physical phenomena in semiconductors. Discussing the structure of the atomic nuclei, phenomena and laws of radioactivity and reactions of heavy nuclei fission and synthesis of light nuclei

Electrical Engineering and Electronics – WMTLYCSI-EEE:

Basic concepts and laws of electrical engineering, methods of analysis of DC and AC circuits. Basic electronic components and their application in circuits. Basics of construction and analysis of electrical circuits, necessary for synthesis and analysis of more complex electrical and mechatronic systems. DC and AC electric circuits. Methods of analysis and design and

determination of basic parameters and characteristics. Principles of operation of selected DC and AC machines. Basic electronic components and systems, their parameters and characteristics.

Engineering Mechanics – WMTLYSCI-EM:

Statics includes the concepts and principles of statics, reduction of force systems and equilibrium conditions, laws of friction and the calculation of centres of gravity. Strength of materials includes the basic concepts of strength of materials, tension, compression, bending, torsion and buckling, characterisation of multidimensional

Strength and Materials Science Laboratory – WMTLYCSI-SaMSL:

Experimental determination of strain and stress in a selected section of a bending beam. Experimental verification of the formula determining the deflection line of a bending beam. Calculation of reactions of a statically indeterminate structure. Experimental determination of material constants, i.e. Young's modulus and Poisson's number of a metal sample. Experimental determination of critical force in a compression bar. Thermal analysis of alloys. Microscopic examination of the structure of steels, cast steels and cast irons. Microscopic examination of non-ferrous metal alloys. Dilatometric analysis of metals. Measurements of metal hardness. Examination of hardiness of steel. Precipitation strengthening of aluminium alloys. Density testing of porous materials and powders.

Mathematics 4 – WMTLYCSI-M-4:

Probability calculus. Basic probability distributions and their applications. Mathematical statistics and its application in experimental research. Using numerical methods in probability calculus and statistics.

Human Factor – WMTLCSI-HF:

Necessity to consider human factors, incidents influenced by human factors/human error, Murphy's Law. Formation of executive processes and activities. The role of training and habits. Human capabilities and limitations. Vision, lighting, hearing, association and inference, concentration and perception, memory, claustrophobia and physical limitations, health hygiene, nutrition. Social psychology (sociology). Responsibility: individual and group, motivation and inhibition of motivation, group pressure on the individual, cultural background/influences, working in groups, management, supervision and leadership. Factors affecting the performance capabilities. Physical fitness/health, stress: domestic and work related, time pressure and deadlines, workload: excess and lack, sleep and fatigue, shift work, alcohol, medication, drugs. Surrounding environment. Noise and fumes, lighting, climate and temperature, movement and vibration, working conditions. Tasks/activities. Physical work, repetitive activities, visual inspection, complex systems. Communication. Communication within and between teams, work distribution and recording, updating, information circulation, sharing information (access levels). Human error. Models and theories of error, types of error in maintenance activities, consequences of errors (e.g. accidents), avoiding and controlling errors. Hazards in the workplace. Recognising and avoiding hazards, dealing with emergency situations.

Aviation Law and Regulations – WMTLYCSI-ALR:

General knowledge of law. Areas and branches of law. The system of law in Poland - basic legal acts. The European Union and Community law. Aviation law - basic concepts and subject matter. A history of aviation law. Applicable regulations of the national and international aviation law. Conventions and legal systems in international aviation law - International Civil Aviation Organisation (ICAO). Selected problems of law jurisdiction in the field of aviation law. The concept of common aviation regulations in the European Union and the role and importance of EASA. National aviation law - the 'Aviation Law' Act. Relationship between 'civil' EASA Part and military Mil Part regulations. Principles and legal basis for the operation and management of continuing airworthiness of aircraft regulations: Part-M continuing airworthiness requirements. Part-145 regulations, approved maintenance organisations. Air transport regulations: Part OPS, Part-AWO, Part - MMEL and Part - MEL. ATA Maintenance Specifications 100/104. Applicable documentation and document specimens.