Curriculum

Field of study: Space Engineering

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General characteristics of the field of study

Basic information

Faculty name:	Faculty of Space Technologies
Field of study:	Space Engineering
Level:	First-cycle (engineer) programme
Profile:	General academic
Form:	Full-time studies
ISCED classification:	0716
Number of ECTS credits necessary to complete studies at a given level:	210
Professional title awarded to graduates:	inżynier
Cycle start date:	2026/2027, winter semester
Duration of studies (number of semesters):	7

Field of science to which the field of study is assigned:

Field engineering and technical sciences

Discipline of science to which the field of study is assigned:

Discipline	Percentage	ECTS
Automation, electronic, electrical engineering and space technologies	77%	162
Mechanical engineering	10%	22
Technical computing and telecommunications	8%	16
Material Engineering	5%	10

Relationship between the field of study and the development strategy and mission of the university

The Space Engineering study programme is fully aligned with the development strategy of AGH University of Science and Technology and with the mission of AGH as a leading technical university with a strong research, innovation, and international profile. The programme directly supports the strategic objectives of AGH in educating highly qualified engineering specialists, conducting research at an international level, and actively contributing to the development of a knowledge-based and innovation-driven economy.

The proposed programme corresponds to AGH strategic priorities related to the development of advanced technologies, systems engineering, digital transformation, artificial intelligence, cybersecurity, and space and dual-use technologies, which constitute key areas for scientific, industrial, and societal development at the national and European levels. The curriculum combines strong scientific and engineering foundations with advanced competencies in the design, integration, verification, and operation of complex technical systems, in line with the mission of AGH to educate engineers capable of solving complex technological challenges.

The Space Engineering programme also reflects AGH strategic goals in the area of internationalisation of education and research. The programme is delivered fully in English, follows European qualification frameworks (EQF/PRK) and relevant international engineering standards (e.g. ECSS), and prepares graduates for work in international research and industrial environments, including the European and global space sector. The curriculum supports student participation in international projects, academic mobility schemes, and collaborative research and development initiatives with international partners.

A key element of the programme’s alignment with the AGH strategy is its strong emphasis on practice-oriented education, project-based learning, and cooperation with the socio-economic environment. The curriculum makes extensive use of laboratories, simulations,

engineering projects, internships, and bachelor theses closely connected with ongoing research and industrial activities. This approach supports AGH's strategic mission of knowledge and technology transfer, innovation development, and close cooperation with industry.

The Space Engineering programme supports the AGH mission of responsible and sustainable technological development as well. The curriculum addresses ethical, environmental, legal, and societal aspects of engineering activities, including the sustainable use of outer space, mission safety, space governance, and the broader societal impact of space technologies. In this way, the programme contributes to educating engineers who are not only technically competent but also socially responsible and aware of the global implications of advanced technologies.

Information on taking into account the socio-economic demand while creating the curriculum and indication of the assumed learning outcomes matching the identified demand

The Space Engineering study programme has been developed in response to clearly identified socio-economic needs related to the dynamic growth of the space sector and its strategic importance for industry, public services, security, and environmental monitoring. Space systems form a critical technological infrastructure supporting satellite communication, navigation, Earth observation, climate analysis, and crisis management, creating strong demand for engineers capable of designing, integrating, and operating complex, safety-critical systems in extreme environments. The programme learning outcomes emphasise competencies in spacecraft and satellite systems, mission architecture, ground and orbital segments, verification and validation, reliability, and mission operations. Graduates are prepared to work with tightly coupled hardware-software systems, subject to strict performance, safety, and regulatory constraints that are characteristic of space missions. Learning outcomes in the areas of embedded systems, autonomy, artificial intelligence, and cybersecurity are explicitly framed within the context of space missions and infrastructure protection. These competencies support socio-economic needs related to the secure operation of orbital assets, resilience of space-based services, and protection of critical space infrastructure. The programme further incorporates knowledge of international standards, space governance, and sustainability, responding to societal expectations for responsible and long-term use of outer space. Through its strong emphasis on project-based education, laboratory work, and mission-oriented problem solving, the programme ensures that graduates acquire practical skills directly applicable to the space sector and related high-technology industries. The alignment between the intended learning outcomes and socio-economic needs enables graduates to contribute effectively to industrial projects, research initiatives, and public-sector activities connected with space systems, mission operations, and advanced technological infrastructure.

Education paths – scope in Polish and in English

The study programme follows a unified curriculum structure and does not differentiate into separate education paths.

Graduation paths – scope in Polish and in English

The study programme does not define separate graduation paths.
All students follow a unified graduation process

The names of the majors in Polish and in English

Name [pl]	Name [en]

General information about the curriculum

Field of study: Space Engineering

General information related to the curriculum (general learning objectives and employment opportunities, typical jobs and opportunities for graduate continuing education)

The Space Engineering study programme is a first-cycle (Bachelor of Engineering) programme designed to provide students with a comprehensive and system-oriented education in space technologies. The primary educational objective of the programme is to prepare graduates to understand, design, integrate, test, and operate complex space systems, including spacecraft, satellites, ground segments, and mission control infrastructures. The curriculum combines strong scientific and engineering foundations with practical competencies in systems engineering, mission lifecycle management, hardware-software integration, reliability, and safety-critical operations. The programme places particular emphasis on the multidisciplinary nature of space engineering, integrating knowledge and skills from mechanics, electronics, embedded systems, software engineering, data processing, artificial intelligence, and cybersecurity, always within the specific context of space missions and extreme operational environments. Graduates are trained to work with tightly constrained systems subject to strict performance, safety, and regulatory requirements, which distinguishes the programme from general-purpose engineering or information technology degrees. Graduates of the Space Engineering programme are prepared for employment in a wide range of space-related and high-technology sectors. Typical employment opportunities include positions in companies involved in satellite and spacecraft design and manufacturing, space mission operations centres, ground segment and communication infrastructure providers, Earth observation and navigation services, as well as research institutes and laboratories working on space technologies. Graduates may also find employment in organisations responsible for the security, monitoring, and operation of critical space and dual-use infrastructure, as well as in high-technology industries closely related to the space sector. The programme also provides a solid foundation for further education. Graduates are well prepared to continue their studies in second-cycle (Master's) programmes in areas such as space technologies, mission safety and cybersecurity, aerospace systems, robotics and autonomous systems, or related interdisciplinary fields. The acquired competencies also enable graduates to pursue professional certifications and engage in lifelong learning within the rapidly evolving space and high-technology sectors.

Information on including the conclusions from the students and graduates careers monitoring in the curriculum

The study programme has been designed with reference to analyses of labour market needs and the outcomes of graduate career monitoring conducted at the institutional level. General conclusions drawn from monitoring the professional careers of graduates of related engineering and technology programmes have been taken into account in defining the programme objectives, learning outcomes, and curriculum structure.

Particular emphasis has been placed on the development of competencies identified as important for graduate employability, including strong engineering foundations, interdisciplinary skills, practical project experience, and familiarity with industry-relevant standards and tools. These elements reflect observed career paths of graduates entering high-technology industries, research institutions, and innovation-driven sectors.

As a newly established programme, Space Engineering will be subject to systematic monitoring of student and graduate career paths. The results of future analyses will be used as an input for periodic programme review and continuous improvement, ensuring that the curriculum remains aligned with evolving labour market needs and career development trends.

Information on including the requirements and recommendations of the accreditation committees, in particular the Polish Accreditation Committee and industry accreditation committees in the curriculum

The study programme has been designed in accordance with the applicable national regulations and the quality assurance standards set out by the Polish Accreditation Committee (Polska Komisja Akredytacyjna). The structure of the curriculum, the formulation of programme learning outcomes, the allocation of ECTS credits, and the methods of teaching and assessment are aligned with the requirements for first-cycle programmes of an academic profile.

The programme takes into account the general guidelines and good practices recommended by accreditation bodies, including those related to outcome-based education, student workload, transparency of assessment, and continuous quality improvement. Particular attention has been paid to ensuring coherence between learning outcomes, curriculum content, teaching methods, and assessment procedures, in line with the expectations of accreditation and quality assurance frameworks.

As a newly established programme, the Space Engineering curriculum has been developed with the intention of full compliance with the standards applied by the Polish Accreditation Committee and relevant sectoral accreditation bodies. The programme is subject to ongoing monitoring and periodic review, and it will be updated as necessary to reflect future recommendations and evolving accreditation requirements.

Information on including examples of good practice in the curriculum

The curriculum is designed in accordance with well-established approaches used in space agencies, research institutions, and high-technology industries, ensuring that students are exposed to professional methods and workflows already applied in real mission environments. Good practices are reflected in the programme through the adoption of a systems engineering approach, covering the full lifecycle of space missions, from concept definition and requirements engineering to system integration, verification, validation, and operational phases. The programme draws on internationally recognised standards and guidelines, such as those developed within the European space sector (e.g. ECSS), which are introduced and applied in coursework, laboratory classes, and project-based activities. The curriculum also incorporates good practices related to project-based learning and teamwork, widely used in engineering education and industry. Students work on multidisciplinary projects that mirror real space mission scenarios, including subsystem integration, interface management, and trade-off analysis. Laboratory activities and simulations follow professional engineering procedures, emphasising documentation, testing, configuration control, and quality assurance. Furthermore, the programme integrates good practices in the areas of safety, reliability, and responsible use of space, including risk analysis, mission assurance, cybersecurity, and sustainability considerations such as space debris mitigation. Exposure to these practices prepares students to operate in highly regulated and safety-critical environments characteristic of space engineering. By embedding these good practices throughout the curriculum, the Space Engineering programme ensures that graduates acquire not only theoretical knowledge but also professional habits, engineering discipline, and system-level thinking consistent with expectations of the space sector and related high-technology industries.

Information on cooperation in the preparation of the curriculum with external stakeholders, in particular associations, professional and social organizations

The Space Engineering study programme has been developed in cooperation with external stakeholders representing the space sector and related high-technology domains. The programme design process took into account feedback from industry practitioners, research organisations, and professional communities involved in the development, operation, and regulation of space systems. This cooperation ensured that the curriculum reflects current technological trends, professional standards, and labour-market expectations. In particular, the programme was consulted with representatives of space-related companies, research institutes, and professional and scientific associations active in the space and aerospace domains. Their input contributed to the definition of the programme’s educational objectives, the selection of key technical areas, and the emphasis on system-level engineering competencies, mission lifecycle understanding, and practical, project-oriented learning. The involvement of external stakeholders also influenced the inclusion of multidisciplinary and application-oriented content, such as systems engineering, mission operations, safety and reliability, cybersecurity, and sustainability of space activities. These areas reflect the expectations of professional organisations and industry bodies regarding the competencies required of graduates entering the space sector and associated high-technology industries. Furthermore, ongoing cooperation with external stakeholders is planned throughout the programme’s implementation. This includes participation of industry and professional representatives in guest lectures, consultations on curriculum updates, supervision of student projects, and collaboration within student scientific associations and mission-oriented initiatives. Such cooperation supports continuous improvement of the study programme and ensures its long-term relevance to socio-economic and professional needs.

Duration, rules and form of the practical placement

As part of the study programme, students are required to complete a professional apprenticeship of at least four weeks’ duration during the summer break following the sixth semester of study.

The professional apprenticeship contributes directly to the achievement of programme learning outcomes, particularly in the areas of practical engineering skills, teamwork, professional responsibility, and understanding of real-world space system operations.

The apprenticeship is completed individually at a company selected by the student, provided that the company’s activities are related to space engineering. Eligible areas include, in particular, spacecraft and satellite design, propulsion and power systems, avionics, payload and instrumentation development, robotics and autonomous systems, mission control and operations, data engineering, applied artificial intelligence for mission systems, space cybersecurity, satellite telecommunications, Earth observation services, AI- and data-driven industries, as well as dual-use technology enterprises supporting both civilian and defence applications.

Admission criteria, rules and policies

Field of study: Space Engineering

Description of competences expected from the candidate applying for admission to studies

Applicants to the first-cycle Space Engineering programme are expected to demonstrate a solid foundation in mathematics and physics at the secondary education level, as well as an interest in engineering, technology, and space-related systems.

Candidates should possess the ability to think analytically, understand fundamental physical phenomena, and apply logical reasoning to problem solving. Basic familiarity with technical concepts, computational tools, or programming principles is considered an advantage, although no advanced prior technical specialisation is required.

Applicants are also expected to show motivation for interdisciplinary learning, combining elements of engineering, physical sciences, and information technologies, along with openness to teamwork and project-based learning. Proficiency in the English language at a level sufficient to follow technical coursework is required, as the programme is conducted entirely in English.

An interest in space technologies, satellite systems, or engineering challenges related to space missions is desirable and will support successful progression through the programme.

Recruitment conditions, including the winners and finalists of the central level high school scientific Olympics, as well as winners of international and national contests

The rules and conditions of recruitment are defined by the relevant resolution of the AGH Senate concerning the terms, procedures, and timeline for the commencement and completion of the recruitment process for the first year of first- and second-cycle studies starting in a given academic year.

The expected limit of admissions to studies along with an indication of the minimum number of admitted candidates required to successfully launch a study cycle

Minimum number of students: 12
Maximum number of students: 90

Learning outcomes

Field of study: Space Engineering

Knowledge

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
SPE1A_W01	A graduate has knowledge and understanding of the fundamentals of mathematics, physics, mechanics, materials science, and computer science used in engineering analysis and modelling.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W02	A graduate has knowledge of systems engineering principles and the fundamentals of spacecraft and satellite design, including propulsion, avionics, communication systems, and orbital mechanics.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W03	A graduate knows and understands architectures and operational principles of onboard systems, ground segments, and mission control infrastructures for space missions.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W04	A graduate has knowledge of verification, validation, and reliability engineering methods for space hardware and software subsystems and their role in mission assurance.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W05	A graduate is familiar and understands modern AI/ML methods, data-driven systems, and autonomous control concepts applied in space missions and exploration.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W06	A graduate is familiar and understands cybersecurity principles for orbital and ground-based space systems, including secure communication, data protection, and emerging post-quantum or quantum-based.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W07	A graduate is familiar with space environment conditions, including vacuum, radiation, microgravity, and space weather, and understands their impact on materials, electronics, and mission design.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W08	A graduate has knowledge of regulatory, ethical, and policy frameworks governing the safe, sustainable, and responsible use of outer space.	P6S_WK_A_Inz, P6S_WK_A
SPE1A_W09	A graduate has knowledge of international standards and procedures (e.g. ECSS, ISO) applied throughout the lifecycle of space systems and missions.	P6S_WG_A_Inz, P6S_WG_A
SPE1A_W10	A graduate has knowledge and understanding of non-technical contexts shaping space systems, including historical, geopolitical, economic, legal, and organizational factors influencing space missions and infrastructures.	P6S_WK_A
SPE1A_W11	A graduate understands the role of space activities in global political, economic, security, and societal systems, including their strategic, dual-use, and long-term implications.	P6S_WK_A

Skills

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
SPE1A_U01	A graduate is able to design, model, and integrate spacecraft, satellite, and space station subsystems, including propulsion, avionics, power, communication, and data-handling units, using systems engineering principles, ECSS standards, and mission lifecycle approaches.	P6S_UW_A_Inz_02, P6S_UW_A
SPE1A_U02	A graduate is able to develop and implement embedded, real-time, and autonomous control software for spacecraft, satellites, robotic platforms, and orbital operations, ensuring reliability and fault tolerance.	P6S_UW_A_Inz_01, P6S_UW_A
SPE1A_U03	A graduate is able to perform mission-level modelling and simulation using digital twin environments, including orbital dynamics, thermal control, power balance, and attitude determination and control.	P6S_UW_A_Inz_01, P6S_UW_A
SPE1A_U04	A graduate is able to design and execute verification, validation, and testing procedures for space hardware and software subsystems, including fault detection, isolation, and recovery (FDIR) analysis and mission assurance activities.	P6S_UW_A_Inz_01, P6S_UW_A

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
SPE1A_U05	A graduate is able to apply AI/ML and data-driven methods, including generative approaches where appropriate, to mission planning, anomaly detection, data interpretation, and adaptive control of space systems.	P6S_UW_A_Inz_01 , P6S_UW_A
SPE1A_U06	A graduate is able to implement and assess cybersecurity measures for space missions, securing telemetry, telecommand, and mission data exchange between orbital, ground, and inter-satellite segments.	P6S_UW_A_Inz_01 , P6S_UW_A
SPE1A_U07	A graduate is able to conduct laboratory and field experiments related to propulsion systems, sensors, communication payloads, and bioengineering for space applications, and to analyse and interpret experimental and simulation-based results.	P6S_UW_A_Inz_01 , P6S_UW_A
SPE1A_U08	A graduate is able to integrate human factors, safety, and sustainability constraints—such as radiation protection, life-support considerations, and space debris mitigation—into space mission and system design.	P6S_UW_A
SPE1A_U09	A graduate is able to apply project management, configuration control, and quality assurance practices to the design, testing, and operation of mission-critical space systems, in accordance with industry standards.	P6S_UW_A
SPE1A_U10	A graduate is able to collaborate effectively in multidisciplinary and international teams, communicate technical concepts clearly, coordinate interfaces across software, electronics, and mechanical domains, and contribute to European and global space projects.	P6S_UU_A, P6S_UK_A, P6S_UO_A
SPE1A_U11	A graduate is able to analyse space systems, missions, and technologies taking into account non-technical constraints, including economic, legal, geopolitical, organizational, and societal factors	P6S_UU_A, P6S_UK_A, P6S_UW_A

Social competence

KEU symbol	Learning outcomes prescribed to a field of study	CEU symbol
SPE1A_K01	A graduate is prepared to work responsibly and ethically in space engineering projects, taking into account safety, sustainability, and societal impact.	P6S_KR_A
SPE1A_K02	A graduate is prepared to collaborate effectively in multidisciplinary, international, and intercultural teams, demonstrating communication, leadership, and problem-solving skills.	P6S_KO_A
SPE1A_K03	A graduate is prepared to show initiative, creativity, and entrepreneurial thinking when addressing new challenges and emerging technologies in the space sector.	P6S_KO_A
SPE1A_K04	A graduate is prepared to adapt to rapid technological progress and to engage in lifelong learning and continuous professional development.	P6S_KK_A
SPE1A_K05	A graduate recognizes the role of space technologies in global development, security, and environmental monitoring, including their dual-use and strategic implications.	P6S_KO_A
SPE1A_K06	A graduate is prepared to engage with the broader professional and research community and to contribute responsibly to the development of the European and global space ecosystem.	P6S_KO_A
SPE1A_K07	A graduate is prepared to consider the broader consequences of engineering decisions in space systems, including political, economic, legal, environmental, and societal impacts	P6S_KR_A, P6S_KO_A

Compliance table of engineering competence (Inz) with directional learning outcomes (KEU)

Major: Space Engineering

Knowledge

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P6S_WG_A_Inz	knowledge of basic processes taking place in the life cycle of technical devices, facilities and systems	SPE1A_W01, SPE1A_W02, SPE1A_W03, SPE1A_W04, SPE1A_W05, SPE1A_W06, SPE1A_W07, SPE1A_W09
P6S_WK_A_Inz	knowledge of basic principles of creating and developing various forms of individual entrepreneurship	SPE1A_W08

Skills

CEU symbol	Learning outcomes for qualifications including engineering competence	KEU references
P6S_UW_A_Inz_01	ability to plan and carry out experiments, including measurements and computer simulations as well as to interpret the obtained results and draw conclusions out of them. When identifying and formulating the specification of engineering problems and solving them, being able to: - use analytical, simulation and experimental methods; - recognize their systemic and non-technical aspects, including ethical connotations; - conduct a preliminary economic assessment of the proposed solutions and planned engineering activities; - perform a critical analysis of the functioning of existing technical solutions to further evaluate them	SPE1A_U02, SPE1A_U03, SPE1A_U04, SPE1A_U05, SPE1A_U06, SPE1A_U07
P6S_UW_A_Inz_02	ability to design solutions in compliance with the given specification as well as being able to: create simple devices, facilities and systems typical for the study major or implement processes using skillfully chosen methods, techniques, tools and materials	SPE1A_U01

Field of study-prescribed outcomes coverage matrix

Field of study: Space Engineering

2026/2027/S/Ii/WTK/SPE/all

Course	Code	Semestr	SPE1A_W01	SPE1A_W02	SPE1A_W03	SPE1A_W04	SPE1A_W05	SPE1A_W06	SPE1A_W07	SPE1A_W08	SPE1A_W09	SPE1A_W10	SPE1A_W11	SPE1A_U01	SPE1A_U02	SPE1A_U03	SPE1A_U04	SPE1A_U05	SPE1A_U06	SPE1A_U07	SPE1A_U08	SPE1A_U09	SPE1A_U10	SPE1A_U11	SPE1A_K01	SPE1A_K02	SPE1A_K03	SPE1A_K04	SPE1A_K05	SPE1A_K06	SPE1A_K07
Mathematics I (Calculus)	WTKSPES.Ii1.19269.26	1s	x																												
Physics I	WTKSPES.Ii1.07041.26	1s	x											x											x							
Materials Science and Foundations of Chemistry	WTKSPES.Ii1.19270.26	1s	x						x											x	x					x		x				
Introduction to programming	WTKSPES.Ii1.19229.26	1s	x													x										x						
Introduction to Academic English	WTKSPES.Ii1.18495.26	1s																					x									
Engineering Mechanics	WTKSPES.Ii1.19271.26	1s	x											x									x		x	x						
Digital Systems and Signal Processing	WTKSPES.Ii2.19278.26	2s	x		x										x					x					x							
Fundamentals of Structural Mechanics and Machine Design	WTKSPES.Ii2.19273.26	2s	x											x									x		x	x						
Introduction to Electronics	WTKSPES.Ii2.19274.26	2s	x																	x			x			x						
Introduction to Engineering Design and CAD Systems	WTKSPES.Ii3.19272.26	1s lub 2s	x	x										x								x			x	x		x				
Mathematics II (Algebra)	WTKSPES.Ii2.19276.26	2s	x																													
Physics II	WTKSPES.Ii2.07046.26	2s	x											x											x							

Course	Code	Semestr	SPE1A_W01	SPE1A_W02	SPE1A_W03	SPE1A_W04	SPE1A_W05	SPE1A_W06	SPE1A_W07	SPE1A_W08	SPE1A_W09	SPE1A_W10	SPE1A_W11	SPE1A_U01	SPE1A_U02	SPE1A_U03	SPE1A_U04	SPE1A_U05	SPE1A_U06	SPE1A_U07	SPE1A_U08	SPE1A_U09	SPE1A_U10	SPE1A_U11	SPE1A_K01	SPE1A_K02	SPE1A_K03	SPE1A_K04	SPE1A_K05	SPE1A_K06	SPE1A_K07
Programming II	WTKSPES.Ii2.19277.26	2s	x			x									x		x					x	x		x	x		x			
Embedded Systems	WTKSPES.Ii4.01411.26	3s	x	x	x	x			x		x			x	x		x			x					x	x		x		x	x
Foundations of Astrophysics and Orbital Mechanics	WTKSPES.Ii4.19281.26	3s	x	x		x			x			x		x		x				x			x	x	x	x		x		x	x
Mathematics III: Probability and Statistics for Engineers	WTKSPES.Ii4.19279.26	3s	x			x										x	x			x					x	x		x			
Numerical methods and computational engineering	WTKSPES.Ii4.19275.26	3s	x											x		x				x					x			x			
Project Management & Teamwork in Space Engineering	WTKSPES.Ii4.19284.26	3s										x	x									x	x	x	x	x		x		x	x
Space Data Systems and Processing	WTKSPES.Ii4.19283.26	3s	x	x	x						x			x	x		x			x		x	x		x				x		
Space Materials, Structures and Environments	WTKSPES.Ii4.19280.26	3s							x												x					x	x				
Applied Engineering Design and Simulations	WTKSPES.Ii8.19286.26	4s	x	x		x								x		x	x								x			x			
Concept Development and Validation	WTKSPES.Ii8.19654.26	4s		x	x	x					x			x		x	x			x			x	x	x	x		x			
Space Systems Engineering Project	WTKSPES.Ii8.19653.26	4s		x							x	x		x								x	x		x	x		x		x	
Ground Infrastructure for Space Missions	WTKSPES.Ii8.19287.26	4s			x									x					x	x						x		x	x		

Course	Code	Semestr	SPE1A_W01	SPE1A_W02	SPE1A_W03	SPE1A_W04	SPE1A_W05	SPE1A_W06	SPE1A_W07	SPE1A_W08	SPE1A_W09	SPE1A_W10	SPE1A_W11	SPE1A_U01	SPE1A_U02	SPE1A_U03	SPE1A_U04	SPE1A_U05	SPE1A_U06	SPE1A_U07	SPE1A_U08	SPE1A_U09	SPE1A_U10	SPE1A_U11	SPE1A_K01	SPE1A_K02	SPE1A_K03	SPE1A_K04	SPE1A_K05	SPE1A_K06	SPE1A_K07
Operating and Real Time Operating Systems for Space	WTKSPES.li8.19291.26	4s	x	x	x	x			x						x		x					x			x	x		x	x		
Sensors, Sensor Interfaces and Data Acquisition	WTKSPES.li8.19282.26	4s		x		x			x		x			x	x		x			x	x				x	x		x			x
Space Payload Design	WTKSPES.li8.17918.26	4s		x	x	x								x		x	x									x	x				
Systems Engineering Fundamentals	WTKSPES.li8.19285.26	4s			x	x			x					x	x	x	x					x	x		x	x	x	x		x	
Telecommunication Fundamentals for Space	WTKSPES.li8.19290.26	4s	x		x				x					x					x	x			x		x	x				x	
Applied AI and Machine Learning for Space Systems	WTKSPES.li10.19295.26	5s	x		x	x	x		x						x		x	x		x					x			x			
Avionics and Onboard Systems	WTKSPES.li10.19294.26	5s	x	x		x															x	x	x		x	x		x		x	
Advanced Concept Design and Validation	WTKSPES.li10.19663.26	5s		x		x					x	x		x		x	x			x		x	x	x	x	x		x		x	x
Attitude Determination and Control System	WTKSPES.li10.19306.26	5s	x	x	x									x	x	x	x								x	x					
Spacecraft Power & Thermal Systems	WTKSPES.li10.19470.26	5s	x	x					x		x			x		x	x								x	x		x			
Advanced Space Systems Engineering Project	WTKSPES.li10.19656.26	5s		x	x	x					x	x		x	x		x					x	x	x	x	x		x			
Ethics, Responsibility and Communication in Space Eng.	WTKSPES.li10.19297.26	5s								x		x	x								x		x	x	x	x			x	x	x

Course	Code	Semestr	SPE1A_W01	SPE1A_W02	SPE1A_W03	SPE1A_W04	SPE1A_W05	SPE1A_W06	SPE1A_W07	SPE1A_W08	SPE1A_W09	SPE1A_W10	SPE1A_W11	SPE1A_U01	SPE1A_U02	SPE1A_U03	SPE1A_U04	SPE1A_U05	SPE1A_U06	SPE1A_U07	SPE1A_U08	SPE1A_U09	SPE1A_U10	SPE1A_U11	SPE1A_K01	SPE1A_K02	SPE1A_K03	SPE1A_K04	SPE1A_K05	SPE1A_K06	SPE1A_K07
Flight Dynamics and Aerodynamics	WTKSPES.li10.19288.26	5s	x	x	x				x					x		x	x			x	x					x	x	x	x	x	
Propulsion Engineering for Space	WTKSPES.li10.19292.26	5s		x					x			x		x						x					x	x			x		
IT Systems Engineering for Space	WTKSPES.li20.19307.26	6s	x	x	x	x					x			x	x		x					x	x		x			x			
Cybersecurity for Space Systems	WTKSPES.li20.19313.26	6s			x	x	x	x	x	x	x			x	x		x	x	x			x			x			x	x		
Advanced Space Structures and Smart Materials	WTKSPES.li20.19301.26	6s		x					x					x							x					x	x	x			
Engineering Internship	WTKSPES.li20.19315.26	6s									x	x										x	x		x	x		x			
Spacecraft Attitude Dynamics and Control	WTKSPES.li20.19489.26	6s	x	x	x											x	x									x					
Mission Safety in Space Systems	WTKSPES.li20.19314.26	6s		x	x	x					x			x			x				x	x			x					x	
Intro to Space Robotics and Planetary Rovers	WTKSPES.li20.19302.26	6s	x	x										x	x											x					
Fundamentals of Earth Observation	WTKSPES.li20.19303.26	6s	x	x	x	x	x							x	x	x	x	x							x	x			x	x	x
Mission Operation Lifecycle	WTKSPES.li20.19735.26	6s		x	x					x	x			x								x	x	x	x	x				x	
Project-based diploma seminar	WTKSPES.li20.19657.26	6s		x					x					x						x		x	x		x	x		x			
Space Environment and radiation effects	WTKSPES.li20.19471.26	6s	x		x	x			x							x	x			x	x				x	x		x		x	
Diploma Project	WTKSPES.li40.18709.26	7s		x	x	x					x			x	x	x	x			x		x	x		x	x		x		x	

Course	Code	Semestr	SPE1A_W01	SPE1A_W02	SPE1A_W03	SPE1A_W04	SPE1A_W05	SPE1A_W06	SPE1A_W07	SPE1A_W08	SPE1A_W09	SPE1A_W10	SPE1A_W11	SPE1A_U01	SPE1A_U02	SPE1A_U03	SPE1A_U04	SPE1A_U05	SPE1A_U06	SPE1A_U07	SPE1A_U08	SPE1A_U09	SPE1A_U10	SPE1A_U11	SPE1A_K01	SPE1A_K02	SPE1A_K03	SPE1A_K04	SPE1A_K05	SPE1A_K06	SPE1A_K07
Introduction to Bioastronautics	WTKSPES.li40.19310.26	7s				x			x	x										x	x		x		x	x	x				
Lab-on-Chip and Microfluidic Systems for Space Applications	WTKSPES.li40.19331.26	7s	x			x			x					x	x	x	x			x			x	x	x	x	x	x	x	x	x
Entrepreneurship and Startup Launching	WTKSPES.li40.19321.26	7s										x	x											x	x	x	x			x	x
Space Policy, Law and Standards	WTKSPES.li40.19324.26	7s								x	x	x	x						x			x		x	x	x		x			x
History and Geopolitics of Space Exploration	WTKSPES.li40.19327.26	7s								x		x	x											x	x	x			x	x	x
Introduction to Space and Astro Biology	WTKSPES.li40.19309.26	7s							x			x									x		x		x	x					
Human-System Interaction and Cooperation	WTKSPES.li40.19328.26	7s								x		x	x								x		x	x	x	x			x	x	x
Sustainability in Space	WTKSPES.li40.19325.26	7s								x											x				x		x		x		
Space Resources Utilization	WTKSPES.li40.19733.26	7s	x						x												x	x		x	x	x		x			
Space Economy and Business Models	WTKSPES.li40.19320.26	7s								x		x	x											x		x	x		x	x	x
Sum (obligatory):			25	16	16	14	2	0	13	2	7	6	2	23	12	12	16	2	2	17	6	11	16	5	29	29	4	20	7	11	6
Sum (elective):			7	10	5	8	1	1	7	7	8	8	5	10	4	5	8	1	2	4	8	8	9	9	17	17	6	11	6	9	7
Sum:			32	26	21	22	3	1	20	9	15	14	7	33	16	17	24	3	4	21	14	19	25	14	46	46	10	31	13	20	13

Characteristics matrix of learning outcomes in relation to modules

Major: Space Engineering

2026/2027/S/Ii/WTK/SPE/all

Course	Code	Semestr	P6S_WG_A_Inz	P6S_WG_A	P6S_WK_A_Inz	P6S_WK_A	P6S_UW_A_Inz_02	P6S_UW_A	P6S_UW_A_Inz_01	P6S_UU_A	P6S_UK_A	P6S_UO_A	P6S_KR_A	P6S_KO_A	P6S_KK_A
Mathematics I (Calculus)	WTKSPES.Ii1.19269.26	1s	x	x											
Physics I	WTKSPES.Ii1.07041.26	1s	x	x			x	x					x		
Materials Science and Foundations of Chemistry	WTKSPES.Ii1.19270.26	1s	x	x				x	x					x	x
Introduction to programming	WTKSPES.Ii1.19229.26	1s	x	x				x	x					x	
Introduction to Academic English	WTKSPES.Ii1.18495.26	1s								x	x	x			
Engineering Mechanics	WTKSPES.Ii1.19271.26	1s	x	x			x	x		x	x	x	x	x	
Digital Systems and Signal Processing	WTKSPES.Ii2.19278.26	2s	x	x				x	x				x		
Fundamentals of Structural Mechanics and Machine Design	WTKSPES.Ii2.19273.26	2s	x	x			x	x		x	x	x	x	x	
Introduction to Electronics	WTKSPES.Ii2.19274.26	2s	x	x				x	x	x	x	x		x	
Introduction to Engineering Design and CAD Systems	WTKSPES.Ii3.19272.26	1s lub 2s	x	x			x	x					x	x	x
Mathematics II (Algebra)	WTKSPES.Ii2.19276.26	2s	x	x											
Physics II	WTKSPES.Ii2.07046.26	2s	x	x			x	x					x		
Programming II	WTKSPES.Ii2.19277.26	2s	x	x				x	x	x	x	x	x	x	x
Embedded Systems	WTKSPES.Ii4.01411.26	3s	x	x			x	x	x				x	x	x
Foundations of Astrophysics and Orbital Mechanics	WTKSPES.Ii4.19281.26	3s	x	x		x	x	x	x	x	x	x	x	x	x

Course	Code	Semestr	P6S_WG_A_Inz	P6S_WG_A	P6S_WK_A_Inz	P6S_WK_A	P6S_UW_A_Inz_02	P6S_UW_A	P6S_UW_A_Inz_01	P6S_UU_A	P6S_UK_A	P6S_UO_A	P6S_KR_A	P6S_KO_A	P6S_KK_A
Mathematics III: Probability and Statistics for Engineers	WTKSPES.Ii4.19279.26	3s	x	x				x	x				x	x	x
Numerical methods and computational engineering	WTKSPES.Ii4.19275.26	3s	x	x			x	x	x				x		x
Project Management & Teamwork in Space Engineering	WTKSPES.Ii4.19284.26	3s				x		x		x	x	x	x	x	x
Space Data Systems and Processing	WTKSPES.Ii4.19283.26	3s	x	x			x	x	x	x	x	x	x	x	
Space Materials, Structures and Environments	WTKSPES.Ii4.19280.26	3s	x	x				x						x	
Applied Engineering Design and Simulations	WTKSPES.Ii8.19286.26	4s	x	x			x	x	x				x		x
Concept Development and Validation	WTKSPES.Ii8.19654.26	4s	x	x			x	x	x	x	x	x	x	x	x
Space Systems Engineering Project	WTKSPES.Ii8.19653.26	4s	x	x		x	x	x		x	x	x	x	x	x
Ground Infrastructure for Space Missions	WTKSPES.Ii8.19287.26	4s	x	x			x	x	x					x	x
Operating and Real Time Operating Systems for Space	WTKSPES.Ii8.19291.26	4s	x	x				x	x				x	x	x
Sensors, Sensor Interfaces and Data Acquisition	WTKSPES.Ii8.19282.26	4s	x	x			x	x	x				x	x	x
Space Payload Design	WTKSPES.Ii8.17918.26	4s	x	x			x	x	x					x	
Systems Engineering Fundamentals	WTKSPES.Ii8.19285.26	4s	x	x			x	x	x	x	x	x	x	x	x
Telecommunication Fundamentals for Space	WTKSPES.Ii8.19290.26	4s	x	x			x	x	x	x	x	x	x	x	
Applied AI and Machine Learning for Space Systems	WTKSPES.Ii10.19295.26	5s	x	x				x	x				x		x
Avionics and Onboard Systems	WTKSPES.Ii10.19294.26	5s	x	x				x		x	x	x	x	x	x
Advanced Concept Design and Validation	WTKSPES.Ii10.19663.26	5s	x	x		x	x	x	x	x	x	x	x	x	x
Attitude Determination and Control System	WTKSPES.Ii10.19306.26	5s	x	x			x	x	x				x	x	
Spacecraft Power & Thermal Systems	WTKSPES.Ii10.19470.26	5s	x	x			x	x	x				x	x	x

Course	Code	Semestr	P6S_WG_A_Inz	P6S_WG_A	P6S_WK_A_Inz	P6S_WK_A	P6S_UW_A_Inz_02	P6S_UW_A	P6S_UW_A_Inz_01	P6S_UU_A	P6S_UK_A	P6S_UO_A	P6S_KR_A	P6S_KO_A	P6S_KK_A
Advanced Space Systems Engineering Project	WTKSPES.li10.19656.26	5s	x	x		x	x	x	x	x	x	x	x	x	x
Ethics, Responsibility and Communication in Space Eng.	WTKSPES.li10.19297.26	5s			x	x		x		x	x	x	x	x	
Flight Dynamics and Aerodynamics	WTKSPES.li10.19288.26	5s	x	x			x	x	x					x	x
Propulsion Engineering for Space	WTKSPES.li10.19292.26	5s	x	x		x	x	x	x				x	x	
IT Systems Engineering for Space	WTKSPES.li20.19307.26	6s	x	x			x	x	x	x	x	x	x		x
Cybersecurity for Space Systems	WTKSPES.li20.19313.26	6s	x	x	x	x	x	x	x				x	x	x
Advanced Space Structures and Smart Materials	WTKSPES.li20.19301.26	6s	x	x			x	x						x	x
Engineering Internship	WTKSPES.li20.19315.26	6s	x	x		x		x		x	x	x	x	x	x
Spacecraft Attitude Dynamics and Control	WTKSPES.li20.19489.26	6s	x	x				x	x					x	
Mission Safety in Space Systems	WTKSPES.li20.19314.26	6s	x	x			x	x	x				x	x	
Intro to Space Robotics and Planetary Rovers	WTKSPES.li20.19302.26	6s	x	x			x	x	x					x	
Fundamentals of Earth Observation	WTKSPES.li20.19303.26	6s	x	x			x	x	x				x	x	
Mission Operation Lifecycle	WTKSPES.li20.19735.26	6s	x	x	x	x	x	x		x	x	x	x	x	
Project-based diploma seminar	WTKSPES.li20.19657.26	6s	x	x			x	x	x	x	x	x	x	x	x
Space Environment and radiation effects	WTKSPES.li20.19471.26	6s	x	x				x	x				x	x	x
Diploma Project	WTKSPES.li40.18709.26	7s	x	x			x	x	x	x	x	x	x	x	x
Introduction to Bioastronautics	WTKSPES.li40.19310.26	7s	x	x	x	x		x	x	x	x	x	x	x	
Lab-on-Chip and Microfluidic Systems for Space Applications	WTKSPES.li40.19331.26	7s	x	x			x	x	x	x	x	x	x	x	x
Entrepreneurship and Startup Launching	WTKSPES.li40.19321.26	7s				x		x		x	x		x	x	

Course	Code	Semestr	P6S_WG_A_Inz	P6S_WG_A	P6S_WK_A_Inz	P6S_WK_A	P6S_UW_A_Inz_02	P6S_UW_A	P6S_UW_A_Inz_01	P6S_UU_A	P6S_UK_A	P6S_UO_A	P6S_KR_A	P6S_KO_A	P6S_KK_A
Space Policy, Law and Standards	WTKSPES.Ii40.19324.26	7s	x	x	x	x		x	x	x	x		x	x	x
History and Geopolitics of Space Exploration	WTKSPES.Ii40.19327.26	7s			x	x		x		x	x		x	x	
Introduction to Space and Astro Biology	WTKSPES.Ii40.19309.26	7s	x	x		x		x		x	x	x	x	x	
Human-System Interaction and Cooperation	WTKSPES.Ii40.19328.26	7s			x	x		x		x	x	x	x	x	
Sustainability in Space	WTKSPES.Ii40.19325.26	7s			x	x		x					x	x	
Space Resources Utilization	WTKSPES.Ii40.19733.26	7s	x	x				x		x	x		x	x	x
Space Economy and Business Models	WTKSPES.Ii40.19320.26	7s			x	x		x		x	x		x	x	
Sum (obligatory):			36	36	2	7	23	36	26	16	16	16	29	30	20
Sum (elective):			16	16	7	11	10	21	11	14	14	9	18	20	11
Sum:			52	52	9	18	33	57	37	30	30	25	47	50	31

Matrix of learning outcomes prescribed to a field of study with related forms of classes and the method of testing

Major: Space Engineering

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Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Mathematics I (Calculus)	Lectures, Auditorium classes	Examination, Activity during classes, Test, Oral answer	SPE1A_W01
Physics I	Lectures, Auditorium classes, Laboratory classes	Test, Activity during classes, Test, Oral answer, Execution of laboratory classes	SPE1A_W01, SPE1A_U01, SPE1A_K01
Materials Science and Foundations of Chemistry	Lectures, Laboratory classes, Project classes	Examination, Execution of laboratory classes, Involvement in teamwork, Completion of laboratory classes, Preparation and conduct of scientific research, Execution of a project, Project, Involvement in teamwork	SPE1A_W01, SPE1A_W07, SPE1A_U07, SPE1A_U08, SPE1A_K02, SPE1A_K04
Introduction to programming	Laboratory classes, Project classes	Execution of exercises, Execution of a project, Test, Project, Execution of exercises, Execution of a project, Test, Project	SPE1A_W01, SPE1A_U03, SPE1A_K02
Introduction to Academic English	Foreign language classes	Activity during classes, Participation in a discussion, Test, Examination, Involvement in teamwork, Presentation	SPE1A_U10
Engineering Mechanics	Lectures, Auditorium classes, Seminars	Examination, Activity during classes, Test, Oral answer, Presentation	SPE1A_W01, SPE1A_U01, SPE1A_U10, SPE1A_K01, SPE1A_K02
Digital Systems and Signal Processing	Lectures, Laboratory classes	Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Test	SPE1A_W01, SPE1A_W03, SPE1A_U02, SPE1A_U07, SPE1A_K01
Fundamentals of Structural Mechanics and Machine Design	Lectures, Project classes	Examination, Activity during classes, Execution of a project, Project, Involvement in teamwork, Presentation	SPE1A_W01, SPE1A_U01, SPE1A_U10, SPE1A_K01, SPE1A_K02
Introduction to Electronics	Lectures, Laboratory classes	Examination, Activity during classes, Execution of laboratory classes, Test	SPE1A_W01, SPE1A_U07, SPE1A_U10, SPE1A_K02
Introduction to Engineering Design and CAD Systems	Lectures, Laboratory classes, Project classes	Activity during classes, Execution of a project, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Report, Completion of laboratory classes, Activity during classes, Execution of a project, Presentation	SPE1A_W01, SPE1A_W02, SPE1A_U01, SPE1A_U09, SPE1A_K01, SPE1A_K02, SPE1A_K04

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Mathematics II (Algebra)	Lectures, Auditorium classes	Examination, Activity during classes, Test, Oral answer	SPE1A_W01
Physics II	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test, Oral answer, Completion of laboratory classes	SPE1A_W01, SPE1A_U01, SPE1A_K01
Programming II	Laboratory classes, Project classes	Activity during classes, Execution of laboratory classes, Test, Oral answer, Completion of laboratory classes, Execution of a project, Report, Involvement in teamwork	SPE1A_W01, SPE1A_W04, SPE1A_U02, SPE1A_U04, SPE1A_U09, SPE1A_U10, SPE1A_K01, SPE1A_K04, SPE1A_K02
Embedded Systems	Lectures, Laboratory classes, Project classes	Activity during classes, Presentation, Oral answer, Presentation, Preparation and conduct of scientific research, Project	SPE1A_W02, SPE1A_W03, SPE1A_W01, SPE1A_W07, SPE1A_W04, SPE1A_W09, SPE1A_U01, SPE1A_U02, SPE1A_U04, SPE1A_U07, SPE1A_K01, SPE1A_K07, SPE1A_K02, SPE1A_K04, SPE1A_K06
Foundations of Astrophysics and Orbital Mechanics	Lectures, Auditorium classes, Laboratory classes	Activity during classes, Participation in a discussion, Examination, Completion of laboratory classes, Activity during classes, Participation in a discussion, Involvement in teamwork, Presentation, Activity during classes, Participation in a discussion, Execution of laboratory classes, Involvement in teamwork, Oral answer, Completion of laboratory classes	SPE1A_W01, SPE1A_W02, SPE1A_W07, SPE1A_W10, SPE1A_W04, SPE1A_U07, SPE1A_U11, SPE1A_U01, SPE1A_U03, SPE1A_U10, SPE1A_K01, SPE1A_K02, SPE1A_K07, SPE1A_K04, SPE1A_K06
Mathematics III: Probability and Statistics for Engineers	Lectures, Auditorium classes, Laboratory classes	Examination, Activity during classes, Test, Activity during classes, Execution of laboratory classes, Project, Presentation	SPE1A_W01, SPE1A_W04, SPE1A_U03, SPE1A_U07, SPE1A_U04, SPE1A_K01, SPE1A_K02, SPE1A_K04
Numerical methods and computational engineering	Lectures, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Test, Completion of laboratory classes, Activity during classes, Participation in a discussion, Execution of laboratory classes, Test, Oral answer, Activity during classes, Execution of a project, Report, Involvement in teamwork, Oral answer	SPE1A_W01, SPE1A_U01, SPE1A_U03, SPE1A_U07, SPE1A_K01, SPE1A_K04
Project Management & Teamwork in Space Engineering	Workshop classes	Execution of exercises, Execution of a project, Involvement in teamwork, Presentation	SPE1A_W10, SPE1A_W11, SPE1A_U09, SPE1A_U10, SPE1A_U11, SPE1A_K01, SPE1A_K07, SPE1A_K02, SPE1A_K06, SPE1A_K04
Space Data Systems and Processing	Lectures, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Completion of laboratory classes, Activity during classes, Participation in a discussion, Execution of laboratory classes, Test, Oral answer, Activity during classes, Execution of a project, Report, Involvement in teamwork, Oral answer	SPE1A_W02, SPE1A_W03, SPE1A_W01, SPE1A_W09, SPE1A_U01, SPE1A_U02, SPE1A_U10, SPE1A_U04, SPE1A_U07, SPE1A_U09, SPE1A_K01, SPE1A_K05

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Space Materials, Structures and Environments	Lectures, Laboratory classes, Project classes	Activity during classes, Examination, Activity during classes, Completion of laboratory classes, Preparation and conduct of scientific research, Activity during classes, Execution of a project, Project	SPE1A_W07, SPE1A_U08, SPE1A_K02, SPE1A_K03
Applied Engineering Design and Simulations	Lectures, Laboratory classes, Project classes	Test, Execution of laboratory classes, Report, Involvement in teamwork, Completion of laboratory classes, Execution of a project, Project	SPE1A_W01, SPE1A_W02, SPE1A_W04, SPE1A_U01, SPE1A_U03, SPE1A_U04, SPE1A_K01, SPE1A_K04
Concept Development and Validation	Project classes, Discussion seminars	Activity during classes, Execution of a project, Execution of a project, Presentation	SPE1A_W02, SPE1A_W03, SPE1A_W04, SPE1A_W09, SPE1A_U01, SPE1A_U11, SPE1A_U03, SPE1A_U04, SPE1A_U07, SPE1A_U10, SPE1A_K01, SPE1A_K02, SPE1A_K04
Space Systems Engineering Project	Project classes, Discussion seminars	Activity during classes, Execution of a project, Execution of a project, Presentation	SPE1A_W02, SPE1A_W09, SPE1A_W10, SPE1A_U01, SPE1A_U09, SPE1A_U10, SPE1A_K01, SPE1A_K04, SPE1A_K02, SPE1A_K06
Ground Infrastructure for Space Missions	Lectures, Laboratory classes	Examination, Activity during classes, Participation in a discussion, Test, Completion of laboratory classes	SPE1A_W03, SPE1A_U06, SPE1A_U01, SPE1A_U07, SPE1A_K02, SPE1A_K04, SPE1A_K05
Operating and Real Time Operating Systems for Space	Lectures, Laboratory classes	Test, Activity during classes, Execution of laboratory classes	SPE1A_W01, SPE1A_W03, SPE1A_W02, SPE1A_W04, SPE1A_W07, SPE1A_U02, SPE1A_U04, SPE1A_U09, SPE1A_K01, SPE1A_K05, SPE1A_K02, SPE1A_K04
Sensors, Sensor Interfaces and Data Acquisition	Lectures, Laboratory classes, Project classes	Execution of laboratory classes, Execution of laboratory classes, Project	SPE1A_W02, SPE1A_W04, SPE1A_W07, SPE1A_W09, SPE1A_U01, SPE1A_U04, SPE1A_U07, SPE1A_U02, SPE1A_U08, SPE1A_K01, SPE1A_K02, SPE1A_K04, SPE1A_K07
Space Payload Design	Lectures, Laboratory classes, Project classes	Participation in a discussion, Examination, Execution of exercises, Test, Execution of a project, Presentation	SPE1A_W03, SPE1A_W04, SPE1A_W02, SPE1A_U01, SPE1A_U03, SPE1A_U04, SPE1A_K02, SPE1A_K03
Systems Engineering Fundamentals	Lectures, Laboratory classes, Project classes	Test, Execution of laboratory classes, Completion of laboratory classes, Project	SPE1A_W03, SPE1A_W07, SPE1A_W04, SPE1A_U01, SPE1A_U02, SPE1A_U09, SPE1A_U03, SPE1A_U04, SPE1A_U10, SPE1A_K01, SPE1A_K03, SPE1A_K02, SPE1A_K04, SPE1A_K06
Telecommunication Fundamentals for Space	Lectures, Laboratory classes, Project classes	Examination, Activity during classes, Test, Completion of laboratory classes, Execution of a project, Project	SPE1A_W01, SPE1A_W07, SPE1A_W03, SPE1A_U01, SPE1A_U07, SPE1A_U10, SPE1A_U06, SPE1A_K01, SPE1A_K02, SPE1A_K06

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Applied AI and Machine Learning for Space Systems	Lectures, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Examination, Completion of laboratory classes, Activity during classes, Participation in a discussion, Execution of laboratory classes, Oral answer, Activity during classes, Execution of a project, Report, Involvement in teamwork, Oral answer	SPE1A_W01, SPE1A_W05, SPE1A_W03, SPE1A_W04, SPE1A_W07, SPE1A_U05, SPE1A_U07, SPE1A_U02, SPE1A_U04, SPE1A_K01, SPE1A_K04
Avionics and Onboard Systems	Lectures, Laboratory classes, Project classes	Activity during classes, Presentation, Oral answer, Report, Presentation, Oral answer, Project, Engineering project	SPE1A_W01, SPE1A_W02, SPE1A_W04, SPE1A_U10, SPE1A_U09, SPE1A_U08, SPE1A_K02, SPE1A_K06, SPE1A_K04, SPE1A_K01
Advanced Concept Design and Validation	Project classes, Discussion seminars	Execution of a project, Execution of a project	SPE1A_W02, SPE1A_W09, SPE1A_W04, SPE1A_W10, SPE1A_U01, SPE1A_U11, SPE1A_U03, SPE1A_U04, SPE1A_U07, SPE1A_U09, SPE1A_U10, SPE1A_K01, SPE1A_K04, SPE1A_K07, SPE1A_K02, SPE1A_K06
Attitude Determination and Control System	Lectures, Laboratory classes, Project classes	Execution of a project, Execution of exercises	SPE1A_W01, SPE1A_W02, SPE1A_W03, SPE1A_U01, SPE1A_U03, SPE1A_U02, SPE1A_U04, SPE1A_K01, SPE1A_K02
Spacecraft Power & Thermal Systems	Lectures, Laboratory classes, Project classes	Execution of a project, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Oral answer, Execution of a project, Involvement in teamwork	SPE1A_W01, SPE1A_W02, SPE1A_W07, SPE1A_W09, SPE1A_U01, SPE1A_U03, SPE1A_U04, SPE1A_K01, SPE1A_K04, SPE1A_K02
Advanced Space Systems Engineering Project	Project classes, Discussion seminars	Activity during classes, Execution of a project, Execution of a project, Presentation	SPE1A_W02, SPE1A_W03, SPE1A_W04, SPE1A_W09, SPE1A_W10, SPE1A_U01, SPE1A_U02, SPE1A_U09, SPE1A_U04, SPE1A_U11, SPE1A_U10, SPE1A_K01, SPE1A_K02, SPE1A_K04
Ethics, Responsibility and Communication in Space Eng.	Seminars, Laboratory classes	Test, Presentation	SPE1A_W08, SPE1A_W10, SPE1A_W11, SPE1A_U08, SPE1A_U10, SPE1A_U11, SPE1A_K01, SPE1A_K02, SPE1A_K05, SPE1A_K06, SPE1A_K07
Flight Dynamics and Aerodynamics	Lectures, Laboratory classes, Project classes	Execution of a project, Examination, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Oral answer, Execution of a project, Involvement in teamwork	SPE1A_W01, SPE1A_W02, SPE1A_W03, SPE1A_W07, SPE1A_U01, SPE1A_U03, SPE1A_U07, SPE1A_U04, SPE1A_U08, SPE1A_K02, SPE1A_K03, SPE1A_K04, SPE1A_K05, SPE1A_K06
Propulsion Engineering for Space	Lectures, Laboratory classes, Auditorium classes	Activity during classes, Test, Examination, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Report, Completion of laboratory classes, Activity during classes, Execution of exercises, Test, Oral answer	SPE1A_W02, SPE1A_W07, SPE1A_W10, SPE1A_U01, SPE1A_U07, SPE1A_K02, SPE1A_K05, SPE1A_K01

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
IT Systems Engineering for Space	Laboratory classes, Project classes	Activity during classes, Execution of laboratory classes, Test, Oral answer, Activity during classes, Execution of a project, Report, Involvement in teamwork, Oral answer	SPE1A_W03, SPE1A_W01, SPE1A_W02, SPE1A_W04, SPE1A_W09, SPE1A_U01, SPE1A_U02, SPE1A_U04, SPE1A_U09, SPE1A_U10, SPE1A_K01, SPE1A_K04
Cybersecurity for Space Systems	Lectures, Laboratory classes, Project classes	Execution of a project, Execution of laboratory classes, Completion of laboratory classes, Activity during classes, Participation in a discussion, Execution of laboratory classes, Test, Oral answer, Activity during classes, Execution of a project, Report, Involvement in teamwork, Oral answer	SPE1A_W03, SPE1A_W05, SPE1A_W06, SPE1A_W07, SPE1A_W08, SPE1A_W09, SPE1A_W04, SPE1A_U01, SPE1A_U05, SPE1A_U06, SPE1A_U04, SPE1A_U02, SPE1A_U09, SPE1A_K01, SPE1A_K04, SPE1A_K05
Advanced Space Structures and Smart Materials	Lectures, Laboratory classes, Project classes	Activity during classes, Execution of laboratory classes, Completion of laboratory classes, Execution of a project	SPE1A_W02, SPE1A_W07, SPE1A_U01, SPE1A_U08, SPE1A_K02, SPE1A_K03, SPE1A_K04
Engineering Internship	Practical placement	Confirmation of completion of practical placement programme	SPE1A_W09, SPE1A_W10, SPE1A_U09, SPE1A_U10, SPE1A_K01, SPE1A_K02, SPE1A_K04
Spacecraft Attitude Dynamics and Control	Lectures, Laboratory classes, Project classes	Essay, Activity during classes, Test	SPE1A_W01, SPE1A_W02, SPE1A_W03, SPE1A_U03, SPE1A_U04, SPE1A_K02
Mission Safety in Space Systems	Lectures, Laboratory classes, Project classes	Execution of a project, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Test, Oral answer, Execution of a project, Involvement in teamwork	SPE1A_W02, SPE1A_W03, SPE1A_W04, SPE1A_W09, SPE1A_U04, SPE1A_U08, SPE1A_U09, SPE1A_U01, SPE1A_K01, SPE1A_K06
Intro to Space Robotics and Planetary Rovers	Lectures, Laboratory classes, Project classes	Participation in a discussion, Test, Execution of laboratory classes, Test, Execution of a project	SPE1A_W02, SPE1A_W01, SPE1A_U01, SPE1A_U02, SPE1A_K02
Fundamentals of Earth Observation	Lectures, Laboratory classes, Project classes	Examination, Execution of exercises, Execution of laboratory classes, Test, Report, Work done within the framework of a practical placement, Preparation and conduct of scientific research, Coordination, conduct of a research project, preparation of a scientific paper, organization, organization of conferences, camps and scientific trips.	SPE1A_W01, SPE1A_W02, SPE1A_W04, SPE1A_W03, SPE1A_W05, SPE1A_U01, SPE1A_U02, SPE1A_U03, SPE1A_U04, SPE1A_U05, SPE1A_K05, SPE1A_K06, SPE1A_K07, SPE1A_K01, SPE1A_K02
Mission Operation Lifecycle	Lectures, Laboratory classes	Completion of laboratory classes, Project	SPE1A_W02, SPE1A_W03, SPE1A_W08, SPE1A_W09, SPE1A_U01, SPE1A_U09, SPE1A_U10, SPE1A_U11, SPE1A_K01, SPE1A_K02, SPE1A_K06
Project-based diploma seminar	Project classes, Seminars	Activity during classes, Participation in a discussion, Execution of a project, Execution of a project, Presentation	SPE1A_W02, SPE1A_W07, SPE1A_U01, SPE1A_U09, SPE1A_U10, SPE1A_U07, SPE1A_K01, SPE1A_K04, SPE1A_K02

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Space Environment and radiation effects	Lectures, Laboratory classes	Examination, Completion of laboratory classes, Activity during classes, Participation in a discussion, Execution of laboratory classes, Case study, Oral answer	SPE1A_W01, SPE1A_W07, SPE1A_W04, SPE1A_W03, SPE1A_U03, SPE1A_U07, SPE1A_U04, SPE1A_U08, SPE1A_K01, SPE1A_K04, SPE1A_K02, SPE1A_K06
Diploma Project	Diploma project	Execution of a project, Engineering project, Presentation	SPE1A_W02, SPE1A_W03, SPE1A_W04, SPE1A_W09, SPE1A_U01, SPE1A_U02, SPE1A_U09, SPE1A_U03, SPE1A_U04, SPE1A_U07, SPE1A_U10, SPE1A_K01, SPE1A_K04, SPE1A_K02, SPE1A_K06
Introduction to Bioastronautics	Lectures, Laboratory classes, Project classes	Test, Execution of laboratory classes, Execution of exercises, Project, Involvement in teamwork	SPE1A_W07, SPE1A_W08, SPE1A_W04, SPE1A_U08, SPE1A_U10, SPE1A_U07, SPE1A_K01, SPE1A_K02, SPE1A_K03
Lab-on-Chip and Microfluidic Systems for Space Applications	Lectures, Laboratory classes, Project classes	Test, Activity during classes, Execution of laboratory classes, Report, Completion of laboratory classes, Preparation and conduct of scientific research, Execution of a project, Project, Involvement in teamwork, Coordination, conduct of a research project, preparation of a scientific paper, organization, organization of conferences, camps and scientific trips.	SPE1A_W01, SPE1A_W04, SPE1A_W07, SPE1A_U01, SPE1A_U03, SPE1A_U10, SPE1A_U11, SPE1A_U07, SPE1A_U02, SPE1A_U04, SPE1A_K01, SPE1A_K02, SPE1A_K03, SPE1A_K04, SPE1A_K05, SPE1A_K06, SPE1A_K07
Entrepreneurship and Startup Launching	Lectures, Laboratory classes, Project classes	Test, Execution of exercises, Activity during classes, Project, Scientific paper, Presentation	SPE1A_W10, SPE1A_W11, SPE1A_U11, SPE1A_K01, SPE1A_K02, SPE1A_K03, SPE1A_K06, SPE1A_K07
Space Policy, Law and Standards	Lectures, Auditorium classes, Project classes	Test, Activity during classes, Project, Involvement in teamwork	SPE1A_W08, SPE1A_W10, SPE1A_W11, SPE1A_W09, SPE1A_U11, SPE1A_U09, SPE1A_U06, SPE1A_K01, SPE1A_K07, SPE1A_K02, SPE1A_K04
History and Geopolitics of Space Exploration	Lectures, Laboratory classes, Project classes	Execution of a project, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Oral answer, Activity during classes, Execution of a project, Involvement in teamwork	SPE1A_W10, SPE1A_W11, SPE1A_W08, SPE1A_U11, SPE1A_K01, SPE1A_K05, SPE1A_K07, SPE1A_K06, SPE1A_K02
Introduction to Space and Astro Biology	Lectures, Laboratory classes, Project classes	Test, Completion of laboratory classes, Report	SPE1A_W07, SPE1A_W10, SPE1A_U08, SPE1A_U10, SPE1A_K01, SPE1A_K02
Human-System Interaction and Cooperation	Lectures, Laboratory classes, Project classes	Test, Activity during classes, Involvement in teamwork, Presentation	SPE1A_W08, SPE1A_W10, SPE1A_W11, SPE1A_U08, SPE1A_U10, SPE1A_U11, SPE1A_K01, SPE1A_K02, SPE1A_K05, SPE1A_K06, SPE1A_K07
Sustainability in Space	Workshop classes	Participation in a discussion, Execution of exercises, Execution of a project, Involvement in teamwork	SPE1A_W08, SPE1A_U08, SPE1A_K01, SPE1A_K03, SPE1A_K05

Name of the module	Activity	Method of verification and assessment of learning outcomes achieved by the student in individual forms of classes and activities for the entire module	KEU references
Space Resources Utilization	Lectures, Laboratory classes, Project classes	Test, Activity during classes, Execution of exercises, Execution of laboratory classes, Report, Scientific paper	SPE1A_W01, SPE1A_W07, SPE1A_U08, SPE1A_U11, SPE1A_U09, SPE1A_K01, SPE1A_K02, SPE1A_K04
Space Economy and Business Models	Lectures, Laboratory classes, Project classes	Execution of a project, Test, Completion of laboratory classes, Activity during classes, Execution of laboratory classes, Oral answer, Activity during classes, Execution of a project, Involvement in teamwork	SPE1A_W10, SPE1A_W11, SPE1A_W08, SPE1A_U11, SPE1A_K05, SPE1A_K07, SPE1A_K03, SPE1A_K02, SPE1A_K06

ECTS credits calculations

Field of study: Space Engineering

The total number of ECTS credits the student needs to obtain in the form of:

classes conducted with the direct participation of academic teachers or other persons conducting classes	116
core science classes relevant to a given major	40
practical classes, developing practical skills, including laboratory, design, practical and workshop classes	159
classes subject to choice by the student (in the amount of not less than 30% of the number of ECTS credits necessary to obtain qualifications corresponding to the level of education)	63
classes in the field of humanities or social sciences - in the case of fields of study assigned to disciplines within fields other than humanities or social sciences, respectively	11
foreign language classes	3
practical placements	5
classes related to the academic activity conducted at the University in the discipline or disciplines to which the field of study is assigned, in the amount greater than 50% of the number of ECTS credits required to complete studies at a given level, taking into account the participation of students in classes preparing to conduct scientific activity or participate in this activity (applies only to studies with a general academic profile)	155
classes shaping practical skills in the amount greater than 50% of the number of ECTS credits required to complete studies at a given level (applies only to studies with a practical profile)	0

Detailed rules of the implementation of the curriculum estabilished by the Dean of the Faculty (the so-called Study Rules)

Field of study: Space Engineering

Enrollment rules for the next semester

The rules governing semester registration are set out by the AGH University of Krakow Study Regulations.

Enrollment rules for the next semester as a part of the so-called ECTS credits debt ceiling

The allowed deficiency of ECTS is:

- When entering the 2nd semester – 6 ECTS
- When entering the 3rd semester – 8 ECTS
- When entering the 4th and 5th semesters – 8 ECTS
- When entering the 6th semester – 6 ECTS
- When entering the 7th semester – 0 ECTS

ECTS credits debt ceiling

Organization of classes within the so-called blocks of classes (i.e. such organization of subjects or individual forms of classes that creates exceptions to the cyclical nature of classes in particular weeks of a given semester of studies)

In the first-cycle studies of Space Engineering, there are no blocks.

Monitoring semesters

3, 6

Study rules in case of the individual organization of studies approved for a specific student

Individual studies are conducted under the academic supervision of a Full Professor or an Associate Professor and may commence no earlier than the third semester of study. Eligibility requires an average grade of at least 4.0 from completed semesters. Additional achievements, such as scientific publications, participation in research clubs, social engagement, awards, or distinctions, are strongly recommended.

The individual study programme must lead to the achievement of the intended programme learning outcomes and is subject to approval by the Deputy Dean for Student Affairs.

Implementation of practical placements including monitoring system and completion rules

In order to complete the apprenticeship, the student is required to submit the following documents:

- a letter of recommendation;
- a draft Apprenticeship Agreement or, in the case of an unpaid placement, a draft Unpaid Apprenticeship Agreement.

All required documents must be approved by the Dean’s Representative for student apprenticeships.

The apprenticeship is assessed and credited by the programme or profile tutor, or by an authorised representative, on the basis of a certificate of attendance and a written apprenticeship report.

Rules of elective modules taking

The rules governing the selection of courses are defined in the Syllabus of the Space Engineering programme.

Rules of education paths, graduation paths, major choice/eligibility

The first-cycle Space Engineering programme does not include any tracks, profiles, or specialisations.

Rules related to the preparation of diploma projects and theses as well as the implementation of the degree granting

The preparation of the final thesis and the graduation process are conducted in accordance to the AGH University of Krakow Study Regulations.

Principles for determining the overall evaluation of graduation (the final grade)

The final degree classification is calculated as a weighted average comprising:

- 60% of the average grade obtained during the course of study,
- 25% of the final grade of the bechelors project,
- 15% of the diploma defense grade.

Other requirements related to the implementation of the curriculum resulting from the AGH University Study Regulations or other regulations in force at the University