COURSE DESCRIPTION CARD - SYLLABUS

Course name

Elements of the theory of technical thermodynamics, IFR communications and human functioning in aviation

Course

Field of study

Aviation and Astronautics

Year/Semester

2/3

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

60

Laboratory classes

15

Other (e.g. online)

Tutorials

45

Projects/seminars

Number of credit points

1

Lecturers

Responsible for the course/lecturer:

Leszek Grześkowiak (IFR Communications)

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Responsible for the course/lecturer:

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Prerequisites

The student starting this subject should have a basic knowledge of the basics of computer science and communication systems. He should also have the ability to apply the scientific method in solving problems and be ready to cooperate within a team.

A student starting this subject should have a basic knowledge of general and aviation psychology, the nature and functioning of human cognitive, emotional and motivational processes. He should also have the ability to apply the scientific method in solving problems and be ready to cooperate within a team.

The student starting this subject should have basic knowledge of the basics of thermodynamics and processes of energy flow and conversion in thermo-flow machines and devices. He should also have the ability to effectively self-study in a field related to the chosen field of study and be willing to cooperate within a team.

Course objective

Familiarizing the student with the technical capabilities of communication equipment and communication systems, and applicable labor regulations for technical means of communication.

To acquaint the student with the emotional and motivational processes of man functioning in normal, difficult and extreme situations. Basic human cognitive processes - perception and attention and their importance in the process of information management in the human - technical object system. The dynamics of small social groups and its application in the process of constructing effective task teams in aviation. Crew / team resource management (CRM).

Acquainting with basic thermodynamic processes, thermodynamic transformations and energy conservation equations. Getting to know the methods of description of various thermodynamic factors and thermodynamic cycles implementing the assumed processes of thermal and mechanical energy conversion in order to modernize or rebuild technological systems in the field of thermal energy. Practical mastery of the ability to describe the implementation of thermal processes.

Course-related learning outcomes

Knowledge

1. has basic knowledge in the field of metrology, knows: measurement methods, characteristics of measuring instruments and their classification according to purpose, principles of operation and metrological features, workshop metrology, sensors and measuring transducers, registration of results, measurement systems, measurement errors - influence of external factors, statistical analysis of measurement results, principles of organization of active and passive experiment

2. has structured, theoretically founded general knowledge covering key issues in the field of on-board equipment as well as on-board and ground electronic communication systems

3. has ordered, theoretically founded general knowledge covering key issues in the field of technical thermodynamics, i.e. the theory of thermodynamic changes, heat flow, heat and cooling machines

4. has detailed knowledge related to selected issues in the field of human capabilities and restrictions when operating an aircraft in flight, as well as the capabilities and limitations of the air ambulance system

5. has basic knowledge necessary to understand social, economic, legal and other non-technical conditions of engineering activities

6. has basic knowledge in the field of law, in particular civil aviation law, copyright law and the protection of industrial property and its impact on the development of technology, is able to use patent information resources

7. knows the general principles of creating and developing forms of individual entrepreneurship, also taking into account time management, as well as the ability of proper self-presentation, using knowledge of the fields of science and scientific disciplines appropriate for aviation and astronautics

Skills

1. knows how to use native and international languages to the extent that it is possible to understand technical texts and to write using technical dictionaries machine descriptions in the field of aviation and astronautics (knowledge of technical terminology)

2. is able to obtain information from literature, the Internet, databases and other sources. Is able to integrate the information obtained, interpret and draw conclusions from them as well as create and justify opinions.

3. knows how to use verbal communication with one additional foreign language at the everyday language level, can describe the issues of the studied field of study in this language, can prepare technical descriptive and drawing documentation of an engineering, transport and / or logistics task

4. is able to carry out elementary technical calculations in the field of fluid mechanics and thermodynamics, such as heat and mass balances, pressure losses in flows around technical flying objects and their modules, select the parameters of fans, compressors and turbines for flow systems, as well as calculate thermodynamic waveforms in heat machines

5. is able to plan and conduct a research experiment using measuring equipment, computer simulations, is able to perform measurements such as temperature measurements with liquid thermistors, thermistor, thermocouples, velocity and flow rate using turbine, laser and ultrasonic flow meters, and interpret results and draw conclusions

Social competences

1. understands the need for lifelong learning; can inspire and organize the learning process of others

2. can interact and work in a group, taking on different roles in it

3. is able to properly set priorities for the implementation of the task specified by him or others

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:

- assessment of knowledge and skills demonstrated on the written test - 1.5 hour

Exercises:

- knowledge acquired during the exercises is verified by two 45-minute colloquia carried out during 3 and 7 classes

Laboratories:

- checking the preparation (knowledge) for laboratory classes,

- rewarding practical knowledge acquired during previous laboratory exercises,

- assessment of knowledge and skills related to the performance of measurements and their development in the form of a report.

Programme content

Lecture (IFR Communications, 15 h):

Meanings and Significance of Associated Terms. Air Traffic Control Abbreviations. Q-Code Groups Commonly Used in RTF Air-Ground Communications. Categories of Messages. Radiotelephony Call Signs for Aeronautical Stations and Aircraft Including Use of Abbreviated Call Signs. Transfer of Communication. Test Procedures Including Readability Scale; Establishment of RTF Communication. Relevant Weather Information Terms (IFR).

Exercises (IFR Communications, 15 h):

Transmission of Letters, Numbers (Including Level Information), Time. Transmission Technique. Standard Words and Phrases (Relevant RTF Phraseology Included). Level Changes and Reports. Action Required to be Taken in Case of Communication Failure. PAN Medical. Morse Code.

Lecture (Human Performance and Limitations 2, 15 h):

Basics of flight physiology. Respiratory and circulatory system. Hypertension and hypotension. Coronary artery disease. Hypoxia. Hyperventilation. Decompression sickness/illness. High-altitude environment. People and the environment: the sensory system. Problem areas for pilots.

Exercises (Human Performance and Limitations 2, 15 h):

Radiation. Humidity. The different senses. Central, peripheral and autonomic nervous system. Vision. Hearing. Equilibrium. Health and hygiene.

Lecture:

Introduction - basic relationships, thermodynamic factor model. First law of thermodynamics. Perfect gases. Basic relationships for open systems. The second law of thermodynamics. Circulation and transformation efficiency. Typical transformations of perfect gas. Real gases. Basics of combustion processes description. Engine circuits. Left-hand cycles. Steam power cycle. Fundamentals of heat flow.

exercises:

The issues presented in the lecture are solved in the form of tasks.

Laboratories:

1. Temperature measurement and calibration.

2. Thermometry. Temperature measurements with resistance and thermoelectric thermometers.

3. Pressure measurement and calibration.

4. Energy balance. First law of thermodynamics.

5. Measurement of heat flux.

6. Perfect gas. The process of expansion in perfect gases.

7. Testing the TA60 absorption aggregate.

Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.

2. Exercises: examples given on the board and performance of tasks given by the teacher - practical exercises.

3. Laboratories: Practical classes on the didactic positions.

Bibliography

Basic

1. "Communication" (JAR Ref 090). JAA ATP1 Training. Germany 2004

2.„Procedury służb Żeglugi powietrznej Zarządzanie Ruchem Lotniczym (PL-4444)"

3. Szajnar S.: „Czynnik ludzki w obsłudze urządzeń technicznych”, Skrypt WAT, Warszawa 2010.

4. Janowska Z.: „Zarządzanie zasobami ludzkimi”, Polskie Wydawnictwo Ekonomiczne, 2010

5. Scott W. E., Cummings L. L.: “Zachowanie człowieka w organizacji”, Państwowe Wydawnictwo Naukowe, 1983

6. www.faa.gov

7. www.easa.europa.eu

8. Kalinowski E.:Termodynamika, Wyd. P. Wr. 1994

9. Szargut J.: Termodynamika techniczna, Wyd. P. Śl. 1997

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11. Wiśniewski St.: Termodynamika techniczna, WNT 1995

12. Tuliszka E. Red.: Termodynamika techniczna. Zbiór zadań, Nr 889, Wyd. P.P. 1980

13. Kestin J.: Course in Thermodynamics, New York, Hemisphere 1979

Additional

1. Tuliszka E.: Teoria maszyn cieplnych, Nr 511, Wyd. P.P. 1974

2. M.J. Morano, H.N.Shapiro: Fundamentals of Engineering Thermodynamics, John Wiley & Sons, New York, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	210	7,0
Classes requiring direct contact with the teacher	120	4,0
Student's own work (literature studies, preparation for written tests)[1]	90	3,0

[1] delete or add other activities as appropriate