



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Programming Languages

### Course

Field of study

Aerospace Engineering

Area of study (specialization)

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

Polish

Requirements

compulsory

### Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

### Number of credit points

2

### Lecturers

Responsible for the course/lecturer:

Prof. dr hab. inż. Andrzej Frąckowiak

Responsible for the course/lecturer:

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Faculty of Environmental and Energy

Engineering

Piotrowo 3, PL60-965 Poznan

### Prerequisites

**KNOWLEDGE:** The student possesses elementary knowledge of the fundamentals of computer science, i.e. the computer architecture, types of variables, the general knowledge of the language of low, medium and high levels used in programming computers and typical engineering applications in the field of computer simulation of physical systems.

**SKILLS:** The student is able to use the concepts in the description of programming languages. The student is able to deal with specific problems that arise during the writing of programs.



**SOCIAL COMPETENCES:** Students can cooperate in a group, taking the different roles. The student is able to define priorities, which are important in solving the tasks posed before her/him. The student demonstrates self-reliance in solving problems, acquiring and improving her/his knowledge and skills.

### Course objective

The aim of the course is to provide students with information concerning the selected programming languages (Fortran, C), the definitions and concepts. Students acquire knowledge and skills in the creation of computer programs.

### Course-related learning outcomes

#### Knowledge

Student has extensive knowledge, necessary for understanding of profile subjects and specialist knowledge about construction, methods of construction, manufacturing, exploitation, air traffic management, security systems, impact on the economy, society and environment of the aviation and cosmonautics for selected specialties: Aeronautical Engineering. Student has detailed knowledge of programming languages used in programming engineering applications, databases, on-board systems, and network applications.

#### Skills

Student is able to communicate using various techniques in a professional environment and other environments using a formal record of construction, technical drawing, concepts and definition of the scope of the studied field of study. Student has the ability to self-study using modern teaching tools, such as remote lectures, websites and databases, didactic programs, e-books. Student can obtain information from literature, the Internet, databases and other sources. Can integrate the information obtained and interpret conclusions and create and justify opinions. Student can use formulas and tables, technical and economic calculations using a spreadsheet programming tools of own authorship, specialized software.

#### Social competences

Student understands the need to learn throughout life; he can inspire and organize the learning process of other people. Student is ready to critically evaluate the knowledge and content received, recognize the importance of knowledge in solving cognitive and practical problems and consult experts in the case of difficulties in solving the problem.

### Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired during the lecture is verified by 45-minute tests carried out during the last lecture. The test consists of 6-10 questions with different scores. Passing threshold: 50% of points. Final issues, on the basis of which the questions are developed, will be sent to students by e-mail using the university's e-mail system.

The skills acquired during the laboratory classes are verified on the basis of 4 short programs written by the student in the C language and one in any chosen language. The pass mark is 4 correctly functioning programs.



### Programme content

Construction of computer programs. Comparison of the structure of C and Fortran. Discussion of the declaration constants, variables and variable types. Arithmetic operators. Functions - value of functions and parameters, making arguments be passed by value and by reference. Expressions - attribution, data comparison, priorities and communication. Branching and loops. Arrays and structures. Standard libraries of C and Fortran. The basic concepts of numerical calculations: iteration, interpolation, approximation, extrapolation, numerical integration, solving ordinary differential equations. Square root algorithm, algorithms for finding zeros of functions - Newton's method, secants and bisection method, method using numerical integration of Richardson extrapolation, solving ordinary differential equations using Euler's method and the midpoint method. The procedures for these algorithms in C and Fortran.

### Teaching methods

1. Lecture: multimedia presentation, illustrated with examples given on the board.
2. Laboratory: examples given on the blackboard and carrying out the tasks given by the teacher.

### Bibliography

#### Basic

1. Conor Sexton, Język C to proste, Wydawnictwo RM, Warszawa 2001.
2. Anna Trykozko: Fortran 77. Podstawy programowania. ZNI „MIKOM”, Warszawa 1994,
3. Michael Metcalf and John Reid: Fortran 90/95 explained, Oxford Science Publications, 1998,

#### Additional

1. Åke Björck, Germund Dahlquist: Metody numeryczne, PWN, Warszawa 1983,

### Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2,0
Classes requiring direct contact with the teacher	32	1,0
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam) <sup>1</sup>	28	1,0

<sup>1</sup> delete or add other activities as appropriate