Field of study: Automation and Robotics
Faculty: Faculty of Computer Science and Technology

Descriptions of courses - winter semester 2023/2024 AY

Semester 1

Basics of Programming

The main aim of the course is to familiarize students with the basic concepts of programming in C and to acquire practical skills to create software in C and C++.

The course presents information for people learning C and C++ as first programming language. Course will give a full introduction to all of the core concepts in the C and C++ programming language.

Topics:

- C and C++ Introduction
    - Variables & Constants, Data Types, Input/Output, Operators
- Flow Control
- Functions
    - Programming Functions, User-defined Functions, Recursion
- Programming Arrays
    - Arrays, Multi-dimensional Arrays, Arrays & Function
- Programming Pointers
    - Pointers, Pointers & Arrays, Pointers & Functions,
- Programming Strings
- Structure And Union
- Programming Files

Computer Added Design

The main aim of the course is to familiarize students with the basics of descriptive geometry and the principles of machine engineering; -developing the ability to draw objects with complex geometry; preparing students to read and create technical drawings in rectangular and axonometric projections; preparing students to create technical documentation in the form of assembly drawings; familiarizing students with CAD software for creating technical drawings.

Topics:

- Basics of descriptive geometry, types of viewports and projections.
- Mapping basic elements: point, line, plane.
- Standardized elements of a machine technical drawing.
- Projecting objects in a technical drawing.
- Views, sections, lays.
- Principles of dimensioning, tolerance of dimensions as well as shape and position.
- Determination of surface roughness and waviness.
- Connections of machine parts.
- Assembly and executive drawings.

Semester 3

Algorithms and Data Structures

The main aim of the course is to familiarize students with the basic concepts of using data structures and algorithms in programming. It provides guidance on how to implement basic data structures from scratch: arrays, linked lists, graph, trees and then use the structures to implement algorithms such as sorting, searching, etc. using C++ or Java language.

Topics:

- Simple data structures: Arrays, Linked Lists
- Abstract data types: Stacks, Queues, Heaps
- Trees: Binary Search Trees, Balanced Binary Trees, B-Trees
- Simple Sorting algorithms: Bubble Sort, Selection Sort, Insertion Sort
- Quick Sorting algorithms: Shell Sort, Heap Sort, Merge Sort, Quick Sort
- Algorithms designing methods: Divide and conquer, Recursion, Dynamic programming
- Graph algorithms: Dijkstra algorithm

Basics of Artificial Intelligence

The aim of the course is to outline the basic methods and techniques of artificial intelligence and to put them in an algorithmic context. The course also equips students with the skills to use artificial intelligence tools in forecasting, classification, approximation, estimation, and logical inference.

Topics:

- Programming in Matlab. Interface. Variables. Vectors (single row or single column matrices). Two-dimensional matrices. Array and array operations.
- Basic functions and constants. Relational Operators. Logical operators and functions.
- If statement. Switch instruction. The for and while loops.

- Creating m-files. Scripts.
- Features. Sub-functions.
- Graphics in Matlab. 2D graphics
- 3D Graphics. Graphs of functions.
- Simulink - modeling of dynamic systems. Mathematical model. Simulink
- Simulink - examples of models of dynamic systems
- Selected numerical capabilities of the Matlab package
- Working with Toolboxes: Neural Network, Genetic Algorithm.
- Modeling KAG systems in Matlab.
- Classification of raster objects and space points using SSN.
- Application of SSN in approximation tasks.
- Modeling SSN systems in Matlab.

Semester 5

Process Robotization

The aim of the course is to familiarize students with technologies and methodologies of robotization of industrial processes. An accessible introduction to the use of robots and the construction and operation of robotic systems. Inspiration for creative reflection on the social role of robotics and robotization in today's world. Learning the basic concepts of robotics and robotics.

Topics:

- Introduction to robotization of industry and services
- Production and service of processes,
- Robotic system, its components and configurations,
- Transport in close vicinity of the robot (material handling),
- Robotic system control.

Laboratory of basics of robotics

The aim of the course is to provide knowledge on basics of robotics. Learns the principles of operation of simple mobile robots. Creates an algorithm for the automatic movement of a robot using data from sensors.

Topics:

- Presentation of the scope of the basics of construction.
- Learning of programming of mobile robots,
- Familiarizing students with solutions to tasks in mobile robotics,
- Preparing students to build and program more complex robots.

Process Visualization

The aim of the course is to introduce the subject of SCADA systems. As part of the course, the student acquires knowledge about the structures of visualization systems, methods of presenting the course of the process and the condition of the facility, methods and guidelines for the designed operator interfaces, methods of monitoring and control of industrial processes.

Topics:

- Structure of InTouch industrial process visualization software.
- Methods for creating objects in the InTouch environment.
- Types of variables and methods of their declaration in the InTouch environment.
- Creating scripts, alarms and trends in InTouch.
- Methods of communication with external applications. Reporting methods in the InTouch environment.
- Ways to compress the application. (Group project - application for the visualization of an industrial technological process)
- Development of the structure and graphic design of the system windows.
- Development and implementation of work algorithms for individual circuits.
- Development and implementation of an algorithm integrating the entire system.
- Implementation of the functionality that allows the application to be secured against unauthorized access and the display of alarms.
- Implementation of the functionality enabling the preparation of reports in text and graphic form on the operation of the system.