

Subject code	Credits
INF3040	4

Title

ROBOTIKA

Title in English

ROBOTICS

Subject goal and annotation

This course introduces students to a wonderful (mobile) robotic world. Students will learn how to use robots in interactive multimedia systems. Students will be able to build simple (mobile) robots, choose proper sensors and actuators, and calibrate them. They will be able to choose the right development environment, build modular software that allows controlling a robot remotely or robot operate autonomously. All theoretical material will be tried practically.

Prerequisites

Undergraduate courses: Mathematics

Relationship between the learning outcomes of the Programme and learning outcomes of the subject

Learning outcomes of the Programme	Learning outcomes of the subject	Criteria for measuring the achievement of learning outcomes
1. Knowledge and understanding of basic mathematics, physics and nature, and its applicability in engineering.	Knowledge and understanding of robots usage, their construction, actions and applications.	Student demonstrates the ability to describe main principles of robot actions, their construction and application areas.
3. Knowledge of basic and advanced computer science and its application	Knowledge and understanding of selecting the appropriate sensors and parts for robot construction.	Student demonstrates the ability to construct a robot from the parts that correspond to the needs of the problem provided.
8. Perform interdisciplinary research and development in Internet systems area, apply results in practical applications. 10. Analysis, design and development of advanced Internet systems.	Ability to program systems that allow controlling robots in a distance (including internet) or to act autonomously.	Student demonstrates skills in programming systems that can be controlled in a distance.
12. Analysis, design and development of diverse software systems.	Ability to choose appropriate programming environments and architectures and algorithms for robot programming.	Student demonstrates skills in solving more complex robotics tasks where appropriate methods have to be chosen.

Subject content

	Lecture topics and contents	Hours
1.	Introduction. Robotics. Mobile Robotics.	2
2.	Sensors: types, calibrations, and usage.	2
3.	Control algorithms. PID regulators.	2
4.	Robot programming. Arduino.	4
5.	Localization.	4
6.	Line following.	2
7.	Obstacle avoidance.	2
8.	Computer vision in robotics.	2
9.	Trajectory planning.	4
10.	Robot architectures.	2
11.	Humanoid robot action generalisation.	2
12.	Human-robot interaction.	2
		30

Practical work contents

Programming robots: control algorithms. All problems should be presented and described.

1. Line following.
2. PID regulators for line following.
3. Obstacle avoidance.
4. Driving in labyrinth.
5. Computer vision. Recognition of the line.
6. Micro-chip PIC programming.
7. Programming with Arduino.

Evaluation of study results

Final written exam (50%), mid-term written exam (17%), and assessments of laboratory (practical) work (33%).

Distribution of subject study hours

Lectures	30
Laboratory work	30
Individual studies (including studies in groups, preparation for the mid-term and final exams)	44
Total	104

Recommended literature

No	Author and name	Number of copies available		
		<i>in the Library of VMU</i>	<i>in specialized publication collections at VMU</i>	<i>in other libraries</i>
Main literature				
1.	LEGO Mindstorms NXT-G Programming Guide, J.F. Kelly, Springer, 2010	Internet link: http://goo.gl/nqaSo		
2.	Robot Manipulators Trends and Development, InTech, 2010	Internet link: http://goo.gl/2fiDh		
3.	Microsoft Robotics Studio tutorials, Microsoft, 2012	Internet link: http://www.microsoft.com/robotics/#Learn		
4.	Mobile Robots Navigation, InTech, 2010	Internet link: http://goo.gl/L4cW8		
Additional literature				
1.	Artificial Intelligence, Stanford, 2012	Internet link for video lectures: http://goo.gl/irfHi		
2.	From Bricks to Brains: The Embodied Cognitive Science of LEGO Robots, AU Press, 2010	Internet link: http://www.aupress.ca/index.php/books/120175		
3.	Robotics: exploring solutions for today and tomorrow, Education Society, 2012	Internet link: http://www.gateways2learning.ca/Robotics/ca1.html		

Subject prepared and coordinated by

Prof dr. Minija Tamozi nait , doc.dr. A.Vidugirien