



COURSE DESCRIPTION

Course code	full-time studies	
	part-time-studies	
Course name	Programowanie współbieżne	
Course name in English	Concurrent programming	
Valid from academic year	2022/23	

PLACEMENT IN THE TEACHING PROGRAM

Field of study	Computer Science
Level of education	1st degree
Studies profile	General
Form and method of teaching classes	Full-time and part-time studies
Specialization	All specializations
Organizational unit responsible for the course	Department of Computer Systems
Course coordinator	Dr inż. Paweł Paduch
Approved by	Dean of the Faculty of Electrical Engineering, Automatic Control and Computer Science Roman Deniziak, KUT prof., DSc, PhD

GENERAL CHARACTERISTIC OF THE COURSE

Course affiliation	Major subject	
Course status	Obligatory	
Language	English	
Semester	full-time studies	V
	part-time-studies	VI
Requirements	Algorithms and data structures Fundamentals of Programming 2 Object-oriented programming 2	
Exam (YES/NO)	NO	
ECTS	4	

Course form		lecture	classes	laboratory	project	other
Hours per semester	full-time studies	30	0	30	0	0
	part-time-studies	18	0	18	0	0

LEARNING RESULTS

Category	Result Symbol	Learning Results	References to the field of study results
Knowledge	W01	Student knows and understands basic concepts concerning concurrent programming.	INF1_W18
	W02	Student knows and understands synchronization and communication methods between processes and threads.	INF1_W18
	W03	Student knows and understands principles of analysis of concurrent programs in terms of effectiveness and safety.	INF1_W18
	W04	Student knows selected concurrent algorithms.	INF1_W18
Skills	U01	Student can program concurrently.	INF1_U18
Social competence	K01	Student is ready to use his knowledge in professional life.	INF1_K01, INF1_K02

COURSE CONTENT

Course Form	Content
lecture	<ul style="list-style-type: none"> • Introduction to concurrent programming - processes, threads, tasks, monitors, semaphors, conditional variables. • Concurrent algorithms in an object-oriented environment • Multithreading in graphical environments - calculations of multithreaded processors. Thread synchronization • Immutable objects • Concurrent collections • Synchronizers • Tasks canceling • Concurrent patterns and frameworks
laboratory	<ul style="list-style-type: none"> • Learning the basics of concurrent programming tools • Creating and terminating threads - delegates, events and timers • Thread synchronization - concurrent collections • Barriers and monitors • Concurrent programming using GUI • Concurrent programming in an object-oriented environment • Immutable objects • Synchronizers • Concurrency patterns and frameworks

LEARNING RESULTS VERIFICATION METHODS

Result Symbol	Learning results verification methods					
	Oral Exam	Written Exam	Midterm	Project	Report	Other
W01			X			
W02			X			
W03			X			
W04			X			
U01			X			X
K01						X

ASSESSMENT FORMS AND CRITERIA

Course Form	Assessment Form	Assessment Criteria
lecture	Passing grade	The student should have at least 50% of points at the final test.
laboratory	Passing grade	The student should obtain at least 50% points from laboratory tasks and tests.

STUDENT'S VOLUME OF WORK

ECTS Balance													
No.	Activity Type	Student Involvement										Unit	
		full-time studies					part-time-studies						
		Lec	C	Lab	P	S	Lec	C	Lab	P	S		
1.	Participation in classes according to the schedule	30	0	30	0	0	18	0	18	0	0	h	
2.	Other (consultations, exams)	4	0	2	0	0	4	0	2	0	0	h	
3.	Total with the direct assist of an academic teacher	66					42					h	
4.	Number of ECTS, that students obtains with the direct assist of an academic teacher	2,64					1,68					ECTS	
5.	Hours of unassisted student work	34					58					h	
6.	Number of ECTS that student obtains working unassisted	1,36					2,32					ECTS	
7.	Practical classes volume of work	30					18					h	
8.	Number of ECTS obtained by student at practical classes	1,2					0,72					ECTS	
9.	Total student's volume of work expressed in hours	100					100					h	
10.	ECTS	4										ECTS	

BIBLIOGRAPHY

1. Ben-Ari M.: Principles of Concurrent and Distributed Programming, 2nd Edition, Pearson, 2005
2. Stevens, W., R.: Unix Network Programming, Volume 1: The Sockets Networking API 3rd Edition, Addison-Wesley Professional, 2003
3. Stevens, W., R.: UNIX Network Programming, Volume 2: Interprocess Communications: 2nd Edition, Prentice Hall, 1999
4. Troelsen A., Japikse P.: C# 6.0 and the .NET 4.6 Framework 7th Edition, Apress, 2015
5. Schildt H.: Java: The Complete Reference, Eleventh Edition 12th Edition, McGraw-Hill Education, 2021
6. Schildt H.: Java: A Beginner's Guide, Ninth Edition 9th Edition, McGraw-Hill Education, 2022
7. Horstmann C. S.: Core Java: Fundamentals, Volume 1 (Oracle Press Java) 12th Edition, Oracle Press, 2021
8. Horstmann C. S.: Core Java: Advanced Features Volume 2, Oracle Press, 2022
9. Goetz B., Peierls T., Bloch J., Bowbeer J., Holmes D., Lea D.: Java concurrency in practice, Addison-Wesley Professional, 2006
10. Schmidt D. C., Stal M., Rohnert H., Buschmann F., Pattern-Oriented Software Architecture: Patterns for Concurrent and Networked Objects, Wiley & Sons, 2000