

Subject (course) name: Concurrent Processing		
Programme: Computer Science Specialty:		Subject code: 7S
		Title graduate: Engineer
Type of course: obligatory	Course level: First-cycle studies	Year: III Semester: VI Semester: summer
Form of classes: Lectures, Classes, Labs, Seminar, Project	Number of hours per week: 1L, 0, 1Labs, 0, 0	Credit points: 3 ECTS

GUIDE TO SUBJECT

SUBJECT OBJECTIVES

- C1. General knowledge of common problems in concurrent processing.
- C2. General knowledge of methods and mechanisms in concurrent processing.

SUBJECT REQUIREMENTS

- 1. General knowledge of operating systems.
- 2. Ability of using a programming language (C++ or similar).
- 3. General ability to independently search in literature.

LERNING OUTCOMES

- EK1 The student knows the fundamental terms and concepts of concurrent processing.
- EK2 – The student understands and identifies typical problems of concurrent processing.
- EK3 – The student knows and applies hardware and software mechanisms of process synchronization and interprocess communication.
- EK4 – The student can solve simple problems of concurrency.

SUBJECT CONTENT

Form of classes - lectures

Topic	Hours
L1 – Fundamental concepts in concurrent processing.	1
L2 – Creating and using threads in selected OS.	1
L3 – The correctness of concurrent programs.	1
L4 – Mutual exclusion.	1
L5 – Classic problems of concurrency.	1
L6 – Process synchronization and interprocess communication.	1
L7 – Semaphores.	1
L8 – Monitors.	1
L9 – Other selected methods of synchronization and communication.	1
L10 – Thread synchronization in selected OS.	1
L11 – Program acceleration and efficiency, data granularity.	1
L12 – Task scheduling.	1
L13 – Real time systems.	1
L14 – Trends, applications, perspectives of concurrent processing.	1
L15 – Test.	1
Total	15

Form of lab

Topic	Hours
L1,2 – Introduction to programming environment.	2
L3,4,5,6 – Creating and using threads.	4
L7,8 – Mutual exclusion.	2
L9,10 – Producers and consumers.	2
L11,12 – Writers and readers.	2
L13,14 – Five philosophers.	2
L15 – Test.	1
Total	15

STUDY METHODS

1. Lectures with use of multimedia presentations.
2. Labs – programming.

EDUCATIONAL TOOLS

1. Audiovisual equipment, lectures in electronic version.
2. Lab instructions.
3. Computers and C++ environment.

METHODS OF ASSESMENT (F – Forming, P – Summary)

P1. Lecture – written test on theory.
P2. Lab – solving particular problems (50%).
P3. Lab – final test (50%).

STUDENT WORKLOAD

Form of activity	Averaged workload (hours)			
	[h]	∑ [h]	ECTS	
Participation in class activities	lectures	15	32	2
	labs	15		
	consultations	2		
Preparation for tutorials (reading literature)	5	25	1	
Preparation for labs	10			
Preparation for tests	10			
Total		57	3	

BASIC READING

1. Ben-Ari M.: <i>Principles of concurrent and distributed computing</i> , Adison-Wesley, 2006.
2. MSDN online – http://msdn.microsoft.com/en-us/library .

FURTHER READING

1. Anthony Williams, <i>C++ Concurrency in Action Practical Multithreading</i> , Manning Publications Co., 2012.
2. Anthony Williams, <i>C++11 Concurrency Tutorial</i> , Just Software Solutions Ltd, http://www.justsoftwaresolutions.co.uk

Learning objectives	In relation to the learning outcomes specified for the field of study	Subject objectives	Study methods	Methods of assessment
EK1	KW_08	C1	lectures, labs	P1, P2, P3
EK2	KW_08	C1	lectures, labs	P1, P2, P3
EK3	KW_08	C1	lectures, labs	P1, P2, P3
EK4	K_U11, K_U14	C2	lectures, labs	P1, P2, P3

II. EVALUATION

Grade	Outcome
EK1	The student knows the fundamental terms and concepts of concurrent processing.
2 (F)	The student does not know any terms and ideas of concurrent processing.

3 (E)	The student poorly knows the basic terms and ideas of concurrent processing.
3,5 (D)	The student knows the basic terms and ideas of concurrent processing.
4 (C)	The student knows the terms and ideas of concurrent processing.
4,5 (B)	The student knows and explains the terms and ideas of concurrent processing.
5 (A)	The student knows, explains and applies the terms and ideas of concurrent processing.
EK2	The student understands and identifies typical problems of concurrent processing.
2 (F)	The student cannot give any problems of concurrent processing.
3 (E)	The student can give at least one problem encountered in concurrent processing.
3,5 (D)	The student can give examples of problems encountered in concurrent processing.
4 (C)	The student can give examples of problems encountered in concurrent processing and explain at least one of them.
4,5 (B)	The student can give and explain examples of problems encountered in concurrent processing and explain them.
5 (A)	The student gives, explains and identifies examples of problems encountered in concurrent processing and explain them.
EK3	The student knows and applies hardware and software mechanisms of process synchronization and interprocess communication.
2 (F)	The student cannot give any mechanisms of process synchronization or interprocess communication.
3 (E)	The student can give some mechanisms of process synchronization or interprocess communication.
3,5 (D)	The student can give many mechanisms of process synchronization or interprocess communication.
4 (C)	The student can give many mechanisms of process synchronization or interprocess communication and explains some of them.
4,5 (B)	The student can give and explain many mechanisms of process synchronization or interprocess communication.
5 (A)	The student can give, explain and apply mechanisms of process synchronization or interprocess communication.
EK4	The student can solve simple problems of concurrency.
2 (F)	The student cannot explain algorithm for any classic problems of concurrency.
3 (E)	The student poorly can explain algorithms of some classic problems of concurrency.
3,5 (D)	The student can explain algorithms of some classic problems of concurrency.
4 (C)	The student can explain algorithms of some classic problems of concurrency and implement at least one of them.
4,5 (B)	The student can explain and implement algorithms of some classic problems of concurrency.
5 (A)	The student can explain and implement algorithms of some classic problems of concurrency, he creates concurrent programs.

III. OTHER USEFUL INFORMATION

1. All information for students on the schedule are available on the notice board and on the website: www.el.pcz.pl.
2. Information on the consultation shall be provided to students during the first lecture and will be placed on the website www.el.pcz.pl.
3. Terms and conditions of credit courses will be provided to students during the first lecture.