and justify them - K_U01         Subjective and justify them - K_U01         Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3       Social competencies         Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:         The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in			STUDY MODULE D	ESCRIPTION FORM			
Field of study       Profile of study (Brank)       Profile of study (Brank)       Year /Semester (Brank)         Elective path/specialty       -       Polish       2/ 4         Subject of fered in: Polish       Course (compulsory, elective)       0bligatory         Cycle of study:       Form of study (full-time, part-line)       No. of credits         Lecture:       15       Classes:       -       No. of the course in the study program (Basic, major, other)       (university-wide, from anather field)       No. of credits         Education areas and fields of science and art       (brack)       (brack)       ECTS distribution (number and %)         Education areas and fields of science and art       (brack)       (brack)       Status of the course in the study program (Basic, major, other)       (university-wide, from anather field)       (brack)         Education areas and fields of science and art       (brack)       Status of the course in the study program, pl tet, 448 61 665 3331       100%         Responsible for subject / lecturer:       drink: krzysztof Buchole email: krzysztof buchole dignup course)       Studen thas an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstrate and their sources; can also integrate the acquire knowledge, interpret it, reason, formulate conclusions and upsis, design techniques, abstrate programmic glaugaes - K, U10]         3       Social competencinge       Studen thas bas cotae fori		•					
Information Engineering         (brak)         2/14           Elective path/specialty         Subject aftered in: Polish         Course (compulscoy, elective) obligatory           Cycle of study:         Form of study (full-time, part-time)         Course (compulscoy, elective)           Form of study (full-time, part-time)         full-time         No. of credits           Status of the course in the study program (Basic, major, other)         (university-wide, from another field)         No. of credits           Education areas and fields of science and art         (Drak)         (Drak)         3           Education areas and fields of science and art         (Drak)         (Drak)         SciEnd Sciences           Responsible for subject / lecturer:         drint. Krzysztof Bucholc         grint. Krzysztof bucholc@put, poznan, pl tet, 448 61 665 3331         Wydzial Elektryczny         Jul. Piotrow 3A 60-965 Poznan           Prerequisites in terms of knowledge, skills and social competencies:         Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K.W04           2         Skills         Student can by preself/himself acquire knowledge from the literature, databases and other analysis, design techniques, abstract data structures and their implementation, formulate conclusions and justify them - K_U01           3         Social         Student understands a	-			Profile of study (general academic, practical)	Year /Semester		
-         Polish         obligatory           Cycle of study:         First-cycle studies         Form of study (full-time_part-time)         full-time           No. of hours         Lecture:         15         Classes:         No. of credits         3           Status of the course in the study program (Basic, major, other)         (university-wide, from another field)         No. of credits         3           Education areas and fields of science and at         ECTS distribution (number and %)         3         100%           Responsible for subject / lecturer:         dr in2. Krzysztof Buchole @put_poznan.pl         ECTS distribution (number and %)         3         100%           Responsible for subject / lecturer:         dr in2. Krzysztof Buchole @put_poznan.pl         ECTS distribution (number and %)         3         100%           Prerequisites in terms of knowledge, skills and social competencies:         1         Knowledge         Student has an ordered and weil-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their mpiementiation, computationally difficult prolems - K_WO4           2         Skills         Student can by herself/himself acquire knowledge from the literature, databases and other subject to use programming environments and platforms to write, perform and test simple programs coded in importative programming languages - [K_U10]           3         Social competencies         Student understand	Info	mation Enginee	ring		2/4		
First-cycle studies       full-time         No. of hours       Laboratory:       15       Project/seminars:       No. of credits         Lacture:       15       Classes:       - Laboratory:       15       Project/seminars:       -       3         Status of the course in the study program (Basic, major, other)       (university-wide, from another field)       (brak)       ECTS distribution (number and %)         Education areas and fields of science and at       ECTS distribution (number and %)       3       100%         Education areas and fields of science and at       ECTS distribution (number and %)       3       100%         Responsible for subject / lecturer:       dr in2. Krzysztof Buchole@put.poznan.pl       Etcl.448 6165 3531       3       100%         Prerequisites in terms of knowledge, skills and social competencies:       Implementation, computationally difficult problems - K_WO4       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_WO4       Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperture programming language - K_U 10]       Student is able to use programming environments and platforms to write, perform and test simple programs coded in indeprative programming language - K_U 10]       Student is able to use programming environments and platforms to write, perform and te	Elective	path/specialty	-				
No. of readits       No. of credits         Lecture:       15       Classes:       Laboratory:       15       Project/seminars:       3         Status of the course in the study program (Basic, major, other)       (university-wide, from another file()       (brak)       Education areas and fields of science and art       ECTS distribution (number and %)         Education areas and fields of science and art       (brak)       (brak)       ECTS distribution (number and %)         Education areas and fields of science and art       (brak)       ECTS distribution (number and %)       3       100%         Responsible for subject / lecturer:       drinz, Krzysztof Bucholc       grinz, Krzysztof bucholc@put.poznan.pl       tet.448 61 653 5331       Wydzial Elektryczny       ui. Piotrowo 3A 60-965 Poznań         Prerequisites in terms of knowledge, skills and social competencies:       1       Knowledge       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_U04         2       Skills       Student can by herself/himself acquire knowledge from the literature, databases and other sources: can also integrate the acquire knowledge from the literature, databases and other sources: can also integrate the acquire knowledge interning languages - [K_U10]         3       Social competencies       Student understands and is aware of the importance of nontechnicial issues rel	Cycle o	f study:		Form of study (full-time,part-time)			
Lecture:       15       Classes:       -       -       3         Status of the course in the study program (Basic, major, other) (brak)       (university-wide, from another field)       (brak)         Education areas and fields of science and art       (brak)       (brak)         technical sciences       3       100%         Responsible for subject / lecturer: dr in2. Krzysztof Bucholc email: krzysztof.bucholc@put.poznan.pl tet.+48 61 665 3331       3       100%         Wydzia: Elektryczny ul. Piotrowo 3A 60-965 Poznań       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student can by herself/himself acquire knowledge, interpret it, reason, formulate conclusions and justify tohem - K_U01         3       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:         1.       Study outcomes and reference to the educational results for a field of study         Student is able to do critical analysis of computer hard		First-cyc	cle studies	full-time			
Status of the course in the study program (Basic, major, other) (university-wide, from another field) (brak) (brak) Education areas and fields of science and art Education areas and fields of science and art technical sciences 3 100% Responsible for subject / lecturer: dr inž. Krzysztof Bucholc email: krzysztof bucholc@put.poznan.pl tel. +48 61 665 3531 Wydzia Elektryczny ul. Piotrowo 3A 60-965 Poznań Prerequisites in terms of knowledge, skills and social competencies: 1 Knowledge Student has an ordered and well-based in theory. knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04 2 Skills Student can by herself/himself acquire knowledge from the literature, databases and other sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify tchem - K_U01 Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10] 3 Scial competencies Study tunderstands and is aware of the importance of nontechnical issues related to computer engineer activity. Suduent understands the responsibility associated to bis engineering decisions [K_K02] Assumptions and objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint. Study outcomes and reference to the educational results for a field of study Knowledge: 1. Student is able to do critical analysis of computer hardware operating, operating system and computer networks [K_U11] 2. Student is able to do critical analysis of computer hardware operating, operating system and computer networks [K_U11] 3. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U20] Social competencies:	No. of h	ours			No. of credits		
(brak)         (brak)           Education areas and fields of science and at         ECTS distribution (number and %)           technical sciences         3 100%           Responsible for subject / lecturer:         a 100%           dr inz. Krzysztof Bucholc email: krzysztof bucholc@put.poznan.pl tel. +486 f 665 3531         wydział Elektryczny ul. Piotrowo 3A 60-965 Poznań           Prerequisites in terms of knowledge, skills and social competencies:         Image: science and science and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04           2         Skills         Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04           2         Skills         Student can by herself/himself acquire knowledge from the literature, databases and other sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify tchem - K_U01           3         Social competencies         Student ta suble to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U02]           Assumptions and objectives of the course:         The objectives of the course:           The objectives of the course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.	Lectu	re: 15 Classes	s: - Laboratory: 15	Project/seminars:	3		
Education areas and fields of science and art       ECTS distribution (number and %)         technical sciences       3 100%         Responsible for subject / lecturer:       dr inz. Krzysztof Bucholc         dr inz. Krzysztof.bucholc@put.poznan.pl       technical sciences         11. 48 61 665 3331       Wydział Elektryczny         ul. 496 1665 3331       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:       The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:       1. Student is able to do critical analysis of	Status o						
technical sciences       3 100%         Responsible for subject / lecturer:       dr in2. Krzysztof Buchole         dr in2. Krzysztof Buchole       email: krzysztof Buchole@put.poznan.pl         tel. +48 61 665 3531       Wydział Elektryczny         ul. Piotrowo 3A 60-965 Poznań       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student can by herself/himself acquire knowledge from the literature, databases and other sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify them - K_U01         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the computer engineer activity. Student understands the systems programmer viewpoint.         3       Social competencies       Study outcomes and reference to the educational results for a field of study         Knowledge:       1       Nod operating systems and vipres of operating system so for computer engineering system and computer engineering system and test simple programs coded in imperative programming languages - [K_K02]         Assumptions and objectives of the course:       The objectives of the course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Studen thas organized knowledge with theoretical foundations of compu			<b>X /</b>	10)	,		
Responsible for subject / lecturer:         dr inż. Krzysztóf Bucholc         email: krzysztóf bucholc@put.poznan.pl         tel48 61 665 3531         Wydział Elektryczny         ul. Piotrowo 3A 60-965 Poznań         Prerequisites in terms of knowledge, skills and social competencies:         1       Knowledge         3       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student as by herself/himself acquire knowledge, interpret it, reason, formulate conclusions and justify tchem - K_U01         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:         The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills       1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         1. Student is able to use programmi	Educati	on areas and fields of sci	ence and art				
drinz, Krzysztof Bucholc         email: krzysztof bucholc@put.poznan.pl         tel. +48 61 665 3531         Wydział Elektryczny         ul. Piotrowo 3A 60-965 Poznań         Prerequisites in terms of knowledge, skills and social competencies:         1       Knowledge         2       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficul problems - K_V04         2       Skills       Student can by herself/himself acquire knowledge from the literature, databases and other sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify tohem - K_U01         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:       The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U06]         Skills:       1.         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to do critical analysis of computer hardware operations, opera	techr	nical sciences			3 100%		
email: krzysztof.bucholc@put.poznan.pl         tel. +48 61 665 3531         Wydział Elektryczny         ul. Piotrowo 3A 60-965 Poznań         Prerequisites in terms of knowledge, skills and social competencies:         1       Knowledge         2       Student has an ordered and well-based in theory, knowledge of basic algorithms and their analysis, design techniques, abstract data structures and their implementation, computationally difficult problems - K_W04         2       Skills       Student can by herset/himself acquire knowledge from the literature, databases and other sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify tchem - K_U01         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:       The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:       1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Studies       1.         1. Student is able to use programming environments and platforms to write, perform and test simple programs co	Responsible for subject / lecturer:						
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2       Skills       sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions and justify tchem - K_U01         3       Social competencies       Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3       Social competencies       Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:       The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:	1	Knowledge	analysis, design techniques, abs				
simple programs coded in imperative programming languages - [K_U10]         3       Social competencies         Student understands and is aware of the importance of nontechnical issues related to computer engineer activity. Student understands the responsibility associated to his engineering decisions [K_K02]         Assumptions and objectives of the course:         The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:	2	Skills	sources; can also integrate the acquired knowledge, interpret it, reason, formulate conclusions				
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Assumptions and objectives of the course:         The objectives of this course is to understand operating system basic structure and implementation principles from the systems programmer viewpoint.         Study outcomes and reference to the educational results for a field of study         Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:	3		Student understands and is aware of the importance of nontechnical issues related to		al issues related to		
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Study outcomes and reference to the educational results for a field of study         Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:	The ob	jectives of this course	is to understand operating system	n basic structure and implementati	on principles from the		
Knowledge:         1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating systems and types of operating systems - [K_W06]         Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:							
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Skills:         1. Student is able to do critical analysis of computer hardware operations, operating system and computer networks         [K_U11]         2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]         3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]         Social competencies:	1. Student has organized knowledge with theoretical foundations of computer architecture, principles of operation of operating						
<ul> <li>[K_U11]</li> <li>2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]</li> <li>3. Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]</li> <li>Social competencies:</li> </ul>			יווש אאנפוווא - נע_עעסן				
<ol> <li>Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]</li> <li>Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]</li> <li>Social competencies:</li> </ol>			al analysis of computer hardware	operations, operating system and	computer networks		
<ol> <li>Student is able to evaluate the usefulness of routine methods and tools for solving simple tasks typical of engineering informatics and select and apply appropriate technologies - [K_U22]</li> <li>Social competencies:</li> </ol>	2. Student is able to use programming environments and platforms to write, perform and test simple programs coded in imperative programming languages - [K_U10]						
•					s typical of engineering		
1. Student understands and is aware of the importance of nontechnical issues related to computer engineer activity [K_K02]	Socia	al competencies:					
	1. Stuc	lent understands and	is aware of the importance of nont	echnical issues related to compute	er engineer activity [K_K02]		

## Assessment methods of study outcomes

Lecture: written exam

Laboratory: exercises assesment, two tests

## **Course description**

Lecture: Architecture of selected operating systems. Real time operating systems. Shell programming. Programming with system functions. Inter process communication. Multithreaded programming. Virtual machines. Computer system administration.

Laboratory: Basics of Linux. Shell programming. Programming with system functions. Administration and log analysis.

## **Basic bibliography:**

1. Glass G., Ables K., Linux dla programistów i użytkowników, Helion, 2007

2. Matthew N., Stones R., Linux programowanie, RM, 1999

3. Mitchell M., Oldham J., Samuel A., Linux Programowanie dla zaawansowanych, RM, Warszawa, 2002

4. W. Stallings, Systemy operacyjne. Struktura i zasady budowy, PWN, 2006

## Additional bibliography:

1. Bovet D., Cesati M., Linux kernel, RM, Warszawa, 2001

2. Stallings W., Operating Systems: Internals and Design Principles 6ed, Prentice-Hall, 2009

Result of average stu	dent's workload	
Activity	Time (working hours)	
1. Lecture		15
2. Laboratory	15	
3. Preparation for laboratory	15	
4. Preparation for exam	25	
5. Consultations and exam	5	
Student's wo	orkload	
Source of workload	hours	ECTS
Total workload	75	3
Contact hours	35	1
Practical activities	30	1