Wrocław University of Science and Technology
Doctoral School

COURSE CARD

1. Basic information

Course name in English:	Modern numerical techniques in science	
Course name in Polish:	Nowoczesne techniki numeryczne w nauce	
Number of hours:	30	
Type of course:	Elective course	
Form of course:	laboratory	
Code of course:		
Course leader:	*Mateusz Tykierko, PhD*	
Faculty of the course leader:	W4 Faculty of Information and Communication Technology	
Email address of the course leader:	mateusz.tykierko@pwr.edu.pl	
Scientific discipline(s) assigned to the course (doctoral students representing the marked disciplines can participate in the course):	Architecture and urban planning	☐
	Automation, electronic, electrical engineering and space technologies	X
	Information and communication technology	X
	Biomedical engineering	X
	Chemical engineering	X
	Civil engineering, geodesy and transport	X
	Materials engineering	☐
	Mechanical engineering	X
	Environmental engineering, mining, and energy	☐
	Mathematics	X
	Chemical sciences	X
	Physical sciences	X
	Management and quality studies	☐

2. Objectives

C1 Gaining knowledge about usage of HPC system, services and software for data analysis
C2 Gaining knowledge about scientific data management

3. Content

Detailed information about the course content, including topics and form of classes.

No.	Topic	Number of hours	Form of classes
1	Introduction to HPC	2	laboratory
2	Basic usage of Linux systems	2	laboratory
3	Shell scripting for data analysis automation 1	2	laboratory
4	Shell scripting for data analysis automation 2	2	laboratory
5	Tools for textual data analysis	2	laboratory

6	Network protocols for data processing automation	2	laboratory
7	Calculation results management	2	laboratory
8	Services in Polish IT infrastructure	2	laboratory
9	Methods of data interactive processing	2	laboratory
10	Cluster architecture and resources definition	2	laboratory
11	Job submission in cluster	2	laboratory
12	Grid architecture and resources definition	2	laboratory
13	Job submission in cloud/grid	2	laboratory
14	Tools and services in grid	2	laboratory
15	Oral presentation and credit	2	laboratory

4. Prerequisites

List of prerequisites relating to knowledge, skills and other competences for course participants.

1. Basic knowledge of Linux operating system

5. Learning outcomes

List of learning outcomes at level 8 of the Polish Qualifications Framework assigned to the course (mark the learning outcomes in the last column).

Symbol	Learning outcome	
	KNOWLEDGE. Doctoral student knows and understands:	
SzD_W 3	the main trends in the development of the scientific or artistic disciplines covered in the curricula;	☐
SzD_W 4	research methodology;	X
SzD_W 5	the rules for the dissemination of scientific results, including in open access mode;	☐
SzD_W 6	the fundamental dilemmas of modern civilization;	☐
SzD_W 7	the legal and ethical conditions of scientific activity;	☐
SzD_W 8	the economic and other relevant conditions of scientific activity;	☐
SzD_W 9	basic principles of knowledge transfer to the economic and social spheres and commercialisation of results of scientific activity and know-how related to these results.	☐
	SKILLS. Doctoral student is able to:	
SzD_U2	use knowledge from different fields of science or art to creatively identify, formulate and innovatively solve complex problems or perform research tasks, in particular: - define the purpose and subject of scientific research, formulate a research hypothesis, - develop research methods, techniques and tools, and use them creatively,	X

	- draw conclusions on the basis of scientific research; critically analyse and evaluate the results of scientific research, expertise and other creative work and their contribution to knowledge development; transfer the results of scientific activities to the economic and social spheres;	
SzD_U3	communicate on specialised topics to the extent that they enable an active participation in the international scientific community;	☐
SzD_U4	disseminate research results, including in popular forms;	☐
SzD_U5	initiate debates and participate in a scientific discourse;	☐
SzD_U6	be able to speak a foreign language at B2 level of the Common European Framework of Reference for Languages to a level that enables them to participate in the international scientific and professional environment;	☐
SzD_U7	plan and implement an individual or collective research or creative activity, including in an international environment;	X
SzD_U8	independently plan and act for one's own development and inspire and organize the development of others;	☐
SzD_U9	plan classes or groups of classes and implement them using modern methods and tools.	☐
	SOCIAL COMPETENCES. Doctoral student is ready to:	
SzD_K3	fulfilling the social obligations of researchers and creators, initiate public interest activities, thinking and acting in an entrepreneurial way;	☐
SzD_K4	maintaining and developing the ethos of research and creative environments, including: - carrying out scientific activities in an independent manner, - respecting the principle of public ownership of research results, taking into account the principles of intellectual property protection.	X

6. Evaluation

Short description of the method(s) used to evaluate the learning outcomes assigned to the course, e.g., exam, test, report, presentation, etc.

oral presentation and computer demonstration

7. Teaching methods

Short description of the teaching methods used during the course, e.g., multimedia presentation, discussion, literature studies, developing written documents, own work, etc.

N1. Computer demonstrations & laboratory work
N2. Supplementary material short multimedia presentations
N3. Own work

8. Literature

List of primary and secondary literature used to prepare the course and including additional knowledge for participants, e.g., books, textbooks, research papers, standards, web pages, etc.

[1] M.Garrels, „Introduction to Linux, TLDP, 2010
[2] G. Hager, G. Wellin "ntroduction to High Performance Computing for Scientists and Engineers", Champan & Hall, 2010
[3] C. Newham "Learning the bash Shell: Unix Shell Programming, O'Reilly, 2005

[4] B. Wilkinson „Grid Computing: Techniques and Applications”, Chapman & Hall, 2009
[5] J. E. Friedl, “Mastering regular expression”, O’Reilly, 2006

9. Other remarks

Additional remarks, comments, (e.g., language of the course)

English