Subject programme

1. Subject name / subject module: **Network Management**

2. Lecture language: **English**

3. **The location of the subject in study plans:**
   - Area or areas of the studies: **Computer Engineering and Mechatronics**
   - Degree of the studies: **1st degree studies**
   - Ftield or fields (implementation of effects standard): **Mechatronics**

4. Supervision of subject implementation:
   - The Institute / Another unit: **Institute of Informatics and Mechatronics**
   - The person responsible for the subject: **Piechowiak Maciej, dr inż.**
   - People cooperating in the development of the programme of the subject:

5. The number of hours and forms of teaching for individual study system and the evaluation method:

Mode of study	Teaching activities with the tutor																					Total
									Form of classes													
	…	SOW	ECTS	Laboratory work	SOW	ECTS	…	SOW	ECTS	…	SOW	ECTS	…	SOW	ECTS	…	SOW	ECTS	…	SOW	ECTS	ECTS
Full-time studies				22	28	2																2
Part-time studies																						
Credit rigor			Graded assignment																			

6. Student workload – ECTS credits balance:

   1 ECTS credit corresponds to 25-30 hours of student work needed to achieve the expected learning outcomes including the student's own work

Activity (please specify relevant work for the subject)	Hourly student workload (full-time studies/part-time studies)
Participation in lectures	-
Participation in laboratory classes	22
Preparation to laboratory classes	12
Independent study of the subject	6
Preparation of final project	8
Participation in an exam / graded assignment	2
Total student workload (TSW)	50
ECTS credits	2
* Student's workload related to trainings	50
Student's workload in classes requiring direct participation of academic teachers	22

7. Implementation notes: recommended duration (semesters), recommended admission requirements, relations between the forms of classes:
   - Recommended admission requirements – none.
   - Recommended duration of the subject is taken from the course plan.

8. Specific learning outcomes – knowledge, skills and social competence

Specific learning outcomes for the subject		Form	Teaching method	Methods for testing of (checking, assessing) learning outcomes
Outcome symbol	Outcome description			
Knowledge				
K_W04	A student has basic knowledge in the field of communication networks and telecommunications, necessary to understand at an advanced level the management solutions in networks and to apply this knowledge in practice through the use of appropriate meth	Laboratory work	Inquiry methods	Student learning activities
K_W06	A student knows and understands selected specific issues in the field of technical computer science related to management of secure computer networks as well as practical applications of this knowledge.			
K_W10	A student has detailed knowledge related to the application of the following in mechatronics: management of computer Networks and information security.			
K_W11	A student has detailed knowledge related to the application of the following in mechatronics: computer networks management and information security.			
Skills				

K_U02	A student is able to use their knowledge - to formulate and solve problems and perform tasks typical for professional activity in the field of computer network issues and in the issues of maintaining the computer networks security.	Laboratory work	Inquiry methods	Student learning activities
K_U05	A student has experience and skills to use the norms and standards applicable in the computer networks security and management.			
K_U14	A student is able to see problems, imperfections in functioning or newly designed computer networks, identify the problem and formulate a specification of simple solutions for the perceived simple problems in computer networks projects.			

9. Assessment rules / criteria for each form of education and individual grades:

0% - 50%	ndst	80% - 86%	db
51% - 70%	dst	87% - 93%	db+
71% - 79%	dst+	94% - 100%	bdb

Activity	Grades	Calculation	To Final
Lab reports	dst, db, bdb, db (3,4,5,4)	arithmetic mean (3,5,3,4)* 50%	2
Attendance	on 70% of all classes	70% * 5 -> 3,5 * 10%	0,35
Final project	bdb (5)	5 * 40%	2
Final result			4,35
Grade		4,35/5 = 87%	db (4.0)

10. The learning contents with the form of the class activities on which they are carried out:

(Laboratory work)

1. Policies, tools and methods for managing hardware and data on information networks;

2. Data Flow Management: VLANs, VLAN routing, load balancing routing, congestion avoidance, FQ queuing, WFQ, RED, WRED, CEF, Linux traffic shaping (cBq), improving connectivity performance (EtherChannel and LACP), and services (clusters);

2. Device management; SNMP protocols and tools, SNMPv2, SNMPv3, RMON solutions, MIB;

3. Network Access Management: 802.1X standard, Dynamic VLAN assignment, VPN (IPSec, PPTP, SSL), Firewall, IDS, and IPS, Honeypot concept

11. Required teaching aids:
    a. Lecture - multimedia projector.
    b. Laboratory classes - specialist laboratory.

12. Literature:
    a. Basic literature:
        1. Donahue Gary A.; Network Warrior; ISBN 978-1-449-38786-0; O'Reilly 2011
        2. Robinson E. Pino; Network Science and Cybersecurity; ISBN 978-1-4614-7597-2; Springer, New York, NY 2014

    b. Supplementary literature:
        1. O. Santos, J. Stuppi: Cisco CCNA Security (any edition)

13. Available educational materials divided into forms of class activities (Author's compilation of didactic materials, e-learning materials, etc.)

14. Teachers implementing particular forms of education:

Form of education	Name and surname
1. Lecture	
2. Laboratory classes	Piechowiak Maciej, dr inż. Pałczyński Marek, mgr inż.
3. Training	
4. Project classes	
5. Workshop classes	
6. Simulation game	
7. Language classes	