COURSE DESCRIPTION CARD – SYLLABUS

Course name

Decision algorithms in the electric power engineering

Course

Field of study
Electrical engineering

Year/Semester
1/2

Area of study (specialization)

Profile of study
general academic

Level of study
Second-cycle studies

Course offered in
English

Form of study
Full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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Prerequisites

Has knowledge of the basics of electrical engineering, power engineering and numerical methods. He can create his own algorithms and simple computer programs. Is aware of the goals of joint action and cooperation in a group.

Course objective

Acquainting with the methods and algorithms that allow the processing of large data sets. Understanding the theoretical and practical applications of algorithms, procedures and data structures ensuring the proper functioning of power systems, power protection automation systems and optimization of algorithms.

Course-related learning outcomes

Knowledge

1. Has in-depth knowledge of the phenomena occurring in the power system and the calculation methods used.

2. Has knowledge in the field of creating algorithms for IT systems used in the power sector.

3. Has knowledge of the identification of power system operation states.

4. Has solid knowledge on the subject of intellectual property protection and the use of information in business activities.

Skills

1. Can adapt the selection of calculation methods to the task being carried out.

2. Is able to assess the processes of implementation of tasks and based on the algorithm write a computer program in the field of power engineering in a higher language.

3. Is able to work individually and in a team and based on the given algorithms make decisions in the power sector by operating various computer programs.

Social competences

1. Is aware of the rapid progress in the field of IT technology and the need to properly coordinate its activities within small project groups.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture

Assessment of activity in class, assessment of homework, final test in writing at the end of the semester, colloquium includes test questions or problem tasks, written exam covering the subject of the subject assessed on a scale of 0 to 100%, the final grade lectures given by more than one lecturer based on weighted average, final grade for more than one component grade based on weighted average, 60% passing mark. The number of questions in the test 10-20, the score depends on the difficulty of the question.

Laboratory

Verification of individual preparation for classes, including material from a single exercise or block of exercises, assessment of individual exercise reports made by the student, colloquium at the end of the semester, colloquium includes test questions or problem tasks, all grades on a scale of 0 to 100%, final grade based on the weighted average of all component ratings, 60% passing mark

Programme content

Lecture

High-level programming languages, use of available libraries in programming. Genetic algorithms, fuzzy logic, machine learning system, artificial neural networks. Processing of large data structures. Optimization and decision problems. Decision algorithms - making decisions under risk conditions, identification of the operating state of the power system. Power flow calculation algorithms, control algorithms. Decision-making algorithms in power protection automatics systems.

Laboratory

Genetic algorithms, fuzzy logic, machine learning, artificial neural networks. The use of libraries of ready-made functions and procedures as well as API interfaces. Creation of algorithms and computer programs realizing specific goals and tasks.

Teaching methods

Lecture

Multimedia and interactive presentation presenting important issues related to the subject, didactic discussion based on the literature on the subject, informative lecture, problem lecture, case study, work on source materials.

Laboratory

Implementation of the content of the exercises, development of algorithms and computer programs that perform the tasks specified in the content of the exercise. Using publicly available information and software tools to support the didactic process, encouraging students to independently search for optimal solutions and solve problems.

Bibliography

Basic

1. Dołęga W., Stacje elektroenergetyczne, Oficyna PWr, 2007
2. Kożuchowski J., Sterowanie systemami elektroenergetycznymi, PWN, 1994
3. Kremens Z., Sobierajski M., Analiza systemów elektroenergetycznych, WNT, Warszawa 1996
4. Lewandowski J., Procesy decyzyjne : w niezawodności i eksploatacji obiektów technicznych o ciągłym procesie technologicznym, Wydawnictwo PŁ, 2008
5. Nowicki L.K., Rozmyte systemy decyzyjne w zadaniach z ograniczoną wiedzą, EXIT, 2009
6. Rutkowska D., Piliński M., Rutkowski L., Sieci neuronowe, algorytmy genetyczne i systemy rozmyte, PWN, Warszawa, 1999
7. Szafran J., Wiszniewski A., Algorytmy pomiarowe i decyzyjne cyfrowej automatyki elektroenergetycznej, WNT, 2001

Additional

1. Bąchorek W., Gancarz A., Algorytmy genetyczne w projektowaniu układów zasilania rezerwowego elektroenergetycznych sieci rozdzielczych średniego napięcia, Zeszyty Naukowe Wydziału Elektrotechniki i Automatyki Politechniki Gdańskiej, XVII Seminarium .Zastosowanie komputerów w nauce i technice. 2007, Oddział Gdański PTETiS, ss.11-14
2. Gwiazda T.D., Algorytmy genetyczne : kompendium, Tom 1 i 2, PWN, 2007
3. Machowski J., Regulacja i stabilność systemu elektroenergetycznego, Oficyna Wydawnicza Polit. Warszawskiej, Warszawa 2007
4. Parol M., Optymalizacja konfiguracji sieci elektroenergetycznych wielokrotnie zamkniętych 110 kV za pomocą adaptacyjnych technik ewolucyjnych, Oficyna PW, 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	60	2
Classes requiring direct contact with the teacher	30 (15W+15L)	1
Student's own work (literature studies, preparation for laboratory classes, preparation of reports, preparation for tests)	30	1