

PROGRAMME OF STUDIES

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: POWER ENGINEERING

in area of technical science

EDUCATION LEVEL: 2nd level, Master of Science

FORM OF STUDIES: full-time

PROFILE: general academic

SPECIALIZATION: **NUCLEAR POWER ENGINEERING**

LANGUAGE OF STUDY: polish

Content:

1. Plan of studies – attachment no. 1

PROGRAMME OF STUDIES

1. Description

| | |
|--|---|
| <p><i>Number of semesters:</i></p> <p>3</p> | <p><i>Number ECTS points necessary to obtain qualifications:</i></p> <p>90</p> |
| <p><i>Prerequisites (particularly for second-level studies):</i></p> <p>1st level qualifications and engineering skills necessary to continue education at 2nd level studies: knowledge of physics and mathematics that enables understanding of the fundamentals of physical phenomena used in the energetics and formulating and solving simple design tasks in the field of energetics, knowledge and skills in the field of mechanics, electronics, electrical , materials, metrology, fluid mechanics, thermodynamics and the basics of machine design, enabling taking of measurements, analysis and design of simple components and power systems, the ability to use to formulate and solve engineering tasks, and methods and experimental design, knowledge and skills in methods and techniques design, enabling the formulation of a simple engineering problem and develop the solution using appropriate computational tools, skills of interpretation, presentation and documentation of the experiment, and the presentation and documentation of the project tasks.</p> | <p><i>Upon completion of studies graduate obtains professional degree of:</i> Master of Science</p> <p>2nd level qualifications</p> |
| <p><i>Possibility of continuing studies:</i> 3rd level doctoral studies</p> | <p><i>Graduate profile, employability:</i> Graduate has a knowledge and skills in the field of advanced technologies and processes, and methods for testing the operation of machinery and equipment in the energy industry and related industries. Graduate is prepared for the design, optimization and implementation of new energy technologies, in particular in the field of nuclear energy and for work in the local government and self-business in the conditions of the functioning of the energy market and the principle of sustainable development. He knows a foreign language at level B2 + and a second foreign language at A1 or A2 level.</p> |
| <p><i>Indicate connection with University's mission and its development strategy:</i></p> | <p>The programme of education is consistent with the mission of the University in the transfer of knowledge and skills to maintain high quality of education and the development of creative, critical and tolerant personality of students by developing and nurturing a strong sense of academic</p> |

| | |
|--|---|
| | community based on communication and social rights of students and employees. |
|--|---|

2. **Fields of science and scientific disciplines to which educational effects apply:** technical science
3. **Concise analysis of consistency between assumed educational effects and labour market needs:** The expected education effects provide engineering competencies gained on the first level of education, especially in terms of knowledge and skills, with particular emphasis on creativity in solving specific technical problems. The programme of education equips graduates with the attributes enabling him to adapt to the rapidly changing requirements of the job market.

4. List of education modules:

4.1. List of obligatory modules:

4.1.1. List of general education modules

4.1.1.1. Liberal-managerial subjects module (min. 3 ECTS points):

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-----|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN0367 | Marketing and Management | 2 | | | | | K2ENG_W06 | 30 | 90 | 3 | 1,5 | T | Z | | | KO | Ob |
| | | Total | 2 | | | | | | 30 | 90 | 3 | 1,5 | | | | | | |

Altogether for general education modules:

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| 2 | | | | | 30 | 90 | 3 | 1,5 |

¹BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

²Traditional – enter T, remote – enter Z

³Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶ KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷ Optional – enter W, obligatory – enter Ob

4.1.2. List of basic sciences modules

4.1.2.1. Mathematics module

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| | | | | | | | | | | | | | | | | | | |
| 1 | ESN0910 | Probability theory | 2 | | | | | K2ENG_W01 | 30 | 90 | 3 | 1,5 | T | E | | | PD | Ob |
| 2 | ESN0910 | Probability theory | | 1 | | | | K2ENG_U05 | 15 | 60 | 2 | 1,5 | T | Z | | P | PD | Ob |
| 3 | ESN0502 | Numerical methods | 2 | | | | | K2ENG_W02 | 30 | 90 | 3 | 1,5 | T | E | | | PD | Ob |
| 4 | ESN0502 | Numerical methods | | | 2 | | | K2ENG_U06 | 30 | 60 | 2 | 1,5 | T | Z | | P | PD | Ob |
| Total | | | 4 | 1 | 2 | | | | 105 | 300 | 10 | 6 | | | | | | |

4.1.2.2. Physics module

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| | | | | | | | | | | | | | | | | | | |
| 1 | ESN0200 | Quantum Physics | 2 | | | | | K2ENG_W03 | 30 | 90 | 3 | 1,5 | T | E | | | PD | Ob |
| Total | | | 2 | | | | | | 30 | 90 | 3 | 1,5 | | | | | | |

Altogether for basic sciences modules:

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| 6 | 1 | 2 | | | 135 | 390 | 13 | 7,5 |

¹BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

²Traditional – enter T, remote – enter Z

³Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷Optional – enter W, obligatory – enter Ob

4.1.3. List of main-field-of-study modules

4.1.3.1. Obligatory main-field-of-study module

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN0553 | Mathematical Modelling of Energy Generation Installations | 2 | | | | | K2ENG_W05 | 30 | 60 | 3 | 1,5 | T | E | | | K | Ob |
| 2 | ESN0553 | Mathematical Modelling of Energy Generation Installations | | | 4 | | | K2ENG_U07 | 60 | 120 | 2 | 1,5 | T | Z | | P | K | Ob |
| 3 | ESN1115 | New Generation Energy Technologies | 2 | | | | | K2ENG_W04 | 30 | 90 | 3 | 1,5 | T | E | | | K | Ob |
| 4 | ESN1062 | Energy Systems | 2 | | | | | K2ENG_W07 | 30 | 60 | 2 | 1 | T | Z | | | K | Ob |
| 5 | ESN1062 | Energy Systems | | 1 | | | | K2ENG_U08 | 15 | 30 | 1 | 0,75 | T | Z | | P | K | Ob |
| 6 | ESN1300 | Environmental Management | 2 | | | | | K2ENG_W06 K2ENG_K03 | 30 | 60 | 2 | 1 | T | Z | | | K | Ob |
| 7 | ESN1380 | Diploma Seminar | | | | | 2 | K2ENG_U01 K2ENG_U02 K2ENG_K01 K2ENG_K03 K2ENG_K04 K2ENG_K05 | 30 | 60 | 2 | 1,5 | T | Z | | P | K | Ob |
| Total | | | 8 | 1 | 4 | | 2 | | 225 | 450 | 15 | 8,75 | | | | | | |

Altogether (for main-field-of-study modules):

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| 8 | 1 | 4 | | 2 | 225 | 450 | 15 | 8,75 |

¹BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

²Traditional – enter T, remote – enter Z

³Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷Optional – enter W, obligatory – enter Ob

4.2. List of optional modules:

4.2.1. List of general education modules

4.2.1.1. Liberal-managerial subjects module (min. 2 ECTS points):

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | HSH100400BK | Humanities Course | 1 | | | | | K2ENG_W06 K2ENG_K02 K2ENG_K06 | 15 | 60 | 2 | 1 | T | Z | O | | KO | W |
| Total | | | 1 | | | | | | 15 | 60 | 2 | 1 | | | | | | |

4.2.1.2 Foreign languages module (min. 3 ECTS points):

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | JZL100655BK | Foreign Language (continue) B2+ level | | 1 | | | | K2ENG_U04 | 15 | 30 | 1 | 0,75 | T | Z | O | P | KO | W |
| 2 | JZL100710BK | Foreign Language (second), any level | | 3 | | | | K2ENG_U09 | 45 | 60 | 2 | 1,5 | T | Z | O | P | KO | W |
| Total | | | | 4 | | | | | 60 | 90 | 3 | 2,25 | | | | | | |

4.2.1.1. Sporting classes module:

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-----|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| | | | | | | | | | | | | | | | | | | |

¹BK – number of ECTS points assigned to hours of classes requiring direct contact of teachers with students

²Traditional – enter T, remote – enter Z

³Exam – enter E, crediting – enter Z. For the group of courses – after the letter E or Z - enter in brackets the final course form (lec, cl, lab, pr, sem)

⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷Optional – enter W, obligatory – enter Ob

Altogether for general education modules:

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| 1 | 4 | | | | 75 | 150 | 5 | 3,25 |

4.2.2. List of main-field-of-study modules

4.2.2.1. Individual master of science project module (min. 4 ECTS points):

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN1364 | Master Individual Student Project | | | | 4 | | K2ENG_U01 K2ENG_U03 K2ENG_K04 K2ENG_K05 | 60 | 120 | 4 | 1 | T | Z | | P | K | W |
| Total | | | | | | 4 | | | 60 | 120 | 4 | 1 | | | | | | |

4.2.2.2. Master of science diploma dissertation module (min. 20 ECTS points):

| No. | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN1430 | Master Thesis | | | | | | K2ENG_U01 K2ENG_U02 K2ENG_U03 K2ENG_K01 K2ENG_K04 K2ENG_K05 | | 600 | 20 | 4 | T | Z | | P | K | W |
| Total | | | | | | | | | | 600 | 20 | 4 | | | | | | |

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⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷ Optional – enter W, obligatory – enter Ob

Altogether for main-field-of-study modules:

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| | | | 4 | | 60 | 720 | 24 | 5 |

4.2.3. List of specialization modules

4.2.3.1. Specialization subjects module (min. 30 ECTS points)

| No | Course/group of courses code | Name of course/group of courses (denote group of courses with symbol GK) | Weekly number of hours | | | | | Field-of-study educational effect symbol | Number of hours | | Number of ECTS points | | Form ² of course/group of courses | Way ³ of crediting | Course/group of courses | | | |
|-------|------------------------------|--|------------------------|----|-----|----|-----|--|-----------------|------|-----------------------|-------------------------|--|-------------------------------|------------------------------|------------------------|-------------------|-------------------|
| | | | lec | cl | lab | pr | sem | | ZZU | CNPS | total | BK classes ¹ | | | university-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN0878 | Heat Transfer and Mass Flow in Nuclear Reactors | 2 | | | | | S2ENJ_W01 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 2 | ESN0878 | Heat Transfer and Mass Flow in Nuclear Reactors | | 1 | | | | S2ENJ_U01 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 3 | ESN0206 | Nuclear Physics and Reactor Theory | 2 | | | | | S2ENJ_W02 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 4 | ESN0206 | Nuclear Physics and Reactor Theory | | 1 | | | | S2ENJ_U02 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 5 | ESN0167 | Thermonuclear Power Generation | 2 | | | | | S2ENJ_W03 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 6 | ESN0167 | Thermonuclear Power Generation | | 1 | | | | S2ENJ_U03 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 7 | ESN0915 | Radioisotopes and Ionizing Radiation Protection | 2 | | | | | S2ENJ_W08 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 8 | ESN0915 | Radioisotopes and Ionizing Radiation Protection | | | 2 | | | S2ENJ_U07 | 30 | 60 | 2 | 1,5 | T | Z | | P | S | W |
| 9 | ESN0102 | Nuclear Fuel Cycle | 2 | | | | | S2ENJ_W05 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 10 | ESN0102 | Nuclear Fuel Cycle | | 1 | | | | S2ENJ_U05 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 11 | ESN0922 | Nuclear Reactors (PWR, BWR, HWR, HTR, FBR) | 3 | | | | | S2ENJ_W06 | 45 | 90 | 3 | 1,5 | T | Z | | | S | W |
| 12 | ESN0922 | Nuclear Reactors (PWR, BWR, HWR, HTR, FBR) | | | 3 | | | S2ENJ_U06 | 45 | 90 | 3 | 2,25 | T | Z | | P | S | W |
| 13 | ESN0415 | Nuclear Machinery and Equipment | 2 | | | | | S2ENJ_W07 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 14 | ESN0265 | Materials Engineering | 2 | | | | | S2ENJ_W04 | 30 | 60 | 2 | 1 | T | Z | | | S | W |
| 15 | ESN0265 | Materials Engineering | | | 2 | | | S2ENJ_U04 | 30 | 60 | 2 | 1,5 | T | Z | | P | S | W |
| 16 | ESN0045 | Nuclear Safety and Security | 1 | | | | | S2ENJ_W09 | 15 | 30 | 1 | 0,5 | T | Z | | | S | W |
| 17 | ESN0045 | Nuclear Safety and Security | | | | | 1 | S2ENJ_U08 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| Total | | | 18 | 4 | 7 | | 1 | | 450 | 900 | 30 | 18 | | | | | | |

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²Traditional – enter T, remote – enter Z

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⁴University-wide course /group of courses – enter O

⁵Practical course / group of courses – enter P. For the group of courses – in brackets enter the number of ECTS points assigned to practical courses

⁶KO – general education, PD – basic sciences, K – field-of-studies, S – specialization

⁷Optional – enter W, obligatory – enter Ob

Altogether for specialization modules:

| Total number of hours | | | | | Total number of ZZU hours | Total number of CNPS hours | Total number of ECTS points | Number of ECTS points for BK classes ¹ |
|-----------------------|----|-----|----|-----|---------------------------|----------------------------|-----------------------------|---|
| lec | cl | lab | pr | sem | | | | |
| 18 | 4 | 7 | | 1 | 450 | 900 | 30 | 18 |

4.3. Diploma dissertation module

| | | | |
|--|-----------------------|----------------|--|
| Type of diploma dissertation | magister | | |
| Number of diploma dissertation semesters | Number of ECTS points | Code | |
| 1 | 20 | ESN1430 | |
| Character of diploma dissertation | | | |
| Experimental/project/ literature survey | | | |
| Number of BK ¹ ECTS points | 4 | | |

5. Ways of verifying assumed educational effects

| Type of classes | Ways of verifying assumed educational effects |
|----------------------|--|
| lecture | examination, final test |
| class | progress test, final test, tasks valuating |
| laboratory | pretest, report from laboratory |
| project | project defence |
| seminar | participation in discussion, topic presentation, essay |
| diploma dissertation | prepared diploma dissertation |

- 6. Total number of ECTS points, which student has to obtain from classes requiring direct academic teacher-student contact (enter total of ECTS points for courses/groups of courses denoted with code BK¹)**
44 ECTS

7. Total number of ECTS points, which student has to obtain from basic sciences classes

| | |
|---|----|
| Number of ECTS points for obligatory subjects | 13 |
| Number of ECTS points for optional subjects | 0 |
| Total number of ECTS points | 13 |

8. Total number of ECTS points, which student has to obtain from practical classes, including laboratory classes (enter total number of ECTS points for courses/group of courses denoted with code P)

| | |
|---|----|
| Number of ECTS points for obligatory subjects | 9 |
| including laboratory classes and projects | 4 |
| Number of ECTS points for optional subjects | 41 |
| including: laboratory classes and projects | 11 |
| diploma dissertation | 20 |
| Total number of ECTS points | 50 |

9. Minimum number of ECTS points, which student has to obtain doing education modules offered as part of university-wide classes or other main field of study (enter number of ECTS points for courses/groups of courses denoted with code OG)
5 ECTS points

10. Total number of ECTS points, which student may obtain doing optional modules (min. 30% of total number of ECTS points)
59 ECTS points (65,6%)

11. Range of the diploma exam

1. Theoretical problems

- 1.1 Defekt masy i energia wiązania.
- 1.2 Nuklidy rozszczepialne i ich zasoby.
- 1.3 Reakcja rozszczepienia.
- 1.4 Spowalnianie i termalizacja neutronów.
- 1.5 Podstawowe kryteria wyboru chłodziwa do chłodzenia reaktora.
- 1.6 Rodzaje i źródła promieniowania jonizującego.
- 1.7 Klasyfikacja i składowanie odpadów promieniotwórczych z elektrowni jądrowych.
- 1.8 Najważniejsze modele fizyczne stosowane do opisu zachowań plazmy w różnych warunkach.
- 1.9 Perspektywa wykorzystania w energetyce reakcji syntezy jądrowej zachodzącej w gorącej plazmie.
- 1.10 Materiały stosowane w energetyce jądrowej – specyficzne warunki pracy.

- 1.11 Główne zasady i techniki ochrony radiologicznej
- 1.12 Analiza przypadków ciężkich awarii reaktorów jądrowych.
- 1.13 Tendencje rozwoju energetyki jądrowej.

2. Construction and technological problems

- 2.1 Budowa elektrowni jądrowej z reaktorem PWR – obieg chłodzenia i konwersji energii
- 2.2 Budowa elektrowni jądrowej z reaktorem BWR – obieg chłodzenia i konwersji energii
- 2.3 Budowa elektrowni jądrowej z reaktorem HWR – obieg chłodzenia i konwersji energii
- 2.4 Budowa elektrowni jądrowej z reaktorem HTR – obieg chłodzenia i konwersji energii
- 2.5 Budowa elektrowni jądrowej z reaktorem FBR – obieg chłodzenia i konwersji energii
- 2.6 Oddziaływanie promieniowania na materię. Defekty strukturalne – charakterystyka i powstawanie.
- 2.7 Podstawowe kryteria doboru materiałów dla elektrowni jądrowych.
- 2.8 Konstrukcja elementów paliwowych.
- 2.9 Wytwornice pary – budowa i zasada działania.
- 2.10 Stabilizator ciśnienia w obiegu pierwotnym reaktora – budowa i zasada działania.
- 2.11 Detektory poziomu promieniowania.
- 2.12 Detektory strumienia neutronów w rdzeniu reaktora.
- 2.13 Urządzenia i instalacje do wzbogacania uranu.

3. Operational problems

- 3.1. Sterowanie pracą reaktora jądrowego.
- 3.2. Aktywne i pasywne systemy bezpieczeństwa.
- 3.3. Ocena i weryfikacja poziomu bezpieczeństwa elektrowni jądrowych.
- 3.4. Klasyfikacja awarii reaktora jądrowego, procedury postępowania po zaistnieniu awarii.
- 3.5. Przeładunek paliwa jądrowego w reaktorze.
- 3.6. Gospodarka wypalonym paliwem jądrowym – przechowywanie, recykling.
- 3.7. Gospodarka odpadami nisko i wysokoaktywnymi.
- 3.8. Bezpieczeństwo transportu odpadów radioaktywnych.
- 3.9. Kontrola poziomu promieniowania w elektrowni i jej otoczeniu.
- 3.10. Budowa i obsługa podstawowych przyrządów dozymetrycznych.
- 3.11. Spektrometria promieniowania beta i gamma – identyfikacja nieznanego źródła.
- 3.12. Obliczanie dawek promieniowania.
- 3.13. Rezerwowe źródła zasilania energią elektryczną.

12. Requirements concerning deadlines for crediting courses/groups of courses for all courses in particular modules

| <i>No.</i> | <i>Course code</i> | <i>Name of course</i> | <i>Crediting by deadline of... (number of semester)</i> |
|------------|--|--|---|
| | Faculty Council Resolution No 4/D/2008 of 19.09.2008 | The condition for admission the student to the execution of the <i>master thesis</i> module is to pass all subjects in plan of studies in the semester prior to the semester of graduation | |

13. Plan of studies (attachment no. 1)