

PLAN OF STUDY

FACULTY: MECHANICAL AND POWER ENGINEERING

MAIN FIELD OF STUDY: POWER ENGINEERING

EDUCATION LEVEL: 2nd level, Master of Science

FORM OF STUDIES: full-time

PROFILE: general academic

SPECIALIZATION: **RENEWABLE SOURCES OF ENERGY**

LANGUAGE OF STUDY: polish

Faculty Council Resolution of 20.09.2017
In effect since 01.10.2017

Plan of studies structure in point layout

| | | | |
|----|------------------|-------------------|----------------|
| 30 | | | |
| 29 | | master individual | |
| 28 | | student project | |
| 27 | | | |
| 26 | | | |
| 25 | | | |
| 24 | | | master |
| 23 | | | thesis |
| 22 | | | |
| 21 | | | |
| 20 | | | |
| 19 | | | |
| 18 | | | |
| 17 | | | |
| 16 | | | |
| 15 | | | |
| 14 | quantum | | |
| 13 | physics | | |
| 12 | | | |
| 11 | | | |
| 10 | numerical | | master seminar |
| 9 | methods | | |
| 8 | | | |
| 7 | | | |
| 6 | | | |
| 5 | probability | | |
| 4 | theory | humanities | |
| 3 | | | marketing and |
| 2 | | foreign | management |
| 1 | foreign language | language | |
| | sem. 1 | sem. 2 | sem. 3 |

| |
|--|
| basic and obligatory courses |
| general and obligatory courses |
| general and optional courses |
| obligatory main-field-of-study courses |
| optional main-field-of-study courses |
| optional/specialization courses |

1. Set of obligatory and optional courses and groups of courses in semestral arrangement

Semester 1

Obligatory courses

number of ECTS points 13

| 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 |
| 2 | ESN0910 | Probability Theory | 2 | | | | | K2ENG_W01 | 30 | 90 | 3 | 1,5 | T | E | | | PD | Ob |
| 3 | ESN0910 | Probability Theory | | 1 | | | | K2ENG_U05 | 15 | 60 | 2 | 1,5 | T | Z | | P | PD | Ob |
| 4 | ESN0502 | Numerical Methods | 2 | | | | | K2ENG_W02 | 30 | 90 | 3 | 1,5 | T | E | | | PD | Ob |
| 5 | ESN0502 | Numerical Methods | | | 2 | | | K2ENG_U06 | 30 | 60 | 2 | 1,5 | T | Z | | P | PD | Ob |
| Total | | | 6 | 1 | 2 | | | | 135 | 390 | 13 | 7,5 | | | | | | |

Optional courses (minimum 255 hours in semester) number of ECTS points 17

| 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 | JZL100709 | Foreign Language (continuation), level B+ | | 1 | | | | K2ENG_U04 | 15 | 30 | 1 | 0,75 | T | Z | O | P | KO | W |
| 2 | ESN0193 | Physics of the Renewable Energy | 3 | | | | | S2OZE_W01 | 45 | 90 | 3 | 1,5 | T | Z | | | S | W |
| 3 | ESN0193 | Physics of the Renewable Energy | | | | 2 | | S2OZE_U01 | 30 | 60 | 2 | 1,5 | T | Z | | P | S | W |
| 4 | ESN0193 | Physics of the Renewable Energy | | | | | 1 | S2OZE_U02 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 5 | ESN0570 | Fuel Cell and Technology of Hydrogen Production | 2 | | | | | S2OZE_W02 | 30 | 60 | 2 | 1 | T | | | | S | W |
| 6 | ESN0570 | Fuel Cell and Technology of Hydrogen Production | | | 1 | | | S2OZE_U03 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 7 | ESN0180 | Water Power Engineering | 2 | | | | | S2OZE_W03 | 30 | 60 | 2 | 1 | T | | | | S | W |
| 8 | ESN0180 | Water Power Engineering | | 1 | | | | S2OZE_U04 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 9 | ESN0180 | Water Power Engineering | | | | 2 | | S2OZE_U05 | 30 | 60 | 2 | 1,5 | T | Z | | P | S | W |

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

| 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 |
| 10 | ESN0303 | Pollutants Emission Control | 1 | | | | | S2OZE_W04 | 15 | 30 | 1 | 0,5 | T | | | S | W | |
| 11 | ESN0303 | Pollutants Emission Control | | | 1 | | | S2CCK_U06 | 15 | 30 | 1 | 0,75 | T | Z | P | S | W | |
| Total | | | 8 | 2 | 2 | 4 | 1 | | 255 | 510 | 17 | 10,75 | | | | | | |

Altogether in semester 1

| 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 | | | | |
| 14 | 3 | 4 | 4 | 1 | 390 | 900 | 30 | 18,25 |

Semester 2

Obligatory courses number of ECTS points 8

| 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 | 90 | 3 | 1,5 | T | E | | | K | Ob |
| 2 | ESN0553 | Mathematical Modelling of Energy Generation Installations | | | 4 | | | K2ENG_U07 | 60 | 60 | 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 |
| Total | | | 4 | | 4 | | | | 120 | 240 | 8 | 4,5 | | | | | | |

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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

Optional courses (minimum 330 hours in semester) number of ECTS points 22

| 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 | | | universit y-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | JZL100655BK | Foreign Language (second), any level | | 3 | | | | K2ENG_U09 | 45 | 60 | 2 | 1,5 | T | Z | O | P | KO | W |
| 2 | HS1100400BK | Humanities | 1 | | | | | K2ENG_W06 K2ENG_K02 | 15 | 60 | 2 | 1 | T | Z | O | | KO | W |
| 3 | ESN0361 | Refrigeration Heating Systems | 1 | | | | | S2OZE_W05 | 15 | 30 | 1 | 0,5 | T | | | | S | W |
| 4 | ESN0361 | Refrigeration Heating Systems | | | | 1 | | S2OZE_U07 K2ENG_K04 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 5 | ESN0140 | Wind Power Plants | 1 | | | | | S2OZE_W06 | 15 | 30 | 1 | 0,5 | T | | | | S | W |
| 6 | ESN0140 | Wind Power Plants | | | | 2 | | S2OZE_U08 | 30 | 60 | 2 | 1,5 | T | Z | | P | S | W |
| 7 | ESN0150 | Geothermal Power Engineering | 1 | | | | | S2OZE_W07 | 15 | 30 | 1 | 0,5 | T | | | | S | W |
| 8 | ESN0150 | Geothermal Power Engineering | | 1 | | | | S2OZE_U09 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 9 | ESN1123 | Power Production Systems and Technology From Biomass | 2 | | | | | S2OZE_W08 | 30 | 60 | 2 | 1 | T | | | | S | W |
| 10 | ESN1123 | Power Production Systems and Technology From Biomass | | 1 | | | | S2OZE_U10 | 15 | 30 | 1 | 0,75 | T | Z | | P | | W |
| 11 | ESN1123 | Power Production Systems and Technology From Biomass | | | | 1 | | S2OZE_U11 | 15 | 30 | 1 | 0,75 | T | Z | | P | S | W |
| 12 | ESN0203 | Photo-thermal Energy Conversion System | 1 | | | | | S2OZE_W09 | 15 | 30 | 1 | 0,5 | T | | | | S | W |
| 13 | ESN0203 | Photo-thermal Energy Conversion System | | | | 2 | | S2OZE_U12 | 30 | 60 | 2 | 1,5 | T | | | P | S | W |
| 14 | ESN0822 | Master Individual Student Project | | | | 4 | | K2ENG_U01 K2ENG_U03 K2ENG_K04 K2ENG_K05 | 60 | 120 | 4 | 1 | T | Z | | P | K | W |
| Total | | | 7 | 5 | | 9 | 1 | | 330 | 660 | 22 | 12,5 | | | | | | |

Altogether in semester 2

| 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 | | | | |
| 11 | 5 | 4 | 9 | 1 | 450 | 900 | 30 | 17 |

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⁷Optional – enter W, obligatory – enter Ob

Semester 3

Obligatory courses number of ECTS points 10

| 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 | | | universit y-wide ⁴ | practical ⁵ | kind ⁶ | type ⁷ |
| 1 | ESN1062 | Energy Systems | 2 | | | | | K2ENG_W08 | 30 | 60 | 2 | 1 | T | Z | | | K | Ob |
| 2 | ESN1062 | Energy Systems | | 1 | | | | K2ENG_U08 | 15 | 30 | 1 | 0,75 | T | Z | | P | K | Ob |
| 3 | ESN1300 | Environmental Management | 2 | | | | | K2ENG_W06 K2ENG_K02 | 30 | 60 | 2 | 1 | T | Z | | | K | Ob |
| 4 | 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 |
| 5 | ESN0367 | Marketing and Management | 2 | | | | | K2ENG_W07 | 30 | 90 | 3 | 1,5 | T | Z | | | KO | Ob |
| Total | | | 6 | 1 | | | 2 | | 135 | 300 | 10 | 5,75 | | | | | | |

Optional courses number of ECTS points 20

| 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 | | | universit y-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 | | 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

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

⁷ Optional – enter W, obligatory – enter Ob

Altogether in semester 3

| 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 | 900 | 30 | 9,75 |

2. Set of examinations in semestral arrangement

| Course code | Names of courses ending with examination | Semester |
|-------------------------------|---|----------|
| ESN0910 ESN0502 ESN0200 | 1. Probability Theory 2. Numerical Methods 3. Quantum Physics | 1 |
| ESN1115 ESN0553 | 1. New Generation Energy Technologies 2. Mathematical modelling of energy generation installations | 2 |

3. Numbers of allowable deficit of ECTS points after particular semesters

| Semester | Allowable deficit of ECTS points after semester |
|----------|---|
| 1 | 10 |
| 2 | 0 |