**Curriculum of Master program**

**in Renewable Energy Sources and Waste Management**

**at the Faculty of Production and Power Engineering,**

**University of Agriculture in Krakow**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Semester | Course | Hours | The form of course completion\* | ECTS |
| Lecture | Lab | Field trainings | Total |
| I | Foreign language | - | 30 | - | 30 | CG | 2 |
| Applied mathematics | 15 | 30 | - | 45 | E | 4 |
| Scientific research methodology | 10 | 20 | - | 30 | E | 3 |
| Module 1 | 18 | - | - | 18 | CG | 1 |
| IT Systems | 15 | 30 | - | 45 | E | 4 |
| Technical system design | 20 | 40 | - | 60 | E | 5 |
| Design and Operation of Renewable Energy Engineering Systems | 20 | 50 | - | 70 | E | 7 |
| Waste recovery engineering | 15 | 30 | - | 45 | E | 4 |
| **Total in semester I** | **118** | **225** | **-** | **343** | **-** | **30** |
| II | Managerial negotiations and staff management | 15 | 20 | - | 35 | E | 3 |
| Module 2 | 18 | - | - | 18 | CG | 1 |
| Quality management | 15 | 15 | - | 30 | E | 2 |
| Systems Engineering, Simulation and Optimisation | 20 | 30 | - | 50 | E | 5 |
| Organization and economics of production systems | 15 | 25 | - | 40 | E | 4 |
| Project and innovation management | 15 | 20 | - | 35 | E | 3 |
| Module 3 (A or B or C) | 40 | 60 | - | 100 | E | 7 |
| Seminar  |  | 30 | - | 30 | CG | 5 |
| **Total in semester II** | **138** | **200** |  | **338** | **-** | **30** |
| III | Module 3 (A or B or C) | 100 | 139 | - | 239 | E | 20 |
| Seminar | - | 30 | - | 30 | CG | 3 |
| Participation in scientific research carried out by the Faculty | - | - | - | - | CG | 5 |
| Master’s diploma thesis  | - | - | - | - | E | 2 |
| **Total in semester III** | **100** | **169** | **-** | **269** | **-** | **30** |
| **Total** | **356** | **594** |  | **950** | **-** | **90** |

\* CG – completion with grade (without exam); E - exam

Additional course:

Employee market in Poland

Module 1

Basics of entrepreneurship or Protection of intellectual property

Module 2

National security or Culture, art and tradition of the region

Module 3A

Courses on specialties: “Energy systems in buildings”

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Semester | Course | Hours | The form of course completion\* | ECTS |
| Lecture | Lab | Field trainings | Total |
| II | Thermal protection of buildings | 20 | 30 | - | 50 | E | 4 |
| Design and operation of energy systems in buildings – part 1 | 20 | 30 | - | 50 | CG | 3 |
| III | Integrated control systems in buildings | 15 | 30 |  | 45 | E | 3 |
| Design and operation of energy systems in buildings – part 2 | 20 | 30 | - | 50 | E | 5 |
| Energy audit and certification | 30 | 25 | - | 55 | E | 5 |
| Economic aspects of renewable energy use | 15 | 24 | - | 39 | E | 3 |
| Environmental impact assessment | 20 | 30 | - | 50 | E | 4 |

Module 3B

Courses on specialties: “Renewable energy sources”

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Semester | Course | Hours | The form of course completion\* | ECTS |
| Lecture | Lab | Field trainings | Total |
| II | Biomass Energy Production Engineering | 20 | 30 | - | 50 | E | 4 |
| Renewable energy market | 15 | 20 | - | 35 | E | 3 |
| III | Digital Image Analysis | 15 | 25 |  | 40 | E | 3 |
| Diagnosis of Renewable Energy Systems | 15 | 24 | - | 39 | E | 3 |
| Designing of centers for renewable energy sources obtaining | 20 | 30 |  | 50 | E | 4 |
| Energy Audit of Manufacturing Processes | 15 | 25 | - | 40 | E | 3 |
| Building Energy Management and Control | 20 | 30 | - | 50 | E | 4 |
| Costs of Production of Renewable Energy | 15 | 20 | - | 35 | E | 3 |

Module 3C

Courses on specialties: “Waste management”

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Semester | Course | Hours | The form of course completion\* | ECTS |
| Lecture | Lab | Field trainings | Total |
| II | Alternative methods of waste management | 20 | 30 | - | 50 | E | 4 |
| Reclamation of degraded land and natural waste utilisation  | 15 | 20 | - | 35 | E | 3 |
| III | Maintenance systems for processing lines  | 15 | 20 |  | 35 | E | 3 |
| Sustainable development of rural areas and environmental protection  | 20 | 30 | - | 50 | E | 4 |
| Robotisation of technological processes | 15 | 30 |  | 45 | E | 3 |
| Environmental impact assessment | 20 | 30 | - | 50 | E | 4 |
| Waste processing costs | 15 | 20 | - | 35 | E | 3 |
| Waste flow control | 15 | 24 | - | 39 | E | 3 |