



No. _____ of _____

USAMV form 0107020110

SUBJECT OUTLINE

1. Information on the programme

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| 1.1. Higher education institution | University of Agricultural Sciences and Veterinary Medicine of Cluj-Napoca |
| 1.2. Faculty | Agriculture |
| 1.3. Department | Environmental and plant protection |
| 1.4. Field of study | Environment engineering |
| 1.5. Cycle of study ¹ | Bachelor |
| 1.6. Specialization/ Study programme | Environment engineering |
| 1.7. Form of education | Full time |

2. Information on the discipline

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|---|------------------------------------|---------------|----|----------------------|----------|------------------------|-----------------------------|----|
| 2.1. Discipline name | WIND ENGINEERING | | | | | | | |
| 2.2. Course coordinator | Șef lucr. dr.ing. Călin Safirescu | | | | | | | |
| 2.3. Seminar/ laboratory/ project coordinator | Șef lucr. dr. ing. Călin Safirescu | | | | | | | |
| 2.4. Year of study | II | 2.5. Semester | II | 2.6. Evaluation type | Sumative | 2.7. Discipline status | Content ² | D |
| | | | | | | | Compulsoriness ³ | DI |

3. Total estimated time (teaching hours per semester)

| | | | | | |
|---|-----|----------------------------|----|-----------------------------------|-------|
| 3.1. Hours per week – full time programme | 4 | out of which: 3.2. lecture | 2 | 3.3. seminar/ laboratory/ project | 2 |
| 3.4. Total number of hours in the curriculum | 56 | out of which: 3.5. lecture | 28 | 3.6. seminar/laboratory | 28 |
| Distribution of the time allotted | | | | | hours |
| 3.4.1. Study based on books, textbooks, bibliography and notes | | | | | 16 |
| 3.4.2. Additional documentation in the library, electronic platforms and field experiences | | | | | 12 |
| 3.4.3. Preparing seminars/ laboratories/ projects, subjects, reports, portfolios and essays | | | | | 12 |
| 3.4.4. Tutorials | | | | | 4 |
| 3.4.5. Examinations | | | | | 4 |
| 3.4.6. Other activities | | | | | |
| 3.7. Total hours of individual study | 48 | | | | |
| 3.8. Total hours per semester | 104 | | | | |
| 3.9. Number of credits ⁴ | 4 | | | | |

4. Prerequisites (if applicable)

| | |
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| 4.1. curriculum-related | Physics, Meteorology and climatology |
| 4.2. skills-related | Team communications skills, organization, use of internet for research |

5. Conditions (if applicable)

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|---|---|
| 5.1. for the course | The course is interactive, students can ask questions about the content of the exhibition. Academic discipline is required for the entire time of the lecture. There are not tolerated others activities during the lecture, mobile phones must be switched off. The classroom has video-projector. |
| 5.2. for the seminar/ laboratory/ project | The classroom has video-projector, blackboard. Academic discipline is required throughout the duration of the work. Laboratory room with process specificity. |

5. Cumulated specific competences

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|--------------------------|--|
| Professional competences | <p>1. Knowledge, understanding, explanation and interpretation</p> <ul style="list-style-type: none"> - Knowledge of the action of the wind on rigid structures, the distribution of local pressures resulting from the wind on the surface of the structure - Knowledge of the action of the wind on structures with dynamic response; - Knowledge of the dispersion of pollutants in the atmosphere; elements of diffusion and dispersion of a pollutant in a fluid environment. <p>2. Instrumental-applicative</p> <ul style="list-style-type: none"> - knowledge of laboratory instruments and equipment. - knowledge of how to use the laboratory equipment. - knowledge of the experimental investigation technology - interpretation of results, knowledge of the use of graphs, diagrams and working tables <p>3. Attitudinal</p> <ul style="list-style-type: none"> - development of creativity through participation in research activities; - the acquisition of the individual study skills through the elaboration of homework and referrals; - awareness of the need for environmental protection to avoid pollution. |
| Transversal competences | <p>To understand the connections between the factors that impact on wind engineering</p> <p>To develop the skills to work effectively with people with different personalities and backgrounds.</p> |

7. Discipline objectives (based on the cumulated specific competences)

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|--------------------------|---|
| 7.1. General objective | Presentation of the concepts, principles and notions essential to wind engineering |
| 7.2. Specific objectives | <p>Knowledge and understanding of the various basic concepts related to wind engineering and their characteristics</p> <p>To develop essential skills in using the concepts specific to wind engineering</p> <p>To develop the capacity for analysis and synthesis using terms specific to the debated problem.</p> |

3. Content

| 8.1. COURSE Number of hours - 28 | Teaching methods | Observation |
|---|------------------|-------------|
| 1. Fluid mechanics elements specific to wind engineering. | Lecture | 2 hours |
| 2. Elements of thermodynamics of the atmosphere | Lecture | 2 hours |
| 3. Elements of aerodynamics of the atmosphere | Lecture | 4 hours |
| 4. The action of the wind on rigid structures | Lecture | 6 hours |
| 5. Wind action on structures with dynamic response | Lecture | 6 hours |
| 6. Dispersion of pollutants into the atmosphere | Lecture | 2 hours |
| 7. Modeling in wind tunnel of wind engineering phenomena. | Lecture | 6 hours |

| 8.2. PRACTICAL WORKS Number of hours - 28 | Teaching methods | Observation |
|--|--|-------------|
| 1. Labor protection training in the wind engineering laboratory; | Exposure.Instructing. | 2 ore |
| 2. The wind farm laboratory performance | | 2 ore |
| 3. Measurement of a medium speed profile in aerodynamic tunnel with boundary layer | Presentation Exercise methode | 4 ore |
| 4. Determining the aerodynamic forces and moments resulting from the wind action on static response constructions. | Prezentare, Brainstorming. Exercise methode | 4 ore |
| 5. Principles of aerodynamic tunneling modeling of the dispersion of a gaseous pollutant in atmosphere. | | 4 ore |
| 6. Modeling the wind action on the aerodynamic tunnel | | |
| 7. Measuring equipment. | | |

| | | |
|---|---|-------------------------|
| 9. Verification of knowledge | Exercise metode Presentation Method of verification | 4 ore 4 ore 4 ore |
| <p><i>Compulsory bibliography:</i></p> <p>1. Oroian Ioan, 2014. <i>Ingineria vântului</i>, note de curs. 2. Vlad, I., 1982. <i>Energia vântului</i>, Editura tehnică, București. 3. Bej, A., <i>Turbine de vânt</i>, Editura Politehnica, Timișoara, 2003 4. Degeratu M. <i>Curs de ingineria vântului</i>, Universitatea Tehnica de Inginerie Civila, București. 5. Vântu V., 2000. <i>Ecologie și protecția mediului</i>, Editura "Ion Ionescu de la Brad", Iasi</p> <p><i>Optional bibliography:</i></p> <p>1. Burton, T., <i>Wind Energy Handbook</i>, John Wiley & Sons, LTD, New York, 2001. 2. *** <i>Wind Directions</i>, Magazine of the European Wind Energy Association, London, UK, 2009. 3. Ionescu Al, 1990. <i>Ecologie și protecția mediului</i>, București. 3. Dan Schiopu, 1997. <i>Ecologie și protecția mediului</i>, Editura didactica și pedagogica, București</p> | | |

9. Corroborating the discipline content with the expectations of the epistemic community representatives, of the professional associations and of the relevant employers in the corresponding field

The content of the discipline is in accordance with what is studied in other university centers in the country and abroad.
The content and structure of the course are aspects adapted to the needs of the students and the demands of the employers in the field of environmental engineering.
The graduates of this course can use their knowledge gained in the job market offers, in institutions with a technological profile in general and in those with an environmental engineering profile in particular, including in companies and or non-governmental organizations that provide consultancy in the field.
At the same time, the specific knowledge of the course is a starting point towards the higher level of preparation, represented by the doctoral programs, in the field of environmental protection.

10. Evaluation

| Type of activity | 10.1. Evaluation criteria | 10.2. Evaluation type | 10.3. Percentage of the final grade |
|--|---|---|-------------------------------------|
| 10.4. Course | Correctness answers, mastery of specialized terms, and understanding the problem treated at the course | Oral exam - access to exam is subject to handing over reports for the practical works of laboratory. | 70% |
| 10.5. Seminar/Laboratory | Quality of prepared reports Laboratory activity Practical vision in solving a analytical problems | Laboratory reports corresponding to the works practical - they teach in next week execution of the activity | 30% |
| 10.6. Minimum performance standards | | | |
| 60% knowledge of the information taught at the course. 60% knowledge of the information obtained from the laboratory hours. | | | |

- 1 Cycle of studies - choose one of the three options: Bachelor/Master/Ph.D.
- 2 according to the educational plan
- 3 Discipline status (compulsoriness) - choose one of the options - DI (compulsory discipline) DO (optional discipline) DFac (facultative discipline).
- 4 One credit is equivalent to 25-30 hours of study (teaching activities and individual study).

Filled in on 04.09.2019
Approved by the department on 05.09.2019
Course coordinator Șef lucr. dr. ing. Călin SAFIRESCU
Laboratory work/seminar coordinator Șef lucr. dr. ing. Călin SAFIRESCU
Head of the Department Prof. dr. Ioan OROIAN