**SYLLABUS** (MODULE-ERASMUS+)

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| Course/module (as specified in the approved curriculum for the field of study) **Meteorology and climate change** | ECTS**3** | Component code**ENVI 3.4** |
| Name in Polish**Meteorologia i zmiany klimatyczne** |
| Unit(-s) providing the course/module (Faculty, Institute/Department)**Faculty of Environmental and Mechanical Engineering, Department of Civil Engineering and Geoengineering** |
| Head of course/module (e-mail address)**Janusz Olejnik, Prof. (****janusz.olejnik@up.poznan.pl****)** |
| Other teachers**Klaudia Ziemblińska, PhD** |
| Course category**Open** | Language**English** | Level**Bachelor/Master** | Profile**Academic-general** | Semester**Summer** |
| **TYPE OF CLASSES/LECTURES AND THE NUMBER OF HOURS**(organised classes/lectures and self-study) |
| Type of studies: full-time |  | Type of studies: extramural |  |
| * lectures
 | 15 | * lectures
 | - |
| * practical classes
 | 15 | * practical classes
 | - |
| * field exercise
 |   | * field exercise
 | - |
| * other lessons
 |  - | * other lessons
 | - |
| * self-study
 |  45 | * self-study
 | - |
| Total number of hours: | 75 | Total number of hours: | - |
| **PRE-REQUSITES**Basics of physics. |
| **OBJECTIVE OF COURSE/MODULE**To increase the general knowledge about natural and anthropogenic aspects of climate change with special attention to their various environmental consequences. Understanding basic physical phenomena related to causes and results of climate change.  |
| **TEACHING METHODS**Lectures with open discussion, practical classes. Possibility to use remote teaching tools and techniques in both cases. |
| **LEARNING OUTCOMES** | Referenceto field outcomes |
| Knowledge | O1: Students will have advanced knowledge about the principles of climate change,O2: Students will discover advanced method of climate change observation and research,O3: Students will know where to find and how to analyze the long series of climate data.  | Notapplicable |
| Skills | O4: Students will have skills of greenhouse gasses fluxes measurements using state-of-the-art techniques,O5: Students will be able to distinguish natural from anthropogenic impacts of climate change. | Notapplicable |
| Socialcompetences | O6: Students will understand the social responsibility for the environment,O7: Students will be able to take a part in an open discussions about climate changes and its consequences. | Notapplicable |
| **METHODS TO VERIFY LEARNING OUTCOMES**Assessment of participation in a discussion, timeliness, reliability and student’s behaviour (lectures)Assessment of completed exercises (Students report- practical lectures) | Outcome ReferenceNumbersO1-O3,O6-O7O4-O5 |
| **TEACHING CONTENT****Lectures**: 1. Composition, structure and development of the atmosphere.
2. Solar and the Earth radiation, energy balance.
3. Air and soil temperature, thermodynamics of the atmosphere, the atmosphere stability conditions.
4. Atmospheric moisture.
5. Atmospheric pressure and global circulation.
6. Air mass and fronts.
7. Global circulation models and weather forecasts.
8. Basics of climatology and climates of the Earth.
9. Current and future climate changes, causes and consequences of climate change.
10. Impact of climate change on terrestrial ecosystems.
11. Measurements and balances of greenhouse gases fluxes.

**Practical classes:** 1. Analysis of past and present temperature records, prediction of future thermal conditions and their impact on vegetation season length
2. Assessment of the change in energy (heat) released to the atmosphere due to land use change- different scenarios
3. Where to find climate data for different places worldwide?
4. Field trips to eddy covariance forest sites to perform measurements of CO2 fluxes using chamber method. Examples of CO2 and H2O fluxes calculations based on the data collected at these sites.
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| **Forms and criteria for passing of course/module** Twenty questions multi-choice test / Assessment of student’s activity and participation in discussion (lectures). Assessment of the report consisting of individual exercises/calculations (practical classes). | Percentage of final mark70% / 30%100% |
| **LIST OF LITERATURE** 1. Cotton William R. and Pielke Sr. Roger A. (2007) Human Impacts on Weather and Climate. Cambridge University Press, 308 pp
2. Covie Jonathan (2007) Climate Change. Biological and Human Aspects. Cambridge University Press, 487 pp
3. Kondratyev Kirill .Ya, Krapivin Vladimir F., Phillips Gary W. (2002) Global Environmental Change. Springer – Verlag Berlin Heidelberg New York, 316 pp
4. Tuba Zoltan, DSc Editor. (2005) Ecological Responses and Adaptations of Crops to Rising Atmospheric Carbon Dioxide. Food Products Press. An Imprint of The Hawort Press, Inc. Binghamton , NY 414 pp
5. Kędziora Andrzej, Podstawy agrometeorologii. Państwowe Wydawnictwo Rolnicze i Leśne, 2008
6. IPCC reports
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