

| SUBJECT CARD FOR RECRUITMENT 2020-2021                                                                                                                                                      |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|------|-------|--------------------------|-----|-------|
| GENERAL INFORMATION                                                                                                                                                                         |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| 1. Name of subject                                                                                                                                                                          | COMPUTATIONAL FLUID DYNAMICS                                                                                                                                                                                                                                                |        |      |       |                          |     |       |
| 2. Name of the course                                                                                                                                                                       | Mechanic and Machine Construction                                                                                                                                                                                                                                           |        |      |       |                          |     |       |
| 3. Learning content group                                                                                                                                                                   | -                                                                                                                                                                                                                                                                           |        |      |       |                          |     |       |
| 4. Type of object<br>(mandatory, optional)                                                                                                                                                  | Optional                                                                                                                                                                                                                                                                    |        |      |       |                          |     |       |
| 5. Level of study                                                                                                                                                                           | First degree studies                                                                                                                                                                                                                                                        |        |      |       |                          |     |       |
| 6. Number of ECTS credits                                                                                                                                                                   | 1                                                                                                                                                                                                                                                                           |        |      |       |                          |     |       |
| 7. Subject level<br>(basic, intermediate, advanced)                                                                                                                                         | The basic                                                                                                                                                                                                                                                                   |        |      |       |                          |     |       |
| 8. Year, semester of study                                                                                                                                                                  | II year, semester IV – summer                                                                                                                                                                                                                                               |        |      |       |                          |     |       |
| 9. Number of hours per semester                                                                                                                                                             | Lect.                                                                                                                                                                                                                                                                       | Exerc. | Lab. | Proj. | Pbn.                     | Zp. | Works |
|                                                                                                                                                                                             | 15                                                                                                                                                                                                                                                                          |        |      |       |                          |     |       |
| 10. Language:                                                                                                                                                                               | English/Polish                                                                                                                                                                                                                                                              |        |      |       |                          |     |       |
| 11. Lecturers(s)                                                                                                                                                                            | (name and surname, degree and e-mail address of the lecturer(s) conducting the classes)<br>Michał Biały, M.Sc. Eng., m.bialy@dydaktyka.pswbp.pl<br>Rafał Sochaczewski, Ph.D. Eng., <a href="mailto:r.sochaczewski@dydaktyka.pswbp.pl">r.sochaczewski@dydaktyka.pswbp.pl</a> |        |      |       |                          |     |       |
| DETAILS                                                                                                                                                                                     |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| 12. Prerequisites                                                                                                                                                                           |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| 1) Course in fluid mechanics.                                                                                                                                                               |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| 13. Objectives                                                                                                                                                                              |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| C1 Familiarising students with the basics of computer fluid mechanics..                                                                                                                     |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| C2 The introduction of basic knowledge on the issues of grid adaptation to the fluid mechanics problem under consideration, grid preparation and its impact on the quality of calculations. |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| C3 The introduction students with the principles of conducting and developing the results of numerical calculations.                                                                        |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| 14. Learning goals in terms of knowledge, skills and social competences                                                                                                                     |                                                                                                                                                                                                                                                                             |        |      |       |                          |     |       |
| A student who has passed the subject:                                                                                                                                                       |                                                                                                                                                                                                                                                                             |        |      |       | reference to directional |     |       |

|                                                                                                                                                                                                                                                                                                                                                                                 |                                              |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
|                                                                                                                                                                                                                                                                                                                                                                                 | learning outcomes                            |
| <b>KNOWLEDGE</b>                                                                                                                                                                                                                                                                                                                                                                |                                              |
| EU01. It has advanced knowledge in designing technological processes of machine elements using computer techniques.                                                                                                                                                                                                                                                             | K_W14                                        |
| <b>SKILLS</b>                                                                                                                                                                                                                                                                                                                                                                   |                                              |
| EU02. Can apply thermodynamics to describe physical phenomena and mathematical modelling of heat exchange in technological processes.                                                                                                                                                                                                                                           | K_U21                                        |
| <b>SOCIALCOMPETENCE</b>                                                                                                                                                                                                                                                                                                                                                         |                                              |
| EU03. Understands the need for continuous learning (e.g. second cycle studies, postgraduate studies, literature studies); can encourage and organise further training for others.                                                                                                                                                                                               | K_K01<br>K_K02                               |
| <b>15. Programme of lecture</b>                                                                                                                                                                                                                                                                                                                                                 |                                              |
| <b>Form of classes - lecture</b>                                                                                                                                                                                                                                                                                                                                                |                                              |
| 1) Introduction to CFDs.<br>2) Preparation of geometry for simulation.<br>3) Numerical Grid in CFD analyses.<br>4) Finite Element Method.<br>5) Methodology of conducting simulation - stages of analysis - analysis settings, boundary conditions, etc..<br>6) Post-processing - analysis of the results obtained, critical assessment of their credibility.<br>7) Colloquium. |                                              |
| <b>16. Teaching tools/methods</b>                                                                                                                                                                                                                                                                                                                                               |                                              |
| 1. Lecture with multimedia presentations.                                                                                                                                                                                                                                                                                                                                       |                                              |
| 2. Discussion.                                                                                                                                                                                                                                                                                                                                                                  |                                              |
| 3. Consultation.                                                                                                                                                                                                                                                                                                                                                                |                                              |
| <b>17. Assessment methods</b> (F – forming; P – summary)                                                                                                                                                                                                                                                                                                                        |                                              |
| F1. Discussion during lectures.                                                                                                                                                                                                                                                                                                                                                 |                                              |
| P1. Evaluation based on the colloquium.                                                                                                                                                                                                                                                                                                                                         |                                              |
| <b>18. Student workload</b>                                                                                                                                                                                                                                                                                                                                                     |                                              |
| form of activity                                                                                                                                                                                                                                                                                                                                                                | average number of hours to complete activity |
| Contact hours with the teacher *                                                                                                                                                                                                                                                                                                                                                | 17                                           |
| Preparation for classes and colloquium                                                                                                                                                                                                                                                                                                                                          | 8                                            |
| TOTAL                                                                                                                                                                                                                                                                                                                                                                           | 25                                           |
| SUMMARY NUMBER OF ECTS POINTS for the subject                                                                                                                                                                                                                                                                                                                                   | 1                                            |
| <b>19. Basic and supplementary literature</b>                                                                                                                                                                                                                                                                                                                                   |                                              |
| Basic literature:                                                                                                                                                                                                                                                                                                                                                               |                                              |
| 1) Podstawy mechaniki płynów i hydrauliki / Romuald Puzyrewski, Jerzy Sawicki. Wydanie 3 poprawione - 1 dodruk. - Warszawa : Wydawnictwo Naukowe PWN, 2000                                                                                                                                                                                                                      |                                              |
| 2) Iteracyjne rozwiązywanie zadań z mechaniki płynów / Piotr Gorzelańczyk, Jan Adam Kołodziej. Piła : Państwowa Wyższa Szkoła Zawodowa im. Stanisława Staszica w Pile, 2007                                                                                                                                                                                                     |                                              |
| Supplementary literature:                                                                                                                                                                                                                                                                                                                                                       |                                              |
| 1) Mateusz Pawłucki, Maciej Kryś. CFD dla inżynierów. Praktyczne ćwiczenia na przykładzie systemu ANSYS Fluent. Wydawnictwo:mHelion.                                                                                                                                                                                                                                            |                                              |
| <b>20. Forms of assessment - details</b>                                                                                                                                                                                                                                                                                                                                        |                                              |
| <b>Conditions for obtaining a pass in the lecture:</b> the classes end with a grade. Elements of the semester grade: 90% are the student's knowledge and skills, 10% are social competences / student                                                                                                                                                                           |                                              |

base.

A method of verifying learning effects in terms of knowledge and skills::

The pass: scores from the colloquium:

Percentage grading scale: 91% - 100% = 5,0

81% - 90% = 4,5

71% - 80% = 4,0

61% - 70% = 3,5

51% - 60% = 3,0

0% - 50% = 2,0

Absence on the colloquium is equivalent to no credit being obtained (2.0). In the case of absence or negative assessment, the student is obliged to pass the colloquium within the correctional period - set by the teacher.

A method of verifying learning outcomes of social competence:

Observation of student's engagement and work during the classes..

#### **21. Other useful information on the subject matter**

1. Direct information about the issues and programme content is provided by the tutor duringt he classes and during consultations.
2. Classes will be take place in PSW in Biała Podlaska.
3. The classes will take place according to the current timetable..
4. The consultations will take place in accordance with the timetable of the leader.

\* Classes conducted with the direct participation of an academic teacher or other person conducting classes and consultations