Module name: Foundry moulding and core sands

Academic year: 2019/2020  Code: ZSDA-3-0221-s  ECTS credits: 5

Faculty of: Szkola Doktorska AGH

Field of study: Szkola Doktorska AGH  Specialty: —

Study level: Third-cycle studies  Form and type of study: Full-time studies

Lecture language: English  Profile of education: Academic (A)  Semester: 0

Course homepage: —

Responsible teacher: dr hab. inż. Major-Gabryś Katarzyna (katmg@agh.edu.pl)

**Module summary**
The course covers general concepts and basic definitions for moulding and core compounds as well as used moulding materials with an emphasis on environmentally friendly technologies. Familiarizes with all the basic forming technologies.

**Description of learning outcomes for module**

<table>
<thead>
<tr>
<th>MLO code</th>
<th>Student after module completion has the knowledge/ knows how to/is able to</th>
<th>Connections with FLO</th>
<th>Method of learning outcomes verification (form of completion)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social competence: is able to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M_K001</td>
<td>Critical evaluation of the achievements within a given discipline, critical assessment of one's contribution to the development of the discipline, recognition of the importance of knowledge in solving cognitive and practical problems;</td>
<td>SDA3A_K01</td>
<td>Examination, Activity during classes</td>
</tr>
<tr>
<td>M_K002</td>
<td>Methodology of scientific research</td>
<td>SDA3A_W03</td>
<td>Execution of laboratory classes, Completion of laboratory classes, Activity during classes</td>
</tr>
<tr>
<td></td>
<td>Skills: he can</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M_U001</td>
<td>Communicate on specialized topics to the extent enabling active participation in the international scientific environment;</td>
<td>SDA3A_U02</td>
<td>Examination, Activity during classes</td>
</tr>
<tr>
<td></td>
<td>Knowledge: he knows and understands</td>
<td></td>
<td></td>
</tr>
<tr>
<td>M_W001</td>
<td>Main development trends of the discipline or disciplines in which education takes place.</td>
<td>SDA3A_W02</td>
<td>Examination, Activity during classes</td>
</tr>
</tbody>
</table>
## Number of hours for each form of classes

<table>
<thead>
<tr>
<th>Suma</th>
<th>Lectures</th>
<th>Auditorium classes</th>
<th>Laboratory classes</th>
<th>Project classes</th>
<th>Conversation seminar</th>
<th>Seminar classes</th>
<th>Practical classes</th>
<th>Fieldwork classes</th>
<th>Workshops</th>
<th>Prace kontrolne i przejściowe</th>
<th>Lektorat</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>10</td>
<td>0</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

## FLO matrix in relation to forms of classes

<table>
<thead>
<tr>
<th>MLO code</th>
<th>Student after module completion has the knowledge/ knows how to/is able to</th>
<th>Form of classes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social competence: is able to</td>
<td>Lectures</td>
</tr>
<tr>
<td>M_K001</td>
<td>Critical evaluation of the achievements within a given discipline, critical assessment of one's contribution to the development of the discipline, recognition of the importance of knowledge in solving cognitive and practical problems;</td>
<td>+ - + - - - - - - -</td>
</tr>
<tr>
<td>M_K002</td>
<td>Methodology of scientific research</td>
<td>- - + - - - - - -</td>
</tr>
<tr>
<td></td>
<td>Skills: he can</td>
<td></td>
</tr>
<tr>
<td>M_U001</td>
<td>Communicate on specialized topics to the extent enabling active participation in the international scientific environment;</td>
<td>+ - + - - - - - -</td>
</tr>
<tr>
<td></td>
<td>Knowledge: he knows and understands</td>
<td></td>
</tr>
<tr>
<td>M_W001</td>
<td>Main development trends of the discipline or disciplines in which education takes place.</td>
<td>+ - + - - - - - -</td>
</tr>
</tbody>
</table>

Module card - Foundry moulding and core sands
Student workload (ECTS credits balance)

<table>
<thead>
<tr>
<th>Student activity form</th>
<th>Student workload</th>
</tr>
</thead>
<tbody>
<tr>
<td>Udział w zajęciach dydaktycznych/praktyka</td>
<td>30 h</td>
</tr>
<tr>
<td>Preparation for classes</td>
<td>15 h</td>
</tr>
<tr>
<td>przygotowanie projektu, prezentacji, pracy pisemnej, sprawozdania</td>
<td>5 h</td>
</tr>
<tr>
<td>Examination or Final test</td>
<td>2 h</td>
</tr>
<tr>
<td>Contact hours</td>
<td>5 h</td>
</tr>
<tr>
<td>Inne</td>
<td>5 h</td>
</tr>
<tr>
<td>Summary student workload</td>
<td>62 h</td>
</tr>
<tr>
<td>Module ECTS credits</td>
<td>5 ECTS</td>
</tr>
</tbody>
</table>

Additional information

Module content

Lectures
Methods of making foundry moulds and cores (the division of moulding and core sands into generations).
Moulding sands bound with physical factors (3rd generation). Types and characteristics of processes.
Moulding sands bound with biotechnological factors (4th generation).
Alternative methods of moulding sands curing.
Methods for regeneration of moulding and core sands.
Methods for determining the harmfulness of moulding sands to the environment.

Laboratory classes
Influence of curing time on bending strength (Rgu) and stretching strength (Rmu) of loose self-hardening moulding sands with synthetic resin (SMS).
Exercise allows to determine the strength properties of loose self-hardening moulding sands with commonly used in foundry practise organic binders. The student gets acquainted with selected properties of 2nd generation moulding sands, their disadvantages and advantages.

Influence of curing time on bending strength (Rgu) and stretching strength (Rmu) of loose self-hardening moulding sands with hydrated sodium silicate.
Exercise allows to determine the strength properties of loose self-hardening moulding sands with environmentally friendly inorganic binders. The student gets acquainted
with selected properties of 2nd generation moulding sands, their disadvantages and advantages.

Influence of curing time on bending strength of microwaved hardened moulding sands with hydrated sodium silicate
Exercise allows to determine the strength properties of microwaved hardened moulding sands with inorganic binders.

Influence of curing time and temperature on bending strength of thermally hardened moulding sands with hydrated sodium silicate
Exercise allows to determine the strength properties of thermally hardened moulding sands with inorganic binders.

Influence of cold-box generation type on strength properties of moulding sands.
Exercise allows to determine the strength properties of moulding sands prepared in different cold-box generation types.

Final passing

Teaching methods and techniques:
Lectures: The content presented at the lecture is provided in the form of a multimedia presentation in combination with a classical lecture panel enriched with demonstrations relating to the issues presented.
Laboratory classes: During the laboratory classes, students independently solve the practical problem, choosing the right tools. The leader stimulates the group to reflect on the problem, so that the obtained results have a high substantive value.

Warunki i sposób zaliczenia poszczególnych form zajęć, w tym zasady zaliczeń poprawkowych, a także warunki dopuszczenia do egzaminu:

Zasady udziału w poszczególnych zajęciach, ze wskazaniem, czy obecność studenta na zajęciach jest obowiązkowa:
Lectures:
- Attendance is mandatory: Yes
- Participation rules in classes: - Obligatory presence: Yes
- Rules for participation in classes: Students participate in classes learning further content of teaching according to the syllabus of the subject. Students should constantly ask questions and explain doubts.
Audiovisual recording of the lecture requires the teacher’s consent.
Laboratory classes:
- Attendance is mandatory: Yes
- Participation rules in classes: - Obligatory presence: Yes
- Rules for participation in classes: Students perform laboratory exercises in accordance with materials provided by the teacher. The student is obliged to prepare for the subject of the exercise, which can be verified in an oral or written test. Completion of classes takes place on the basis of presenting a solution to the problem. Completion of the module is possible after completing all laboratory classes.

Method of calculating the final grade
Presence at lectures - 20%. Laboratory classes passing - 30%, exam - 50%. Laboratory classes passing and exam may take place in an oral form – the decision is taken by the instructor on the basis of the number of persons joining the next exam (passing) period.

Sposób i tryb wyrównywania zaległości powstałych wskutek nieobecności studenta na zajęciach:
Prerequisites and additional requirements
Recquired attendance at lectures (80%). Compulsory attendance at laboratory classes (100%).
Theoretical preparation for laboratory exercises. Passing the report on laboratory classes. Returning the report from the completed exercise before the next exercise. Reports can be sent electronically.

Recommended literature and teaching resources
1. Dobosz St.M.: Woda w masach formierskich i rdzeniowych. Wydawnictwo Naukowe „Akapit”, Kraków 2006,
2. Lewandowski J.L.: Tworzywa na formy odlewnicze, Wydawnictwo Naukowe „Akapit”, Kraków 1997,

Scientific publications of module course instructors related to the topic of the module
1. Dobosz St.M.: Woda w masach formierskich i rdzeniowych. Wydawnictwo Naukowe „Akapit”, Kraków 2006,
3. JAKUBSKI J., DOBOSZ St. M. , MAJOR-GABRYŚ K.: Active binder content as a factor of the control system of the moulding sand quality / // Archives of Foundry Engineering / Polish Academy of Sciences. Commission of Foundry Engineering ; ISSN 1897-3310, 2011 vol. 11 iss. 1, s. 49–52,
4. DOBOSZ St.M., Jelinek P. MAJOR-GABRYŚ K.: Author’s researches of improvement of moulding and core sands — Autorskie badania nad doskonaleniem mas formierskich i rdzeniowych, Przegląd Odlewnictwa : miesięcznik naukowo-techniczny / Stowarzyszenie Techniczne Odlewników Polskich, Kraków ; ISSN 0033-2275, 2011 nr 5-6, s. 196–209,
6. MAJOR-GABRYŚ K., DOBOSZ St.M., GRABARCZYK A., Badania laboratoryjne odlewniczych mas formierskich — Moulding sands laboratory tests, Laboratorium (Katowice) : przegląd ogólnopolski ; ISSN 1643-7381. — 2015 nr 11-12, s. 62–64,
7. DOBOSZ St.M., Jelinek P., MAJOR-GABRYŚ K.: Development tendencies of moulding and core sands, China Foundry ; ISSN 1672-6421. — 2011 vol. 8 no. 4, s. 438–446,
9. DOBOSZ St.M., GRABARCZYK A., MAJOR-GABRYŚ K., JAKUBSKI J.: Influence of quartz sand quality on bending strength and thermal deformation of moulding sands with synthetic binders, Archives of Foundry Engineering / Polish Academy of Sciences. Commission of Foundry Engineering ; ISSN 1897-3310, 2015 vol. 15 iss. 2, s. 9-12,

Additional information
Lectures and laboratory classes take place according to the schedule agreed and communicated to students.