



Module name: Foundry moulding and core sands

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

Faculty of: Szkoła Doktorska AGH

Field of study: Szkoła 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

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Connections with FLO	Method of learning outcomes verification (form of completion)
Social competence: is able to			
M_K001	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;	SDA3A_K01	Examination, Activity during classes
M_K002	Methodology of scientific research	SDA3A_W03	Execution of laboratory classes, Completion of laboratory classes, Activity during classes
Skills: he can			
M_U001	Communicate on specialized topics to the extent enabling active participation in the international scientific environment;	SDA3A_U02	Examination, Activity during classes
Knowledge: he knows and understands			
M_W001	Main development trends of the discipline or disciplines in which education takes place.	SDA3A_W02	Examination, Activity during classes

Number of hours for each form of classes

Suma	Form of classes										
	Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
30	10	0	20	0	0	0	0	0	0	0	0

FLO matrix in relation to forms of classes

MLO code	Student after module completion has the knowledge/ knows how to/is able to	Form of classes										
		Lectures	Auditorium classes	Laboratory classes	Project classes	Conversation seminar	Seminar classes	Practical classes	Fieldwork classes	Workshops	Prace kontrolne i przejściowe	Lektorat
Social competence: is able to												
M_K001	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;	+	-	+	-	-	-	-	-	-	-	-
M_K002	Methodology of scientific research	-	-	+	-	-	-	-	-	-	-	-
Skills: he can												
M_U001	Communicate on specialized topics to the extent enabling active participation in the international scientific environment;	+	-	+	-	-	-	-	-	-	-	-
Knowledge: he knows and understands												
M_W001	Main development trends of the discipline or disciplines in which education takes place.	+	-	+	-	-	-	-	-	-	-	-

Student workload (ECTS credits balance)

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

Additional information

Module content

Lectures

Methods of making foundry moulds and cores (the division of moulding and core sands into generations).

Properties of matrix and binder of classic moulding sands (1st generation moulding sand). Technologies for the production of classic green sands. Processes for refreshing moulding sands.

Moulding sands bonded with organic and inorganic binders (moulding and core furnaces of the second generation). Technology of loose self-hardening moulding sands. Properties, advantages and disadvantages of the moulding sands, application. Cold-box technology. Properties, advantages and disadvantages of the moulding sands, application. Hot-box technology. Properties, advantages and disadvantages of the moulding sands, application.

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 (R_{gu}) and stretching strength (R_{mu}) 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 (R_{gu}) and stretching strength (R_{mu}) 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:

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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

Required 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,
3. Materiały Formierskie – Laboratorium, Skrypt Uczelniany nr 1500, Wydawnictwo AGH, Kraków 1997.
4. Major-Gabryś K.: Odlewnicze masy formierskie i rdzeniowe przyjazne dla środowiska, Wydawnictwo Archives of Foundry Engineering, Katowice-Gliwice 2016.

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,
2. Major-Gabryś K.: Odlewnicze masy formierskie i rdzeniowe przyjazne dla środowiska, Wydawnictwo Archives of Foundry Engineering, Katowice-Gliwice 2016,
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,
5. MAJOR-GABRYŚ K., DOBOSZ St.M.: A new ester hardener for moulding sands with water glass having slower activity, Archives of Foundry Engineering / Polish Academy of Sciences. Commission of Foundry Engineering ; ISSN 1897-3310. — Tytuł poprz.: Archiwum Odlewnictwa. — 2009 vol. 9 iss. 4, s. 125-128,
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,
8. DOBOSZ St.M., MAJOR-GABRYŚ K., Hosadyna-Kondracka M., JAKUBSKI J.: Impact of furan moulding sands on structure of castings made of spheroid (nodular) cast iron / I // W: Proceedings of the 2015 WFO international forum on Moulding materials and casting technologies : October 25-28, 2015, Changsha, China / WFO Moulding Materials Commission, Foundry Institution of Chinese Mechanical Engineering Society, Productivity Promotion Center of Foundry Industry of China. — [China : s.n.], 2015. — S. 25-32,
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,
10. GRABARCZYK A., MAJOR-GABRYŚ K., DOBOSZ St.M., Wojczuk M., Superson M.: Kompozycje: uwodniony krzemian sodu - materiał biodegradowalny jako spoiwo mas formierskich — Compositions: hydrated sodium silicate - biodegradable material, as moulding sands binder, Archives of Foundry Engineering / Polish Academy of Sciences. Commission of Foundry Engineering ; ISSN 1897-3310, 2014 vol. 14 spec. iss. 4, s. 37-42.

Additional information

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