

Polish course name	<b>NOWOCZESNE TECHNIKI WYTWARZANIA</b>
English course name	<b>MODERN MANUFACTURING TECHNIQUES</b>
Course code	<b>WIP-MDL-D1-MMT-05</b>
Field of study	<b>Materials design and logistics</b>
Level of qualification	<b>First degree</b>
Form of study	<b>Full-time</b>
Semester	<b>5</b>
Number of ECTS points	<b>7</b>
Ways of assessment	<b>Test</b>

#### Number of hours per semester

<b>Lecture</b>	<b>Seminar</b>	<b>Classes</b>	<b>Laboratory</b>	<b>Project</b>
30			30	30

#### **TEACHERS:**

Dr inż. Małgorzata Łągiewka,

Dr hab. inż. Adam Cwudziński, prof. PCz.,

Dr hab. inż. Grzegorz Stradomski, prof. PCz.

#### **COURSE OBJECTIVES:**

- › **C1** Provide students with knowledge in the field of modern manufacturing techniques.
- › **C2** Acquisition by students of practical skills in the selection of technologies for the production of metals and metal products depending on the type and purpose.

#### **PRELIMINARY REQUIREMENTS FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCES:**

1. Basic knowledge of physics, chemical and materials science.
2. Basic knowledge of basic manufacturing techniques and production processes.
3. Ability to work independently and in a group.
4. Ability to use literature sources and internet resources.

#### **COURSE CONTENT**

## LECTURE

- › **L1 - L5** Manufacturing techniques of modern steels and metal alloys.
- › **L6** Environmental aspect in metal production technologies.
- › **L7 - L11** Modern technologies for the production of castings.
- › **L12, L13** Machines and devices in modern foundries.
- › **L14, L15** BAT technologies in metal plants.
- › **L16 - L20** Modern technologies for the production of plastically processed products.
- › **L21, L22** Machines and devices in modern plastic forming plants.
- › **L23, L24** Modern techniques of rapid prototyping.
- › **L25, L26** Industrial measuring systems.
- › **L27, L28** Design of technological processes.
- › **L29, L30** Measurement techniques in the metal industry.

## LABORATORY

- › **Lab1 - Lab5** Experimental determination of the transition zone during continuous casting of slabs/Experimental determination of the hydrodynamic structure in the COS crystallizer.
- › **Lab6 - Lab10** Observation of steel smelting and continuous casting in industrial conditions - fieldwork/Experimental determination of the relationship between the basicity of slag and the degree of desulphurization of the liquid iron alloy/Sintering of iron ore.
- › **Lab11 - Lab15** Centrifugal, precision and pressure casting.
- › **Lab16 - Lab20** Modern materials for foundry molds and castings.
- › **Lab21 - Lab25** Drawing and rolling.
- › **Lab26 - Lab30** Conducting tests of mechanical properties for selected plastic worked elements. Carrying out upsetting tests.

## PROJECT

- › **P1 - P10** Completion of the industrial technology project for the production of selected metals.
- › **P11 - P20** Preparation of technological documentation of the selected casting.
- › **P21 - P30** Designing the technology for the production of plastically processed elements.

## BASIC REFERENCES

1. T. Lis: Współczesne metody otrzymywania stali, Wyd. Politechniki Śląskiej, Gliwice 2000 r.
2. A. Ghosh: Secondary Steelmaking: Principles and Applications, CRC Press, 2001 r.
3. J. Jowša: Inżynieria procesów kadziowych w metalurgii stali, Wyd. Pol. Częst., Częstochowa, 2008 r.
4. Y. Sahai, T. Emi: Tundish Technology for Clean Steel Production, World Scientific Press, 2008 r.
5. Botor J.: Podstawy metalurgicznej inżynierii procesowej, Wyd. Politechniki Śląskiej, Gliwice, 1999 r.
6. M. Holzer: Procesy metalurgiczne i odlewnicze stopów żelaza. Podstawy fizykochemiczne, Wyd. PWN, Warszawa 2013 r.
7. Blacha L.: Metalurgia próżniowa, Wyd. Politechniki Śląskiej, Gliwice 2005 r.
8. A. Kosowski: Podstawy odlewnictwa, Wydawnictwo Naukowe AKAPIT, Kraków, 2008 r.
9. T. Warchał: Technologia modelu i formy. Cz. I i II. Skrypt P.Cz., Częstochowa 1984, 1985 r.
10. J.L. Lewandowski: Masy formierskie i rdzeniowe. PWN, Warszawa 1991 r.
11. M. Skarbiński, J. Skarbiński: Technologiczność konstrukcji maszyn. WNT, Warszawa 1987 r.
12. M. Perzyk i inni: Materiały do projektowania procesów odlewniczych”; PWN, Warszawa, 1990 r.
13. A. Tabor, J.S. Rączka: Projektowanie odlewów i technologii form Fotobit, Kraków, 1998 r.
14. W. Gorecki: Inżynieria wytwarzania i przetwórstwa płaskich wyrobów metalowych. Wyd. Politechniki Śląskiej 2006 r.
15. J. Łuksza, A. Skołyszewski, F. Witek, W. Zachariasz: Druty ze stali i stopów specjalnych. Wydawnictwo Naukowo-Techniczne, Warszawa 2006 r.
16. J. Herian: Wybrane techniki wytwarzania wyrobów metalowych. Wydawnictwo Politechniki Śląskiej 2004 r.

## **SUPPLEMENTARY REFERENCE MATERIALS**

1. Poradnik inżyniera. Odlewnictwo tom 1 i 2. Praca zbiorowa. WNT, Warszawa 1986 lub dostępne wydanie.

2. J. Hankus: Budowa i własności mechaniczne lin stalowych. Główny Instytut Górnictwa, Katowice 2000 r.
3. B. Maligowski, M. Pofelski: Wyroby z drutu. Wyd. Śląsk, 1970 r.
4. J. Kasprzak: Liny stalowe. Wyd. Śląsk, 1973 r.

## LEARNING OUTCOMES

- › **EU1** The student has a basic knowledge of the processes of producing metals and alloys, casting and plastic forming of metal products.
- › **EU2** The student knows the basic machines, devices and tools for the production of metal products.
- › **EU3** The student is able to use the basic knowledge in the field of technological processes used in the production of metal products to design the finished product.

## TEACHING TOOLS

- › Lecture with the use of audiovisual means.
- › Specialist laboratory.
- › Computer software.
- › CUT e-learning platform (possible use).

## WAYS OF ASSESSMENT (F – FORMATIVE, P – SUMMATIVE)

- › **F1.** Assessment of preparation for laboratory classes.
- › **F2.** Assessment of preparation for design classes.
- › **P1.** Assessment of the ability to prepare technological documentation.
- › **P2.** Assessment of the preparation for the final test of the lectures.

## STUDENT WORKLOAD

Form of activity	Number of hours	ECTS
Contact hours with the teacher		
Lectures	30	1,2
Seminar		
Classes		
Laboratory	30	1,2
Project	30	1,2

Test	5	0,2
Exam		
Total contact hours	95	3,8
Student's own work		
Getting acquainted with the indicated literature	25	1
Preparation for seminar		
Preparation for classes		
Preparation for lab	20	0,8
Project preparation	30	1,2
Consultation	2	0,08
Preparation for the test	3	0,12
Total student's own work	80	3,2
<b>Total number of hours/ ECTS points for the course</b>	<b>175</b>	<b>7,0</b>

#### ADDITIONAL INFORMATION

Timetable of classes	<a href="https://wip.pcz.pl/dla-studentow/plan-zajec/studia-stacjonarne">https://wip.pcz.pl/dla-studentow/plan-zajec/studia-stacjonarne</a>
Information about the consultation (time + place)	<a href="https://wip.pcz.pl/dla-studentow/konsultacje-dla-studentow">https://wip.pcz.pl/dla-studentow/konsultacje-dla-studentow</a>

#### MATRIX OF LEARNING OUTCOMES REALISATION

Learning outcome	Reference of given outcome to outcomes defined for whole program	Course objectives	Course content	Ways of assessment
EU 1	K_W03, K_W04,	C1, C2	L1 - L30	F1, F2, P1
EU 2	K_W03, K_W04, K_U03, K_U04, K_U05, K_K02,	C1, C2	L1 - L30 Lab1 - Lab30	F1, F2, P1
EU 3	K_W03, K_W04,	C1, C2	P1 - P30	F1, F2, P1

	K_U03, K_U04, K_U05, K_K02,			
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### FORM OF ASSESSMENT - DETAILS

**EU1** The student has a basic knowledge of the processes of producing metals and alloys, casting and plastic forming of metal products.

- › 2,0 The student has no basic knowledge of the processes of producing metals and alloys, casting and plastic forming of metal products.
- › 3,0 The student has some knowledge of the processes of producing metals and alloys, casting and plastic forming of metal products.
- › 3,5 The student almost knows the processes of producing metals and alloys, casting and plastic forming of metal products.
- › 4,0 The student knows well the processes of producing metals and alloys, casting and plastic forming of metal products.
- › 4,5 The student knows almost very well the processes of producing metals and alloys, casting and plastic forming of metal products.
- › 5,0 The student knows very well the processes of producing metals and alloys, casting and plastic forming of metal products.

**EU2** The student knows the basic machines, devices and tools for the production of metal products

- › 2,0 The student does not have basic knowledge about machines, devices and tools for the production of metal products.
- › 3,0 The student has some knowledge of machines, devices and tools for the production of metal products.
- › 3,5 Student knows almost about the machines, devices and tools used to manufacture metal products.
- › 4,0 The student knows well the machines, devices and tools for the production of metal products.
- › 4,5 The student knows almost the machines, devices and tools used to manufacture metal products.
- › 5,0 The student knows the machines, devices and tools for the production of metal products very well.

**EU3** The student is able to use the basic knowledge in the field of technological processes used in the production of metal products to design the finished product.

- › 2,0 The student is not able to use the knowledge of technological processes used in the production of metal products to design a finished product.
- › 3,0 The student is able to partially use the basic knowledge of technological processes used in the production of metal products to design a finished product.
- › 3,5 The student can almost use the basic knowledge of the technological processes used in the production of metal products to design the finished product.
- › 4,0 The student is able to use the basic knowledge in the field of technological processes used in the production of metal products to prepare the finished product design.
- › 4,5 The student is able to use the basic knowledge in the field of technological processes used in the production of metal products almost very well to perform the design of the finished product.
- › 5,0 Student to make good use of the basic knowledge in the field of technological processes used in the production of metal products to design the finished product.