COURSE DESCRIPTION CARD - SYLLABUS

Course name

Historia nauk chemicznych i przemysłu chemicznego (History of chemistry and chemical industry)

Course

Field of study	Year/Semester
Technologia chemiczna (Chemical Technology)	II/3
Area of study (specialization)	Profile of study
Elektrochemia techniczna (Technical Electrochemistry)	general academic
Level of study	Course offered in
Second-cycle studies	Polish
Form of study	Requirements
full-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
30	0	0
Tutorials	Projects/seminars	
0	0	

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Faculty of Chemical Technology

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Responsible for the course/lecturer:

Prerequisites

The student has the knowledge, skills and social competences resulting from completing a full course of first-cycle studies in the field of Chemical Technology (or in other related fields of technical studies), in particular:

Knowledge:

W1) Has general knowledge about the current state of chemistry as a field of science, both in theoretical (current ideas, applicable laws, major research directions) and practical (current state and development trends in the chemical industry)

Skills:

U1) Is able to indicate the directions and areas of theoretical knowledge in the field of chemical sciences that are of priority importance for the development of the most important branches of chemical production (both on a national and global scale)

Social competences:

K1) Is aware of the necessity and the benefits of continuous learning and raising the level of their knowledge

K2) Demonstrates constant interest in the development trends of chemical sciences and the pace and scope of implementation of their achievements by chemical industry; is aware of the key importance of proper interactions between science and industry and is focused on actively supporting activities that build and improve these interactions

Course objective

Lectures will enrich students' knowledge about issues related to the history of chemistry from prehistoric times to the present day. The changeability over the time of basic chemical ideas, will be presented, with a parallel presentation (in chronological order) of raising ideas (theoretical solutions) and chemical practice (technical, technological, industrial solutions) to an ever higher level along with the increase of the civilization-level of humanity. This approach should give students the opportunity to trace the development of chemistry and the chemical industry in historical terms, but also the opportunity to quantify the extent of changes and the related continuous increase in the importance of chemical activities in the lives of societies. In the classes will be present, among others the most important theories regarding the structure of matter, including the history of the relationship between physics and chemistry. The contribution of Polish scientists to the development of chemistry will also be taken into account. An important effect of students' participation in classes will be also forming beliefs in them, that the knowledge of the development of a given scientific discipline in historical terms (in this case chemistry) is conducive to more effective assimilation of rapidly growing the new knowledge in this discipline

Course-related learning outcomes

Knowledge

1. The student knows the issues of the development of Polish and global chemical thought (chemical ideas) over the centuries (K_W02, K_W06, K_W14)

2. Has structured, well-grounded and theoretically founded knowledge at a general level on practical aspects of the history of chemistry and directions of development of the chemical industry in Poland and in the world (K_W02, K_W06, K_W14)

3. Knows the most important representatives of various fields of chemistry and the chemical industry (on a national and international scale) and their contribution to the development of chemistry/chemical production (K_W02, K_W06, K_W14)

Skills

1. The student is able to conduct discussions on topics related to the history (development) of chemistry - he properly argues and is able to underpin with appropriate examples his theses and opinions (K_U01, K_U04, K_U17)

2. Is able to explain the sense of the main concepts appearing at various stages of chemistry development and their impact on the development of this science discipline (K_U11, K_U15, K_U17)

3. Is able to compare the historical and the contemporary state of chemistry as a science (K_U17)

4. Is able to organize and interrelate basic facts related to the development of chemistry (K_U11, K_U17)

5. Sees the environmental, economic and social consequences of the development of chemistry and the chemical industry and the risks and threats associated with it (K_U12, K_U13, K_U20)

Social competences

1. The student understands the need to provide the public with information on the development of chemistry and the chemical industry and is able to convey such information in a commonly understandable way (K_K07)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The form of the final verification of learning outcomes/obtaining the grade from the subject, is chosen by students during the first class in the semester. Three possible variants to choose from, are: 1) independent preparation of a paper on a topic given by the teacher (a different topic for each student); 2) final colloquium, consisting of 4-8 open-ended problem questions of varying degrees of difficulty (various points); 3) final test, consisting of about 30-40 single-choice test questions, equally scored with varying degrees of difficulty (variously scored). In the case of a final colloquium or test, passing credit: 50% of the total points. As the final grade from the subject will be accepted the grade issued for the prepared paper, or the grade from the final colloquium or final test, issued on the basis of the number of points obtained. Ratings are issued using the scale of grades in force at Poznan University of Technology

Programme content

Lecture:

1. The period of "dark magic" (prehistory to the beginning of Christianity): the discovery of fire; primitive art; pottery; metallurgy (copper, bronze, iron); beginnings of exploitation of natural resources (metal ores, pigments); ancient atomic views of Greek philosophers

2. The period of alchemy (from the beginning of Christianity to the mid-seventeenth century): the search for the "philosopher's stone", the flourishing of Arabic alchemy (from the eighth century) and European alchemy (from tenth to seventeenth century); practical and speculative face of alchemy; beginning of the 13th century - retreat from the idea of the "philosopher's stone"; Roger Bacon, Albertus Magnus and Raymond Lully - the slogan for searching for new utility products (discovering new elements, chemical compounds, development of apparatus); Theophrastus Bombastus and the beginning of iatrochemistry; the life and activities of Avicenna (father of medicine and pharmacy) and Agricola (the beginnings of modern metallurgy); Robert Boyle - abandonment of alchemical ideas ("The Skeptical Chymist")

3. The period of traditional chemistry (from the mid-seventeenth century to the first half of the nineteenth century): the "mysterious" combustion process - the phlogiston theory (Johann Joachim Becher and Georg Ernst Stahl); Joseph Priestley and the discovery of oxygen (the fall of the phlogiston theory); Antoine Lavoisier and a new theory of the combustion process; foundations for the development of organic chemistry (August Kekule)

4. The period of modern (or atomic) chemistry (from the first half of the 19th century): John Dalton and his atomic theory; Amedeo Avogadro; chemistry as a science - new methods as a tool to experimentally test the theory; basic chemical laws; Newlands, Cannizzaro, de Chancourtois and systematics of chemical elements; Dmitri Mendeleev and the periodic table of elements - chemistry as an exact science (the beginning of theoretical chemistry); Jacobus van't Hoff and the development of physical chemistry; Henri Becquerel, Maria Skłodowska-Curie and Piotr Curie - radioactivity (isotopes) and the birth of nuclear chemistry; Joseph Thompson, Ernest Rutherford and Niels Bohr - structure of the atom (finalization of modern atomic theory); quantum mechanics and a new stage in the development of all branches of chemistry

5. Chemistry and chemical production in Poland: prehistoric times; alchemy in Poland - Michał Sędziwój; Jędrzej Śniadecki - dissemination of modern chemical ideas; The Main Crown School - the beginnings and history of chemistry at the Jagiellonian University; chemistry in other Polish academic centers (Vilnius, Lviv/Wroclaw, Warsaw, Poznan); Włodzimierz Hubicki and Eugeniusz Kwiatkowski - Polish chemical historiography; chemical scientific societies (international and national)

6. Selected issues: the impact of alchemy and chemistry on the development of civilization; beginnings of chemical production (chemical industry); stereochemistry and coordination chemistry; solution chemistry and electrochemistry; polymer chemistry; thermochemistry; food chemistry; development of industrial chemical synthesis; petrochemistry; nuclear chemistry and nuclear energy; chemical weapon; development and transformation of the chemical industry in the second half of the 20th century - chemical corporations and globalization of chemical production; toxicology, environmental protection and green chemistry

Teaching methods

Wykład prowadzony jest w oparciu o prezentacje multimedialne zawierające odpowiednie przykłady; jako uzupełnienie przedstawiane są przykłady dodatkowe na tablicy, z odpowiednimi objaśnieniami

Bibliography

Basic

1. W.H. Brock, Historia chemii, Wydawnictwo Prószyński, Warszawa 1999

2. E. Scerri, Układ Okresowy: historia i znaczenie, Wydawnictwo Politechniki Wrocławskiej, Wrocław 2013

3. A. Sztejnberg, W zwierciadle historii chemii, Oficyna Wydawnicza Impuls, Kraków 2016

3. J. Sikora, Z historii chemii…, Nasza Księgarnia, Warszawa 1977

4. W. Hubicki, Z dziejów chemii i alchemii, WNT, Warszawa 1991

5. B. Bryson, Krótka historia prawie wszystkiego, Wydawnictwo Zysk i S-ka, Poznań 2009

6. I. Asimow, Krótka historia chemii, PWN, Warszawa 1970

7. W. Lampe, Zarys historii chemii w Polsce, PAU, Kraków 1948

8. H.E. Fierz-David, Historia rozwoju chemii, PWN, Warszawa 1958

9. W. Bergandy, Od alchemii do chemii kwantowej, Wydawnictwo UAM, Poznań 2000

10. R. Mierzecki, Historyczny rozwój pojęć chemicznych, PWN, Warszawa 1987

11. Z. Ruziewicz, Studia nad historią chemii w Polsce, Wydawnictwo TINTA, Wrocław 1998

12. E. Kwiatkowski, Dzieje chemii i przemysłu chemicznego, WNT, Warszawa 1962

13. W.I. Kuzniecow, Podstawowe prawa chemii. Ewolucja poglądów, PWN, Warszawa 1967

14. R.T. Prinke, Zwodniczy ogród błędów. Piśmiennictwo alchemiczne do końca XVIII wieku, Wydawnictwo IHN PAN, Warszawa 2014

15. A. Łukasik, Atom. Od greckiej filozofii przyrody do nauki współczesnej, Wydawnictwo UMCS, Lublin 2001

Additional

1. T. Gray, Wielka księga pierwiastków, z których zbudowany jest Wszechświat, Wydawnictwo Bellona, Warszawa 2011

2. M. Eliade, Kowale i alchemicy, Wydawnictwo Aletheia, Warszawa 2007

3. T. Pogwizd, M. Mendychowski, Maria Curie i córki. Listy, Wydawnictwo Dolnośląskie, Wrocław 2011

4. S. Emling, Maria Skłodowska-Curie i jej córki, Wydawnictwo Muza S.A., Warszawa 2013

5. E. Curie, Maria Curie, PWN, Warszawa 1997

6. A.K. Wróblewski, Historia fizyki, PWN, Warszawa 2011

7. J. Balchin, 100 uczonych, odkrywców i wynalazców, którzy zmienili świat, Świat Książki, Warszawa 2006

8. I.Z. Siemion, Wilno chemiczne do połowy XIX stulecia, Wydawnictwo Retro-Art. S.C., Warszawa 2009

9. R. Mierzecki, Antoine Laurent de Lavoisier (1743-1794). Geniusz Skojarzeń, Wydawnictwo Retro-Art. S.C., Warszawa 2008

10. J. Barner, Chemia filozoficzna, Wydawnictwo Aspra, Warszawa 2012

11. R. Rembielinski, B. Kuznicka, Historia farmacji, PZWL, Warszawa 1972

12. W. Wawrzyczek, Twórcy chemii, PWN, Warszawa 1959

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	1,6
Student's own work (literature studies as an element of preparation for current lectures, preparation for the final colloquium/test or writing a paper on a given topic) [1]	35	1,4

[1] delete or add other activities as appropriate