

STUDY GUIDE

METAL PROCESS ENGINEERING

Organised by
University of Mons (UMONS)



1. IDENTIFYING DATA.	
· Course Name.	<i>Metal process engineering</i>
· Coordinating University.	<i>UMONS</i>
· Partner University(ies) Involved.	-
· Course Field(s).	<i>Engineering</i>
· Related Study Programme.	<i>Master in Engineering in Chemistry and Materials Science</i>
· Course Code.	<i>I-META-002</i>
· ISCED Code.	<i>7</i>
· SDG.	<i>9- 12</i>
· Study Level.	<i>M</i>

· Number of ECTS credits allocated.	<i>3</i>
· Mode of Delivery.	<i>Online synchronous</i>
· Language of Instruction.	<i>English</i>
· Delivery Period.	<i>Second semester</i>
· Course Dates.	<i>FEV-7-2023 to MAY – 11 - 2023</i>
· Precise Schedule of the Lectures.	<p><i>· Precise Schedule of the Lectures.</i></p> <p><i>Time zone : Belgium</i></p> <p><i>Tuesday 7th February 2023</i></p> <p><i>13h30 - 15h30</i></p> <p><i>15h45 - 17h45</i></p> <p><i>Thursday 9 February 2023 13h30 - 15h30</i></p> <p><i>Tuesday 14 February 2023 13h30 - 15h30</i></p> <p><i>Thursday 16 February 2023 13h30 - 15h30</i></p> <p><i>Tuesday 21 February 2023 13h30 - 15h30</i></p>





	<p><i>Thursday 23 February 2023 13h30 - 15h30</i></p> <p><i>Tuesday 28 February 2023 13h30 - 15h30</i></p> <p><i>Thursday 02 March 2023 13h30 - 15h30</i></p> <p><i>Thursday 09 March 2023 13h30 - 15h30</i></p> <p><i>Thursday 16 March 2023 13h30 - 15h30</i></p> <p><i>Thursday 20 April 2023 13h30 - 15h30</i></p> <p><i>Thursday 27 April 2023 13h30 - 15h30</i></p> <p><i>Thursday 04 May 2023 13h30 - 15h30</i></p> <p><i>Thursday 11 May 2023 13h30 - 15h30</i></p>
· Key Words.	<i>Metallurgy, Processes, Production of metals</i>
· Catchy Phrase.	<i>What are the processes and technologies used to make the metals essential to our daily lives? Do they use a lot of energy and resources?</i>
· Link to Course Guide.	Metal process engineering (umons.ac.be)

· Prerequisites and co-requisites.	<i>Knowledge of chemical thermodynamics, materials thermodynamics, mineral chemistry, electrochemistry. B-level in English</i>
· Number of EUNICE students that can attend the Course.	20
· Course inscription procedure(s).	<i>Registration through EUNICE website</i>

2. CONTACT DETAILS.

· Department.	<i>Metallurgy Lab (Chemistry and Materials Science)</i>
· Name of Lecturer.	<i>Véronique Vitry</i>
· E-mail.	<i>Veronique.vitry@umons.ac.be</i>
· Office.	<i>Site Epargne, B4, 1st floor.</i>
· Other Lecturers.	-

3. COURSE CONTENT.





Thermodynamic study of steelmaking and non-ferrous production processes; Phenomenological study of steelmaking: oxygen steelmaking and refining of steel (including stainless steel), steel recycling with EAF furnace, Non-ferrous metal production processes: copper, zinc, magnesium, titanium, molybdenum, zirconium ... Theoretical and phenomenological study of metal solidification, including continuous casting; Metallurgical phenomena occurring during hot and cold rolling; Products quality; Environmental aspects.

4. LEARNING OUTCOMES.

Justification of the chosen extraction processes for various metals and comprehension of the industrial processes used therefor. The main objective is to allow students to understand the link between the operating conditions and the necessary thermodynamic conditions. The students will also be aware of the energy needs and environmental impact of metal processing.

5. OBJECTIVES.

Identify complex problems and develop specifications including needs, context and technical, economical, environmental and societal aspects.

Master and apply in a relevant way knowledge, models, methods and techniques relating to the physics, chemistry and mechanics of materials to the development, implementation, eco-responsible exploitation of materials to the behavior of materials in a given context. to a rational approach material selection and innovation

Analyze and model a problem by critically selecting theories and methodological approaches (modeling, calculations), including taking into account multidisciplinary aspects.

Demonstrate openness and critical thinking by comparing technical aspects and non-technical issues of the problems analyzed and the solutions proposed.

Use the various means available to document and train independently.

6. COURSE ORGANISATION.

UNITS

1.	<i>Thermodynamic and phenomenological study of steelmaking: oxygen steelmaking and refining of steel (including stainless steel), steel recycling with EAF furnace</i>
2.	<i>Non-ferrous metal production processes: copper, zinc, magnesium, titanium, molybdenum, zirconium ...</i>
3.	<i>Theoretical and phenomenological study of metal solidification, including continuous casting</i>





4.	<i>Metallurgical phenomena occurring during hot and cold rolling; Products quality; Environmental aspects.</i>
LEARNING RESOURCES AND TOOLS.	
<i>Slides and presentation on Moodle Specific vocabulary learning activity on Memrise Video illustrations for some processes and phenomena 'refresher slide deck' on prerequisites</i>	
PLANNED LEARNING ACTIVITIES AND TEACHING METHODS.	
<i>Lecture with active participation of students</i>	

7. ASSESSMENT METHODS AND CRITERIA.	
<i>Written essay on a specific topic related to the class content and oral discussion of the essay (online)</i>	
OBSERVATIONS.	
<p>The students will be selected according to the following criteria (in order of importance):</p> <ul style="list-style-type: none"> - Balanced representation of EUNICE partners - Mastery of the pre-requisite by students - Order of inscription 	

8. BIBLIOGRAPHY AND TEACHING MATERIALS.	
<i>No required literature</i>	
<i>Recommended literature:</i>	
<p>R.J. Fruehan - 1998 - The Making, Shaping and Treating of steel - Pittsburgh - The AISE Steel Foundation. R. Rumbu - 2015 - Non-Ferrous Extractive Metallurgy - Industrial Practices - CreateSpace Independent Publishing Platform R. Rumbu - 2017 - Refractory Metals Extractive Metallurgy: Titanium-Zirconium-Tungsten Molybdenum-Vanadium-Rhenium - CreateSpace Independent Publishing Platform R. Rumbu - 2019- Steelmaking Overview - CreateSpace Independent Publishing Platform</p>	

