| Course Outline Model (Syllabus) | | |
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| **Faculty:** | Geoscinces | |
| **Name of study program:** | Faculty of Geoscinces | |
| **Department:** | Materials and Metallurgy | |
| **Level:** | Master | |
| **The code of subject:** | 2 | |
| **Subject:** | Metallurgical industrial furnaces | |
| **Subject Status:** | M | |
| **Semester:** | I | |
| **Total hours:** | 3+2 | Winter |
| **ECTS:** | 7 | |
| **Schedule / Hall** | | |
| **Academic year:** | | |
| **Professor:** | Nurten Deva | Assistants: |
| | | |
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| **BRIEF CONTENT OF SUBJECT** | This course enable the student to acquire a fundamntal knowledges about the importance of the metallurgical furnace for individual technological processes in the manufacture, processing and heat treatment, furnace elements, the fundamentss of dimensioning and the selection of the furnace, and learn about their structure and the importance of accompanying devices and equipment for optimal management of the technological process. The course contains variety topics related the types of metallurgical furnaces metallic , characteristics, usage, chronology flow of materials in cycle of metallurgy production in furnace . |
| **AIMS** | The course aims is to provide students with the basic information about the types of furnaces in metallurgy which are used in metallurgy, as well as their constructive, technological and thermal characteristics, and their importancy in relation with other processes in metallurgy.Students has oppurtinity to gain informations about the devices for heating of metal materials.This course enable students to understand the processes for semi and final products obtaining , and valorization of scrap and byproducts . Furthermore, this is a course that encourages the student to apply the knowledge gained in practical work. |

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| **EXPECTED LEARNING OUTCOMES** | By the end of the module, students should be able to:<br><br>1. Analyze and identify problems in the work of the industrial furnace and propose technical solutions;<br>2. Determine computationally the profile and dimensions of the furnace space.<br>3. Calculate the individual periods and regimes of heating of metal materials.<br>4. Analyze and propose solutions for increasing the energy efficiency of a furnace.<br>5. Analyze and propose solutions for reducing emissions of pollutants into the environment.<br>6. Plan and manage metallurgical processes.<br>7. Analyse the material and thermal balance of metallurgical processes and formulate and suggest measures for increasing energy efficiency | |
| **PROGRAM** | **Weeks** | Topic and Readings |
| | **Week - I** | Introductions to the course, syllabus reading<br>General information about the requirements that the furnace should satisfy<br>Furnaces of process industries. Furnaces of manufacturing industry. Classification of furnaces and individual features. Structural elements of the furnace. |
| | **Week - II** | Blast furnaces. The structural elements of the blast furnace. |
| | **Week - III** | Cupola furnaces. The structural elements of cupola furnaces. |
| | **Week - IV** | Converters. The structural elements of converters; |
| | **Week - V** | Electric arc furnaces. The structural elements of arc furnace ; |
| | **Week - VI** | Induction electric furnace. High-frequency electric furnace. Electric resistance furnace. Furnaces with electron beam. Furnaces with plasma jet |
| | **Week - VII** | Movable and immovable mixers. Construction of mixers. Mixer supplied with burners. Lining of mixers and their use. |
| | **Week - VIII** | Furnaces of manufacturing industry; |
| | **Week - IX** | Temperature and thermal regime of furnace. Constructional characteristics ; Arrangement of burners, heat exchangers and of their installation. |
| | **Week - X** | Walking-beam furnaces and their development. Constructional characteristics; The possibility of changing of dimensions and shape of the load. Thermaltechnical zones of furnace and their conditionality. |
| | **Week - XI** | Rotary hearth furnaces for rolling mills of seamless pipes. Plate and ring furnaces. Thermal-technical zones of furnaces and their conditionality. Temperature and thermal regime of furnace. |
| | **Week - XII** | Blast furnaces ; |
| | **Week - XIII** | Conveyor furnaces. Construction of conveyor and place its installation. |
| | **Week - XIV** | Students presentations, The second colloquium . |
| | **Week - XV** | Video film about metallurgy furnaces from early stage up to nowdays; |

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| **LITERATURE** | Basic literature used in the course:<br>1. M.Rizaj, N.Deva Furrat Metalurgjike, Ligjerata te autorizuara, Prishtine, 2014<br>2 P. Mullinger, B. Jenkins Industrial and process furnaces:principles, design and operation, 2008, Burlington, USA<br>3 W.S.Jana, Engineering Heat Transfer, second edition, CRS Press LLC, Florida , USA, 2000. |
| **TEACHING METHODOLOGY** | Each class will consist of a combination of theoretical lectures , practical lectures in laboratory ineractive discussions in the classroom, seminar paper.<br>We will try to invite experts from different areas of the metallurgy to give a lecture on the relevant topics , followed by questions and answers.<br>**Delivery tools/ IT tools**<br>Teaching will take place in the classroom and laboratories through lectures, practical assignments, individual and group interpretations, periodic self-assessments, etc.<br>**The ratio between the theoretical and practical part of the study**<br>Theoretically, general scientific knowledge based on contemporary literature will be provided. The practical part will mainly be realized through concrete examples from the literature and practical knowledge of private and public production enterprise. The relationship between the theoretical and the practical part is given in the tabular part of the study program. Theory-practical ratio **:** 50% theory and 50% practice / case study / seminar paper. |

**Contribution to student workload (which should correspond to student learning outcomes 1 ECTS credit = 25 hours)**

| Activity | Hours | Day/Week | Total |
|---|---|---|---|
| Lectures | 3 | 15 | 45 |
| Exercise sessions - theoretical | 2 | 15 | 30 |
| Field exercises | 3 | 5 | 15 |
| Practical work | 3 | 5 | 15 |
| Consultation with the professor / assistant | 1 | 5 | 5 |
| Colloquiums / seminars | 2.5 | 2 | 5 |
| Independent tasks (work) | 1 | 10 | 10 |
| Student self study time (in library or at home) | 1 | 20 | 20 |
| Final exam preparation | 1 | 10 | 10 |
| Time spent in assessment (tests, quizzes, final exams) | 1 | 15 | 15 |
| Projects, presentations, etc. | 1 | 10 | 10 |
| **Total** | | | **175** |

**EVALUATION**

| Evaluation methods [according to the Statute and Regulation of UMIB Studies] | |
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| Tests | 2*20% = 40 % |
| Practical test during exercises | 15% |
| Seminary work (in word) | 10% |
| Interpretation and presentation of seminary work | 10% |
| Tasks and essays during the semester | 5% |
| Final exam | 20% |

**ACADEMIC POLICIES**

**Further guidance:**

- **Working with computer**

Written papers must be written in computerised form, and is obligatory to respect the criteria required during the written work.

- **Ethics in learning**

All students tasks should be the student's work, and therefore is not allowed copying from each other work .

- **Deadlines**

The deadlines will be set in agreement with the students, and therefore student absence to class when the task is explained does not justify the student for not submitting the paper. The student has the right to request consultation with the professor whenever he/she needed help for the performance of his / her work.

- **Rules of conduct and academic policies:**

o student's active participation in lectures
o participation in discussions, comments and free expression of academic opinion, opinion and attitude (with arguments)
o mandatory independent work and the use of additional sources of information (various scientific websites, scientific journals, conference proceedings etc.)
o silent cell phones during the lectures