Course Outline Model (Syllabus)		
Faculty:	Geoscinces	
Name of study program:	Materials and Metallurgy	
Department:	Specialization -Metallurgy	
Level:	Bachelor	
The code of subject:	3	
Subject:	Electro and hydrometallurgy	
Subject Status:	Compulsory	(Compulsory or Elective)
Semester:	VI Summer	(Winter / Summer)
Total hours:	2+2	(According to approved programe)
ECTS:	5 ECTS	(According to approved programe)
Schedule / Hall		
Academic year:		
Professor:	Afrim Osmani	
Assistants:		
Contacts:	Professor	Assistant
Email:	Afrim.osmani@umib.net	
Telefon:		

BRIEF CONTENT OF SUBJECT	This course teaches students the basics of electro-hydrometallurgical processes. The course contains various topics related to electro-hydrometallurgical processes, their importance, characteristics, use, chronological flow of processes in the production cycle in metallurgy. In particular the course focuses on the processes to obtain semi-finished or finished products through these technologies, the improvement and continuous development of processes, their application, monitoring and control.
AIMS	The course aims is to provide students the basic information (competencies):about the theoretical and practical knowledge from the technological processes of obtaining and refining of metals from solutions and melts using electric current. To gain knowledge of the principles and procedures for water treatment of ores concentrates and extraction of metals from aqueous solutions.Furthermore, this is a course that encourages the student to apply the knowledge gained in practical work.

<table>
<tr><td>EXPECTED LEARNING OUTCOMES</td><td colspan="2">By the end of the module, students should be able to:
1. Why are important electro-hydro metallurgy in metallurgy engineering ;
2. Define basic theoretical knowledge that enable them to continue studying electro-hydrometallurgy .
3. Demostarte that they have mastered the basic skills for the practical application of existing technologies of the electrometallurgy.
4. Explain the theoretical basis of hydrometallurgy.
5. Classify the leaching of mineral raw materials. Appraise hydrometallurgical technologies.
6. Make use of purification and concentration of leaching solutions.
7. Demosntarte abbility to supervise the efficient extraction and refining of metals from ores, making use of hydrometallurgical processes in a metallurgical plant.</td></tr>
<tr><td rowspan="15">PROGRAM</td><td>Weeks</td><td>Topic and Readings</td></tr>
<tr><td>Week - I</td><td>Introductions to the course, syllabus reading;
Electrometallurgy-fundamental terms, definition ;</td></tr>
<tr><td>Week - II</td><td>Theoretical basis of electrometallurgy;</td></tr>
<tr><td>Week - III</td><td>Faraday Laws, Electrolysis and Polarization;</td></tr>
<tr><td>Week - IV</td><td>Equilibrium potential, Mechanism of electrochemical reaction;</td></tr>
<tr><td>Week - V</td><td>Electrochemical kinetics, Diffusion kinetics, Crystallization kinetics,</td></tr>
<tr><td>Week - VI</td><td>Anode processes, Cathode processes, Current utilization in electrolysis;</td></tr>
<tr><td>Week - VII</td><td>The first colloquium;</td></tr>
<tr><td>Week - VIII</td><td>Electrolysis in aqueous solutions, Electrorefining of copper; electro-refining of silver and gold;</td></tr>
<tr><td>Week - IX</td><td>Zinc , lead , nickel and cadmium electrolysis</td></tr>
<tr><td>Week - X</td><td>Theoretical basis of hydrorometallurgy , Leaching - theoretical basis, types of leaching, practice and devices for leaching</td></tr>
<tr><td>Week - XI</td><td>Separation of liquid and solid phase - thickening, filtering, apparatus and devices for
filtering;</td></tr>
<tr><td>Week - XII</td><td>Separation of metal compounds from the solution - crystallization of salts, precipitation by hydrolysis, precipitation by reagents;</td></tr>
<tr><td>Week - XIII</td><td>Extraction of metals from the solution - cementation, electrolysis;
Nxjerrja e metaleve nga tretësira - çimentimi, elektroliza;</td></tr>
<tr><td>Week - XIV</td><td>Students presentations, The second colloquium .</td></tr>
</table>

	Week - XV	Video film about the core of lesson learned- elaborated ;
LITERATURE	Basic literature used in the course: 1. N.Deva ,Ligjerate interne , 2020 2. K. I. Popov, B. N. Grgur, OSNOVI ELEKTROMETALURGIJE, Tehnološko-metalurški fakultet, Beograd, 2002, udžbenik (Original title) 3. Хидрометалургија, интерна скрипта П. Пауновиќ, Технолошко- металуршки факултет, Скопје-2011 4. Modern electrochemistry, John O'M. Bockris, 5. Fundamental aspects of electrometallurgy , Konstantin Popov;	
TEACHING METHODOLOGY	Each class will consist of a combination of short lectures , ineractive discussions in the classroom, We will try to invite speakers from different areas of the business to give a lecture on the relevant topics of the day on operations strategy, followed by questions and answers. **Delivery tools/ IT tools** Teaching will take place in the classroom and laboratories through lectures, practical assignments, individual and group interpretations, periodic self-assessments, etc. **The ratio between the theoretical and practical part of the study** 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			
Consultation with the professor / assistant	1	6	6
Colloquiums / seminars	1	2	2
Independent tasks (work)	1	5	5
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	12	12
Projects, presentations, etc.	1	10	10
Total			**150**

EVALUATION

Evaluation methods [according to the Statute and Regulation of UMIB Studies]	
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 and if they hace the same or similar works will have negative ratings on the student's final grade.

- **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 needed and necessary 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 adherence to lecture schedules without prejudice to academic freedom (silent cell phones)