**MINING ENGINEERING MSc PROGRAMME**

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| **First Year** | | | | | | |
| **I. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501011101 | [THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS](#EN39) | 7.5 | 3+0 | 3 | **C** | Turkish |
| 503602505 | [MINING STATISTICS](#EN1) | 7.5 | 3+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-2 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Total of I. Semester | 30 |  | 12 |  |  |
| **II. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
|  | Elective Course-3 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-5 | 7.5 | 3+0 | 3 | E | Turkish |
| 503602001 | Seminar | 7.5 | 0+1 | - | **C** | Turkish |
|  | Total of II. Semester | 30 |  | 9 |  |  |
|  | TOTAL OF FIRST YEAR | 60 |  | 21 |  |  |

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| **Second Year** | | | | | | | | |
| **III. Semester** | | | | | | | | | |
| Code | Course Title | | ECTS | | T+P | Credit | C/E | Language |
| 503601702 | MSc THESIS STUDY | | 25 | | 0+1 | - | **C** | Turkish |
| 503601703 | SPECIALIZATION FIELD COURSE | | 5 | | 3+0 | - | **C** | Turkish |
|  | | Total of III. Semester | 30 |  | |  |  |  | |
| **IV. Semester** | | | | | | | | | |
| Code | | Course Title | ECTS | T+P | | Credit | C/E | Language | |
| 503601702 | | MSc THESIS STUDY | 25 | 0+1 | | - | **C** | Turkish | |
| 503601703 | | SPECIALIZATION FIELD COURSE | 5 | 3+0 | | - | **C** | Turkish | |
|  | | Total of IV. Semester | 30 |  | |  |  |  | |
|  | | TOTAL OF SECOND YEAR | 60 |  | |  |  |  | |

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| **Elective Courses** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 503601501 | [ADVANCED HYDROMETALLURGY](#EN2) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601504 | [ADVANCED SOLID LIQUID SEPARATION](#EN4) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602507 | [AGGLOMERATION IN SUSPENSIONS](#EN16) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601511 | [AUXILIARY VENTILATION](#EN11) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601510 | [COAL PREPARATION](#EN10) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602506 | [COLUMN FLOTATION](#EN15) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602510 | [DRILLING AND BLASTING DESIGN FOR UNDERGROUND STRUCTURE](#EN19) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602517 | [ENVIRONMENTAL EFFECTS ON NATURAL BUILDING STONES](#EN25) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601505 | [EVALUATION OF MINERAL PROCESSING WASTES](#EN5) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602515 | [FIELD STRESSES](#EN23) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601502 | [FLOTATION CHEMISTRY](#EN3) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602501 | [FUZZY LOGIC APPLICATIONS IN MINING](#EN13) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602514 | [GRINDING KINETICS](#EN22) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601509 | [INSTRUMENTAL ANALYSIS IN MINERAL PROCESSING I](#EN9) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602509 | [INSTRUMENTAL ANALYSIS IN MINERAL PROCESSING II](#EN18) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602502 | [MAGNETIC SEPARATION](#EN14) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601507 | [MINERAL AND COAL FLOTATION CIRCUIS](#EN7) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602520 | [MODELLING AND SIMILATION APPLICATIONS IN MINERAL PROCESSING](#EN43) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602516 | [MODELLING OF AIR QUALITY IN UNDERGROUND MINES](#EN24) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601506 | [NUMERICAL METHODS IN ROCK MECHANICS](#EN6) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602504 | [OPEN PIT MINES PRODUCTION PLANNING](#EN40) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602513 | [OPTIMIZATION APPLICATIONS IN MINING](#EN21) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602508 | [PARTICLE SIZE ANALYSIS](#EN17) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601514 | [PARTICLE TECHNOLOGY](#EN12) | 7.5 | 3+0 | 3 | E | Turkish |
| 503601508 | [QUALITY CONTROL IN MINING](#EN8) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602518 | [RESPONSE SURFACE METHODS IN MINERAL PROCESSING](#EN26) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602519 | [Rheology of Mineral Suspensions](#EN42) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602521 | [Systematic Analysis, Modeling and Simulation of Ore Beneficiation Plants](#EN41) | 7.5 | 3+0 | 3 | E | Turkish |
| 503602511 | [TAILING MANAGEMENT IN MINING INDUSTRY](#EN20) | 7.5 | 3+0 | 3 | E | Turkish |

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**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602505 | **TITLE** | Mining Statistics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 3 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Statistical concepts; distribution models; confidence interval estimates; hypothesis tests, regression and correlation analysis. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce the statistical calculations used in mining operations | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Increased knowledge on statistical application for Mining Industry. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge of statistical methods  Edit numeric data  By selecting the appropriate method to calculate  Be able to analyze the problems  Decision-making with the help of calculations | | | | | | | |
| **TEXTBOOK** | | | | | Konuk, A. ve Önder,S. 2006, Maden İstatistiği, Osmangazi Üniversitesi Müh.Mim.Fak. Maden Mühendisliği Bölümü | | | | | | | |
| **OTHER REFERENCES** | | | | | All statistic books | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Statistical concepts |
| 2 | Statistical concepts |
| 3 | Distribution models |
| 4 | Distribution models |
| 5 | Confidence interval estimates |
| 6 | Midterm Examination 1 |
| 7 | Confidence interval estimates |
| 8 | Hypothesis tests |
| 9 | Hypothesis tests |
| 10 | Regression and correlation analysis |
| 11 | Midterm Examination 2 |
| 12 | Regression and correlation analysis |
| 13 | Application in mining |
| 14 | Application in mining |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr.Seyhan ÖNDER | **Date:** | | 13.05.2015 | | | |

**Signature**:

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**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601501 | **TITLE** | Advanced Hydrometallurgy |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | NON | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Historical progress and necessity of hydrometallurgical precesses. Hydrometallutgical systems; sulpuric acid system, concentrated sulphuric acid system, diluted sulphuric acid+Fe+3 system, Chloride system, ammonia system, bacterial system, cyanide system, kinetics of leaching reactions, kinetics models. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To get necessary knowledg over hydrometalurgy, to grasp necessity of hydrometallugical prcesses, to comprehend the chemistry of hydrometalurgical reactions, to construct Eh-Ph diagrams, to learn kinetic models and to apply them to the hidrometallurgical reactions | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To be able to learn necessary knowledg related to hyrometallurgical processes, to be able to apply a hyrdometallurgical process to minreals and metals, to be able to comprehend chemistry of leaching processes, to understand kinetics of leaching reactions, to be able to drow Eh-Ph diagrams. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Have theoretical and practical knowledge in mireal processing at advanced level  2.Work effectively as an individual, in teams and multidisciplinary setting  3.Develop and evaluate minerals engineering processand project  4.Design and conduct theoretical and experimnnental studies, and analyse and interpret the data generatedfrom these studiies at highly specialized level | | | | | | | |
| **TEXTBOOK** | | | | | 1.Textbook of Hydrometallurgy, HABBASHI, F., Deparment of Mining and Metallurgy, Laval University, Quebec City, Canada, 1993, 2.Rate of Extractive Metallurgy. SHONE, H. Y., WADSWORTH, E. M. Plenum Pres., 1979.3.The Chemistry of Hydrometallurgical Processes. BURKIN, A.R. Translated by UTİNE, T., Maden Mühendisleri Odası, 1988. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Historical progress of hydrometalurgy |
| 2 | Hydrometalurgical processes |
| 3 | Sulphuric asid system; concentrated sulpuric asid system; diluted sulphueric acid+fe+3 system |
| 4 | chloride system; ammonia system |
| 5 | Bacterial system, cyanide system. |
| 6 | Midterm Examination 1 |
| 7 | Kinetics of reactions |
| 8 | Kinetics models |
| 9 | simple kinetic model |
| 10 | Shirinking core model |
| 11 | Midterm Examination 2 |
| 12 | Construction of Eh-Ph diagrams |
| 13 | Using of Eh-Ph diagrams |
| 14 | Usige of Eh-Ph diagrams |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Hüseyin ÖZDAĞ | **Date:** | | 04.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

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**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601502 | **TITLE** | Flotation Chemistry |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to flotation, solid-liquid- gas phases, classification and use of reactives and metalic/industrial minerals flotation properties and applications will be covered. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this course, necessary chemical background for flotation will be given. Bonds, flotation reactives, mineral-air phase interactions will be explained in detail. Flotation industrial application for metallic and some industrial minerals will be covered. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Detailed information will be given about physico-chemisty of flotation and mineral-reactive interactions. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Fundamental knowledge about physico-chemisty on flotation will be introduced. Phase and interface phenomena about mineral-reactive systems will be covered in detail. | | | | | | | |
| **TEXTBOOK** | | | | | M. Kaya, Flotasyon Kimyası Ders Notları, 2011, ESOGÜ. | | | | | | | |
| **OTHER REFERENCES** | | | | | M. Kaya, Froth Flotation Fundamentals, 2012, ESOGÜM.C. Fuerstenau, J.D. Miller and M.C. Kuhn, Chemistry of Flotation, SME-AIME, 1985. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Flotation rules, history, development and application areas |
| 2 | Advantages and disadvantages of flotation, phases in flotation and bonds |
| 3 | Liquid phase, ionization, surface tension, contact angle and water hardness |
| 4 | Gas phases, polar/apolar minerals, natural hydrophobicity |
| 5 | Classification of flotation reactives, ionizing collectors |
| 6 | Midterm Examination 1 |
| 7 | Adsorption and absorption types |
| 8 | Activators and depressants |
| 9 | Frothers and pH requlators |
| 10 | Non-ionizing collectors |
| 11 | Midterm Examination 2 |
| 12 | Flotation application foer sulfide type Cu, Pb and Zn ores |
| 13 | Oxizied and carbonated ores flotation |
| 14 | Industrial minerals flotation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Muammer KAYA | **Date:** | | 11 05 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

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**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601504 | **TITLE** | Advanced Solid Liquid Separation |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | TR |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 2 | | 1 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction, Pre-Treatment of Solid/Liquid Mixtures, Filtration, Rapid Settling Systems, Moderate and Slow Settling Systems, The Clarification of Liquids, Suspensions and Non-Fluid Systems, Ancillaries, Selecting the Right Separation Equipment, Practical Applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The mechanisms of solid/liquid separation, and methods and equipments used in solid/liquid separation are taught to students. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students can work in wastewater treatment plants, mineral processing plants and ceramic factories etc., that use solid/liquid separation technologies after taking this lesson. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Have information about methods and equipments used in solid liquid separation.  Able to analyze settling systems.  Able to comprehend the clarification of liquids.  Able to select the right separation equipment. | | | | | | | |
| **TEXTBOOK** | | | | | PURCHAS, Derek B., 1981, ‘Solid/Liquid Separation Technology’, Uplands Press Publication, England, 705 p. | | | | | | | |
| **OTHER REFERENCES** | | | | | HOŞTEN, Ç., 2002, ‘Cevher Hazırlama ve Zenginleştirme temel İşlemlerinin Tasarımı’, ODTÜ Basım İşbirliği, Ankara, 184 s.İPEKOĞLU, Ü., 1990, ‘Susuzlandırma (Katı-Sıvı Ayırımı) ve Yöntemleri’, Dokuz Eylül Üniversitesi Mühendislik-Mimarlık Fakültesi MM/MAD – 90 EY 196, İzmir, 113 s. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, Pre-Treatment of Solid/Liquid Mixtures |
| 2 | Pre-Treatment of Solid/Liquid Mixtures |
| 3 | Filtration |
| 4 | Rapid Settling Systems |
| 5 | Moderate and Slow Settling Systems |
| 6 | Midterm Examination 1 |
| 7 | The Clarification of Liquids |
| 8 | Suspensions and Non-Fluid Systems |
| 9 | Ancillaries |
| 10 | Selecting the Right Separation Equipment |
| 11 | Midterm Examination 2 |
| 12 | Selecting the Right Separation Equipment |
| 13 | Practical Applications |
| 14 | Practical Applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Yaşar UÇBAŞ | **Date:** | | 08.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601505 | **TITLE** | Evaluation of Mineral Processing Wastes |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Evaluation of boron, chromite, magnesite, coal and other ores wastes. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is possible to evaluate mineral processing wastes with a new technologies developed or as an alternative source of raw materials. The main aim of the course is to teach students newly developed laboratory, pilot and industrial works related to evaluation of mineral processing wastes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn which methods are used for the utilization of mineral processing wastes, and they can select the appropriate method when they may need in their professional life. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Information about how mineral processing wastes are generated and their properties.  Information about the methods used for the evaluation of the mineral processing wastes.  Comprehending the importance of economic and environmental effects of the evaluation of mineral processing wastes.  Comprehending and evaluation of the works performed on mineral processing waste evaluation.  Information about the applications towards the solution of mineral processing waste evaluation problems encountered throughout their career. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Proceedings of the International and Local Mineral Processing, Coal and Industrial Minerals Symposiums.2. Reports published by Eti Holding, BOREN, TKI and DPT. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Evaluation of mineral processing wastes - introduction |
| 2 | Evaluation of boron wastes. |
| 3 | Evaluation of boron wastes. |
| 4 | Evaluation of chromite wastes. |
| 5 | Evaluation of chromite wastes. |
| 6 | Midterm Examination 1 |
| 7 | Evaluation of magnesite wastes. |
| 8 | Evaluation of magnesite wastes. |
| 9 | Evaluation of coal wastes. |
| 10 | Evaluation of coal wastes.Evaluation of other ores wastes. |
| 11 | Midterm Examination 2 |
| 12 | Evaluation of other ores wastes. |
| 13 | Evaluation of other ores wastes. |
| 14 | Presentations. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Ender Sönmez | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601506 | **TITLE** | Numerical Methods in Rock Mechanics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 3 | COMPULSORY  (   ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1. Introduction, 2.Numerical Methods, 3.Numerical Methods in rock mechanics, 4. FEM, 5. 1D - FEM and analysis, 6. 2D-FEM and analysis, 7. Computer Programs, modeling techniques and data sets, 8. Other Numerical techniques | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Historical Development of numerical methods, importance of numerical methods in rock mechanics, Finite Element Method, 1D and 2D Finite Element Method, Computer programming techniques An application on a software FEM program, Other numerical methods in rock mechanics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To teach mathematics application in rock mechanics, computer applications, effective and safety underground structures by using numerical techniques. A student can design and analysis an underground structure by using numerical techniques. | | | | | | | |
| **TEXTBOOK** | | | | | 1) J.N. Reddy, An Introduction to finite element methods,2) Course notes from instructor | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) G. Herget, Stresses in Rock, 2) E. Hinton and D.R.J. Owen, Computational Mathematics and Applications Finite Element Programming,3) S.L.Crouch, A. M. Starfield, Boundary Element Methods in Solid Mechanics. 4) Finite Element Applications in Microcoputers. Course notes. CSM, ABD. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and definition of numerical methods |
| 2 | Numerical methods |
| 3 | Numerical methods in rock mechanics |
| 4 | Numerical methods in rock mechanics |
| 5 | Introduction to finite element method |
| 6 | Midterm Examination 1 |
| 7 | finite element method in one dimensional |
| 8 | finite element method in 2D and 3D |
| 9 | Modeling techniques in FEM Model |
| 10 | Data sets in finite element method |
| 11 | Midterm Examination 2 |
| 12 | Computer programs and creating a model |
| 13 | Computer programs and creating a model |
| 14 | Other numerical techniques in rock mechanics |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Hürriyet AKDAŞ | **Date:** | | 09.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601507 | **TITLE** | Mineral and Coal Flotation Circuis |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 45 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Surface chemistry: Interfaces and electrical double layer Principles of sulphide ores flotation; Assessment of the performance of sulphide ores flotation circuits;The pattern of behaviour of sulphide minerals in rougher and cleaner flotation circuits; Principles of coal flotation; assessment of the performance of coal flotation circuits; The pattern of behaviour of coal in rougher and cleaner flotation circuits; Relationship between recovery and flotation variables; Samples of flotation circuits at different mineral processing plants | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1 Comprehend use and importance of minerals and coal.  2. Understand the importance and place of flotation in mineral processing.  3. To understand the difference between mineral and coal flotation  4. The evaluation of flotation applications in the world. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course is focuses on teaching sulphide ores and coal flotation circuits. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand the importance and place of flotation in mineral processing.  2. Understand the importance of sulfhide minerals in global industry.  3. Understand the importance of coal in energy production.  4. The importance of fine coal beneficiation by flotation. | | | | | | | |
| **TEXTBOOK** | | | | | Lynch, A. J., Johnson, N. w., Manlapig, E. v. & Thorne, C. g. (1981). Mineral and coal flotation circuits. UK: Elsevier. Oxford | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Fuerstenau, D. W. (1962). Froth flotation. Newyork. USA:SMN. 2. King, R. P. (1982). Principle of flotation. Johannesburg. SA:South African Institute of Mining and Metallurgy. 3. Kural, O(ed.). (1994). Coal . İstanbul-TÜRKİYE | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Surface chemistry in flotation |
| 2 | The relationship between recovery and flotation variables |
| 3 | Sulphide ore flotation |
| 4 | Sulphide ore flotation circuits and their evaluation |
| 5 | Examples in sulphide ore flotation practices |
| 6 | Midterm Examination 1 |
| 7 | Industrial minerals flotation |
| 8 | Industrial minerals flotation circuits and their evaluation |
| 9 | Examples in industrial mineral flotation practices |
| 10 | Coal flotation |
| 11 | Midterm Examination 2 |
| 12 | Coal flotation circuits and their evaluation |
| 13 | Examples in coal flotation practices |
| 14 | Design in flotation circuits |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601508 | **TITLE** | Quality Control in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Quality definition, concept ve history. Basic probability concept. Quality Control Charts. Usage of Quality Control process in mining | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Quality Control applications in mining systems | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Grant, L.E., Statistical Quality Contol, McGraw-Hill Book Company, 1985. Aslan, D., Kalite Kontrol, DEÜ, 2001. Kara, İ., Olasılık,Bilim Teknik Yayınevi, 2000. Burnak, N., Toplam Kalite Yönetimi, Tekam, 1997. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Quality Control concept, definition and history |
| 2 | Sampling |
| 3 | Sampling methods |
| 4 | Quality Control Costs |
| 5 | Quality Control tools |
| 6 | Midterm Examination 1 |
| 7 | Quality Control Charts |
| 8 | Quality Control Charts for variables |
| 9 | Quality Control Charts for variables |
| 10 | Quality Control Charts for variables |
| 11 | Midterm Examination 2 |
| 12 | Quality Control Charts for attributes |
| 13 | Applications of Quality Control in mining |
| 14 | Applications of Quality Control in mining |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Hüseyin ANKARA | **Date:** | | 30.April.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601509 | **TITLE** | Instrumental Analysis in Mineral Processing I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | TR |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 2 | | 1 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Instrumental analysis techniques used in mineral processing are given in detail. Spectroscopy techniques such as Atomic and Ultraviolet Absorption are covered. In addition particle size analysis and zeta-potential measurement methods are given. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | - Have a perspective about instrumental analysis techniques that could be used in their thesis research.  - Improve their report preparation and presentation skills | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Inform students about the instrumental analysis techniques currently employed in mineral processing studies | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | - Have information about the instrumental analysis techniques used in mineral processing.  - Able to give a writen and oral presentation about the use of any learned techniquein mineral processing based upon the literature survey.  - Able to select an anaysis technique that might be used in thesis research.  - Able to evaluate the results obtained from the used analysisl technique. | | | | | | | |
| **TEXTBOOK** | | | | | İnstrümental Analiz, Prof. Dr. Turgut Gündüz, 7. Baskı, 2004 | | | | | | | |
| **OTHER REFERENCES** | | | | | Principles of Instrumental Analysis, D. A. Skoog & J. J: Leary, 4th Edition, 1991. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | INTRODUCTION -Analytical Method Selection |
| 2 | INTRODUCTION - Electromagnetic Spectrum and Properties |
| 3 | ATOMIC ABSORPTION SPEKTROSCOPY |
| 4 | ATOMIC ABSORPTION SPEKTROSCOPY |
| 5 | ATOMIC ABSORPTION SPEKTROSCOPY |
| 6 | Midterm Examination 1 |
| 7 | ULTRAVIOLET ABSORPTION SPEKTROSCOPY |
| 8 | ULTRAVIOLET ABSORPTION SPEKTROSCOPY |
| 9 | ULTRAVIOLET ABSORPTION SPEKTROSCOPY |
| 10 | PARTICLE SIZE ANAYSIS METHODS |
| 11 | Midterm Examination 2 |
| 12 | PARTICLE SIZE ANAYSIS METHODS |
| 13 | ZETA-POTENTIAL |
| 14 | ZETA-POTENTIAL |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Volkan BOZKURT | **Date:** | | 29.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601510 | **TITLE** | COAL PREPARATION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | -------- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Physical and chemical properties of coal, Sampling, Comminution, Enrichment of coarse and fine particle coal using dry and wet methods, The description of coal analysis methods and devices, The evaluation of experimental data using computer software. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to introduce detailed information on coal and coal processing in mineral processing. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Have the principles of coal preparation unit operations.  - Acquire the abilities of coal analysis for characterization, and evaluation of separation performance of coal cleaning equipments.  - Acquire the knowledge of coarse and fine particle coal beneficiation by using dry and wet methods.  - Use computer software tools.  - Evaluate the experimental data using computer software. | | | | | | | |
| **TEXTBOOK** | | | | | Coal Preparation, J.W.Leonard, Society for mining, metallurgy and exploration, Inc., Littleton, Colorado, 1991. | | | | | | | |
| **OTHER REFERENCES** | | | | | -Kömür, Orhan Kural, 1991. - Kömür Teknolojisi, Mevlüt Kemal, Dokuz Eylül Üniversitesi MMF Mad-87 EY 033, 1987, İzmir. - Mineral Processing Laboratory Manual, M. Abouzeld, Trans Tech Publications, Series on Mining Engineering Vol.9, 1990. - Kömürün Zenginleştirilmesi ve Lavvar Tesislerinin Çalıştırılması, Güven Önal, Zeki Doğan, Suna Atak ve Gündüz Ateşok,, 1986, İstanbul. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction of the course and to give information about the evaluation of the course |
| 2 | Introduction to the physical properties of coal |
| 3 | Introduction to the chemical properties of coal |
| 4 | Introduction to methods of coal samples |
| 5 | Introduction to methods of coal crushing |
| 6 | Midterm Examination 1 |
| 7 | Introduction to methods of preparation of the samples taken |
| 8 | Dry beneficiation methods of coarse-grained coals |
| 9 | Wet beneficiation methods of coarse-grained coals |
| 10 | Dry beneficiation methods of fine-grained coals |
| 11 | Midterm Examination 2 |
| 12 | Wet beneficiation methods of fine-grained coals |
| 13 | Introduction of coal analysis methods and tools |
| 14 | Evaluation by using computer of the obtained data |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Dr. Kemal BİLİR | **Date:** | | 08.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601511 | **TITLE** | Auxiliary Ventilation |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 3 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Auxiliary ventilation devices; auxiliary ventilation systems; auxiliary ventilation calculation; the design applications of auxiliary ventilation; computer aided design of auxiliary ventilation; the investigation of auxiliary ventilation variables. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce the auxiliary ventilation systems and auxiliary ventilation calculation used in underground mines. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Increased knowledge on auxiliary ventilation for Mining Industry. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge of auxiliary ventilation systems.  Analyzing of problems of auxiliary ventilation.  Proper design of auxiliary ventilation. | | | | | | | |
| **TEXTBOOK** | | | | | McPherson, M.J. (1993). Subsurface Ventilation and Environmental Engineering.Önder, M. (1996). Bilgisayar destekli tali havalandırma tasarımı (Osmangazi Üniversitesi Fen Bilimleri Enstitüsü Yüksek Lisans Tezi) | | | | | | | |
| **OTHER REFERENCES** | | | | | Önce,G., & Saraç,S. (1986). Madenlerde Havalandırma. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Auxiliary ventilation concept |
| 2 | Auxiliary ventilation equipment |
| 3 | Auxiliary ventilation systems |
| 4 | Auxiliary ventilation systems |
| 5 | Basic ventilation calculation |
| 6 | Midterm Examination 1 |
| 7 | Auxiliary ventilation calculation |
| 8 | Auxiliary ventilation calculation |
| 9 | Auxiliary ventilation calculation |
| 10 | Auxiliary ventilation calculation |
| 11 | Midterm Examination 2 |
| 12 | Investigation of auxiliary ventilation variables |
| 13 | Computer aided auxiliary ventilation design |
| 14 | Computer aided auxiliary ventilation design |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr.Mustafa ÖNDER | **Date:** | | 13.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503601514 | **TITLE** | Particle Technology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The importance and the scope of the Particle Technology, The physical properties of the solid particles and the methods used to determine these properties, the importance of the physical properties of the solid particles in the mineral processing, example applications in this field. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To give information about the partical's physical properties that form the basis of the mineral processing and about his behavior in fluid medium. To teach theoretical and practical required ways and methods for these. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | He learns the physical properties of minerals, can predict the behavior of fluid medium, ore preparation and enrichment can produce solutions to problems by learning about the impact of the performance in the process. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. The student will understand the importance of mechanics and will have the necessary theoretical knowledge .  2. The student will learn the methods required to determine the physical properties of particles,  3- The student will be able to predict the behavior of particles in the fluid environment and understand the importance of the mineral ore .  4- The student will learn the the flotaion process and processing methods, then the effect of physical properties of the solid particles and analyze the results. | | | | | | | |
| **TEXTBOOK** | | | | | Course notes | | | | | | | |
| **OTHER REFERENCES** | | | | | Öteyaka, B., 1993, Modélisation d’une colonne de flottation sans zone d’écume pour la séparation des particules grossieres, doktora tezi, Université Laval, Quebec, Kanada.2. Svarovsky, L., 2000, Solide- Liquid Separation, Butterworth Heinemann, Linacre House, Jordan Hill, Oxford. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What is the mechanical part ? The scope and importance. |
| 2 | Technical terms and particle characterization ( particle shape and size, particle size measurement methods). |
| 3 | Technical terms and characterization of particles (Fig factor, size distribution functions , and interpretation of the granular material ) . |
| 4 | The size distribution of the granular material size reduction ratio of tools leveraging the graphics and hammer and tool selection of estimation of mouth opening. |
| 5 | Specific surface area and density of the granular material (molding and pulp density) and properties of the fluid medium |
| 6 | Midterm Examination 1 |
| 7 | The solid particles in the fluid motion and gravity environment (forces acting on the particle and theoretical terminal velocity , graphic method and speed calculation) |
| 8 | Calculation of concentration by , cyclones and thickener design calculations , |
| 9 | Problem solving (fluid medium grain rate, pulp density and graphical method and speed calculation ) |
| 10 | The possibility of disruption in grain - bubble flotation aggregates ( stability) theoretical calculation |
| 11 | Midterm Examination 2 |
| 12 | Theoretical calculation of the turbulence in the flotation column and its relationship with grain size. |
| 13 | Theoretical calculation of the maximum grain size can be floated in the flotation cell . |
| 14 | The applications of hydrodynamic particle drift paths |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Bahri ÖTEYAKA | **Date:** | | 14.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602501 | **TITLE** | Fuzzy Logic Applications in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | X | |  |  | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Teaching the main principles and components of fuzzy logic approach,  Explaining the required process or stages which should be folllowed in constructing a fuzzy logic model,  Researching mining related problems in which fuzzy logic approach is applied,  Solving several engineering or mining related problems by fuzzy modeling. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Understanding of the difference between crisp set and fuzzy set,  Teaching the main principles of fuzzy logic approach,  Using fuzzy logic for solving several engineering problems, especially for mining engineering related problems. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Propose a solution for several engineering problems together with mining engineering problems by employing fuzzy sets. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Comprehend the basic principles and components of fuzzy logic approach.  2. Follow and apply the required stages of constructing a fuzzy model.  3. Understand the fuzzy logic applications in mining engineering.  4. Use the softwares designed for fuzzy modeling. | | | | | | | |
| **TEXTBOOK** | | | | | Presentation notes of the course. | | | | | | | |
| **OTHER REFERENCES** | | | | | Grima, M.A., 2000, Neuro-Fuzzy Modelling in Engineering Geology, A.A. Balkema.Jang, R.J.S., Sun, C.T. and Mizutani, E., 1997, Neuro-Fuzzy and Soft Computing, Prentice Hall, Upper Saddle River, NJ.Ross, T., 1995, Fuzzy Logic with Engineering Applications, McGraw-Hill, Inc.Şen, Z., 2001, Bulanık Mantık ve Modelleme İlkeleri, Bilge Sanat Yapım Yay. Tan. Kağ. Turz. San. Tic. Ltd. Şti. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Crisp (Classical) Sets and Fuzzy Sets |
| 2 | Operations on Fuzzy Sets |
| 3 | MEMBERSHIP FUNCTIONS:  The Types and Features of Membership Functions |
| 4 | Assigning Membership Degree, Defuzzification Methods |
| 5 | Fuzzy “if-then” Rules |
| 6 | Midterm Examination 1 |
| 7 | RULE-BASED FUZZY MODELLING:  Fuzzy Inference Systems |
| 8 | Mamdani Type Fuzzy Algorithm  Takagi-Sugeno-Kang Type Fuzzy Algorithm |
| 9 | The Stages of Constructing a Fuzzy Model |
| 10 | Introducing of MATLAB Software |
| 11 | Midterm Examination 2 |
| 12 | Constructing Fuzzy Model by Employing MATLAB Software |
| 13 | The Applications of Fuzzy Logic in Mining |
| 14 | The Applications of Fuzzy Logic in Mining |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr. Melih İPHAR | **Date:** | | 06.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602503 | **TITLE** | Magnetic Separation |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | NON | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to magnetic separation, The importance of magnetic separation in ore processing. Basic units of magnetism, Magnetic separation of minerals, magnetic force on mineral particle, Parameters affected magnetic force, Minimum particle size that retained by a magnet, Classification of magnetic separators, Examples of magnetic separators. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to teach magnetic separation method in detail that is used in mineral processing and, all necessary information about magnetic separators and, to enable to design separation flow-sheet of magnetic separation for certain ores. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course enables the student to comprehend the importance of magnetic separation, and to use magnetic separation method, and to make decision over how to select an appropriate magnetic separator for a given ore. In addition to be able to recommend processing flow-sheets | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Have theoretical and practical knowledge in mireal processing at advanced level  2.Work effectively as an individual, in teams and multidisciplinary setting  3.Develop and evaluate minerals engineering processand project  4.Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studiies at highly specialized level | | | | | | | |
| **TEXTBOOK** | | | | | 1.Magnetic Methods for the Treatment of Minerals. Fuerstenau D.W. -Editor, Svoboda, Elsevier, 1982. 2. Handbook of Mineral Processing. AIMM | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to magnetic separation, the aim of the course, giving the general information for contents of course. |
| 2 | Basic units and quantities related to magnetism. |
| 3 | Magnetic field, magnetic flux, intensity of magnetic flux, and magnetic susceptibility. |
| 4 | Classification of minerals according to their magnetic susceptibilities. |
| 5 | Parameters that affected separation, and magnetic force on the mineral particle. |
| 6 | Midterm Examination 1 |
| 7 | Minimum particle size to be attracted by a magnet, and determination of critical rotation speed in roll type dry magnetic separator. |
| 8 | Classification of magnetic separators, and criteria based on the classification. |
| 9 | Magnets for Protective purposes |
| 10 | Magnetic separators for enrichment purposes, low intensity dry magnetic separators, high intensity dry magnetic separators, dry magnetic separators with super conducting coils. |
| 11 | Midterm Examination 2 |
| 12 | Low field intensity wet magnetic separators, high field intensity wet magnetic separator, wet magnetic separators with super conducting coils. |
| 13 | Magnetic separators for cleaning purposes |
| 14 | Magnetic separators for cleaning purposes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Hüseyin ÖZDAĞ | **Date:** | | 04.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602506 | **TITLE** | Column Flotation |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 3 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The importance of particle size in flotation; The introduction – design and principles of the flotation colon (CPT), the Jameson Cell and Jet Diffuser flotation colomn that are important for the flotation of small particles; Mathematical models and their fundamentals concerning the mentioned equipment; Flotation problems and their solutions about these equipment | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In the flotation process with high performens the enrichment of problematic fine-grained minerals, but our country their applications are uncommon the flotation column and Jameson flotation cell, giving the basic and practical information for the application is to ensure that students have sufficient knowledge and skills in this area. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. The diameter of the air bubble , the effect of particle size and flotation efficiency of other operating parameters and develop solutions to problems in this area  2. In our country, the application of the new flotation column flotation cells and Jameson will learn working principles in detail and knows the importance of the problem for the flotation of fine-grained minerals.  3.The student will recognize the effective parameters on the flotation efficiency and can produce solutions to problems faced by the parameters.  4. The student will understand the detailed mechanism of flotation and have knowledge about modeling , develop new ideas for scientific research and industrial work will be done in this area.  5. In some tools related to the flotation circuit design can offer new ideas and proposals to look at the broader perspective .  6.The student will be inform about the patent intake phase of the diffuser or flotation column designed. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | It is aimed that students;  - Comprehend the effects of the particle size on the flotation efficiency and creates solutions for the possible problems,  - Know the implementation of colon flotation and the Jameson Flotation Cell; learn the principles in details and comprehend the importance of it for the flotation of small particles,  - Know the effective parameters on the flotation efficiency and creates solutions for the problems concerning parameters,  - Learn the flotation mechanics in detail and have information about modelling and creates new ideas concerning this field,  - Create new ways of thinking about the circuit design concerning flotation.lease write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Lecture notes prepared. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Öteyaka, B., 1993, Modélisation d’une colonne de flottation sans zone d’écume pour la séparation des particules grossieres, doktora tezi,1. Column Flotation, Finch, J., A. and Dobby, G., S., 1990, | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The effect of particle size on the efficiency of the flotation process , the importance of the Jameson cell flotation column . |
| 2 | The introduction of the flotation column design and operating principle. |
| 3 | Flotation column types and their differences , technical terms |
| 4 | Micro events flotation zones and flotation column. |
| 5 | Flotation column to yield important parameters affecting the measurement of these parameters and methodsi |
| 6 | Midterm Examination 1 |
| 7 | The yield on the important parameters affecting the flotation column and methods of measurement of these parameters |
| 8 | Sizing the flotation of Cologne ( modeling) |
| 9 | Dimensioning of the Modified column flotation . |
| 10 | Jameson identification and design of the flotation cell. |
| 11 | Midterm Examination 2 |
| 12 | Jameson flotation operation principles and effective yield important operating parameters of the cell |
| 13 | CPT industrial scale flotation column flotation cells and Jameson Applications |
| 14 | Jet Diffisor Design and Design of flotation column |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Bahri ÖTEYAKA | **Date:** | | 14.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602507 | **TITLE** | Agglomeration in Suspensions |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | TR |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 2 | | 1 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction, Colloids and Properties of Interfaces, Coagulants, Destabilization with Metal Coagulants, Destabilization with Polyelectrolytes, Rapid Mixing, Flocculation, Coagulation and Flocculation Tests. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Mechanisms of coagulation and flocculation, methods used to produce flocs, properties of produced flocs and coagulation - flocculation test methods are taught to students. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students can work in wastewater treatment and solid liquid separation plants that use coagulation and flocculation techniques after taking this lesson. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Able to comprehend the causes of stability of suspensions.  Able to learn destabilization of suspensions with coagulants.  Have information about destabilization of suspensions with flocculants.  Able to perform clarifying of water. | | | | | | | |
| **TEXTBOOK** | | | | | BRATBY, Bratby, 1980, ‘Coagulation and Flocculation’, Uplands Press Publication, England, 354 p. | | | | | | | |
| **OTHER REFERENCES** | | | | | Coagulation and Flocculation, 1993, Zeta-Meter, Inc., PO Box 3008, Staunton VA 24402-3008, USA, 37 p.Zeta Potential: A Complete Course in 5 Minutes, Zeta-Meter, Inc., PO Box 3008, Staunton VA 24402-3008, USA, 8 p.Süspansiyonlarda Gerçekleştirilen Koagülasyon, Flokülasyon ve Aglomerasyon İşlemlerinin Oluşum Mekanizmaları, 1991, Mesleki Gelişme Seminerleri - Cevher Hazırlama Sistemleri, Anadolu Üniversitesi Maden Mühendisliği Bölümü, 3-5 Haziran, Eskişehir, 12 s. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, Colloids and Properties of Interfaces |
| 2 | Colloids and Properties of Interfaces |
| 3 | Coagulants |
| 4 | Coagulants |
| 5 | Dationestabiliz with Metal Coagulants |
| 6 | Midterm Examination 1 |
| 7 | Destabilization with Polyelectrolytes |
| 8 | Destabilization with Polyelectrolytes |
| 9 | Rapid Mixing |
| 10 | Flocculation |
| 11 | Midterm Examination 2 |
| 12 | Flocculation |
| 13 | Flocculation |
| 14 | Coagulation and Flocculation Tests |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Yaşar UÇBAŞ | **Date:** | | 08.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 503602508 | **TITLE** | Particle Size Analysis |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Screen Analysis, Classification, Sedimentation Analysis, Microscopic Measurement Methods, Specific Surface Measurement Methods, Mass Weight Determination and Sedimentation Volume Determination. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Usually it is necessary to work with fine particles in mineral processing. The control of fine particles is possible only by knowing their particle size distribution. Fine particle measurements are performed with different methods. More sensitive devices are developed. The purpose of this course is to give info about the methods mentioned above. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will have enough knowledge of fine particle measurements and have the ability to use these methods when it is needed. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Information about the fine particle measurement techniques.  Information about the equipments used in fine particle mesasurements.  Application of fine particle measurement methods in lab and industrial  scales.  Evaluation of the results of fine particle measuremens. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Allen, T. (1981). Particle Size Measurment, London2. Somasanduran, P. (1980). Fine Particles Processing, New York3. Aytekin, Y. (1979). İnce Tane Ölçüm Yöntemleri, İzmir4. Devices Catalogs | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The review of all fine particle analysis methods |
| 2 | Screen Analysis |
| 3 | Microscopic Measurement Methods |
| 4 | Specific Surface Measurement Methods |
| 5 | Specific Surface Measurement Methods |
| 6 | Midterm Examination 1 |
| 7 | Sedimentation Analysis |
| 8 | Sedimentation Analysis |
| 9 | Specific Surface Measurement Methods |
| 10 | Mass Weight Determination |
| 11 | Midterm Examination 2 |
| 12 | Mass Sedimentation Volume Determination |
| 13 | Other Methods |
| 14 | Presentations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. r. Ender Sönmez | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602509 | **TITLE** | Instrumental Analysis in Mineral Processing II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | TR |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 2 | | 1 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Instrumental analysis techniques used in mineral processing are given in detail. Infrared Absorption Spectroscopy, X-Ray Diffraction (XRD) Spectroscopy, X-Ray Fluorescence (XRF) Spectroscopy and Scanning Electron Microscopy (SEM) Techniques are covered. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | - Have a perspective about instrumental analysis techniques that could be used in their thesis research.  - Improve their report preparation and presentation skills | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Inform students about the instrumental analysis techniques currently employed in mineral processing studies | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | - Have information about the instrumental analysis techniques used in mineral processing.  - Able to give a writen and oral presentation about the use of any learned techniquein mineral processing based upon the literature survey.  - Able to select an anaysis technique that might be used in thesis research.  - Able to evaluate the results obtained from the used analysisl technique. | | | | | | | |
| **TEXTBOOK** | | | | | İnstrümental Analiz, Prof. Dr. Turgut Gündüz, 7. Baskı, 2004 | | | | | | | |
| **OTHER REFERENCES** | | | | | Principles of Instrumental Analysis, D. A. Skoog & J. J: Leary, 4th Edition, 1991. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | INTRODUCTION -Analytical Method Selection |
| 2 | INTRODUCTION - Electromagnetic Spectrum and Properties |
| 3 | INFRARED (IR) ABSORPTION SPEKTROSCOPY |
| 4 | INFRARED (IR) ABSORPTION SPEKTROSCOPY |
| 5 | INFRARED (IR) ABSORPTION SPEKTROSCOPY |
| 6 | Midterm Examination 1 |
| 7 | X-RAY DIFFRACTION (XRD) SPECTROSCOPY |
| 8 | X-RAY DIFFRACTION (XRD) SPECTROSCOPY |
| 9 | X-RAY DIFFRACTION (XRD) SPECTROSCOPY |
| 10 | X-RAY FLUORESCENCE (XRF) SPECTROSCOPY |
| 11 | Midterm Examination 2 |
| 12 | X-RAY FLUORESCENCE (XRF) SPECTROSCOPY |
| 13 | SCANNING ELECTRON MICROSCOPY |
| 14 | SCANNING ELECTRON MICROSCOPY |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Volkan BOZKURT | **Date:** | | 29.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602510 | **TITLE** | Drilling and Blasting Design for Underground Structure |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 3 | COMPULSORY  (   ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Blasting theories , design techniques for blasting , Blasting methods for metal and nonmetal mining methods, Blasting techniques in room-pillar, Blasting techniques in block caving mining, some applications in the world, Blasting techniques in tunnel and shaft, Cost analysis of blasting operations | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To develop and teach the drilling and blasting techniques for underground openings and to teach drilling and blasting methods | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To develop and teach the drilling and blasting techniques for underground openings and to learn drilling and blasting method | | | | | | | |
| **TEXTBOOK** | | | | | Course notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Applied Explosives Technology for Construction and Mining2) Explosives and Rock Blasting, Atlas Powder Company, 19873) Mining Engineering Hand Book, SME, 19924) Advanced drilling & blasting, Course Notes, CSM, ABD, 19935) Underground Excavations in Rock, E Hooke, E. Brown | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and importance of blasting |
| 2 | Blasting theories |
| 3 | Calculation techniques for blasting |
| 4 | Blasting Methods in metal and nonmetal underground mines |
| 5 | Various blasting techniques |
| 6 | Midterm Examination 1 |
| 7 | Blasting techniques in room and pillar mining |
| 8 | Blasting techniques in block caving mining |
| 9 | Blasting techniques in block caving mining |
| 10 | Some applications in the world |
| 11 | Midterm Examination 2 |
| 12 | Drilling and drilling techniques |
| 13 | Drilling techniques in tunnel and shaft in underground |
| 14 | Economical and cost analysis of a blasting design |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Hürriyet AKDAŞ | **Date:** | | 09.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602511 | **TITLE** | Tailing Management in Mining Industry |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | x | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Sources of solid and liquid wastes in mining industry. Introduction to legal requirements for tailings and effluent disposal. Characterization of tailings. Methods of handling solid, liquid wastes. Quality of effluent water and treatment required. Pre treatment, principles of sedimentation. Fundamental factors in performance of adsorption and ion exchange. Design principles of adsorption and ion exchange equipment. Importance of recycling in mining processes. Selected applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The objective of the course is to equip the students with principle and application of waste management methods used in mineral processing. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding of the importance of waste management in mineral processing applications | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To understand the role of waste management and treatment methods in Mining Industry  To learn the basic principles of waste management for mining industry  Ability to selection of appreciates treatment methods and develop process design  Ability to analysis of results  Ability to following of recent literature related with waste management | | | | | | | |
| **TEXTBOOK** | | | | | Lecturer notes | | | | | | | |
| **OTHER REFERENCES** | | | | | G. M. Ritcey, 1989, Tailing Management. Elsevier Science publisher, Amsterdam-HollandD. Barnes, P.J. Bliss, B.W. Gould, H.R. Vallentine, 1981, Water and wastewater Engineering systems, Pitman books Limited-London-UKG. Smethurst, 1979, Basic Water Treatment, Thomas Telford LTD. London-UK | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to waste management in mining Industry |
| 2 | Characterization of tailings. Introduction to legal requirements for tailings and effluent disposal |
| 3 | Quality of effluent water and treatment required, Pre treatment ,theory and application of sedimentation of effluent water |
| 4 | Filtration, disinfection |
| 5 | Typical sorption processes. Fundamentals of sorption; Langmuir and Freundlich isotherms |
| 6 | Midterm Examination 1 |
| 7 | Design principles of adsorption and ion exchange equipment |
| 8 | Importance of recycling in mining processes. Sustainable development-the role of waste minimization and recyclables |
| 9 | Selected applications; gold production, treatment of cyanide solution |
| 10 | Selected applications; Iron ore, slag recycling, importance of by product, Zn recovery |
| 11 | Midterm Examination 2 |
| 12 | Selected applications; Alumina Plant tailing, reuse, recovery of valuable product such as vanadium |
| 13 | Selected applications; Zinc, slag recycling |
| 14 | Selected applications; Treatment of Flotation Circuits |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Haldun KUrama | **Date:** | | 5.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602513 | **TITLE** | Optimization Applications in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 20 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Linear programming applications in mining; non-linear programming applications, Integer programming applications in mining, dynamic programming aplications in mining, decision making applications in mining, network theory applications in mining, expert systems in mining. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce Operation Research applications in mining and to teach how to use several software’s in solution stage. Another aim o the course is to enable students to specialize in decision making applications in mining. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learn basic knowledge of Operation Research applications in mining. Model different problems. Solve models by using several software’s. Interpret model solutions. Make multiple attribute decision. Construct network. Solve network problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To describe the decision making problem.  2. To select suitable decision making methods for solving the problem.  3. To solve decision making problems using at least two different methods.  4. To apply sensitivity analysis on decision making problems. | | | | | | | |
| **TEXTBOOK** | | | | | Hamdy a Taha (Çevirenler: Ş. Alp Boray, Şakir Esnaf), 2001, Yöneylem Araştırması, Literatür Yayıncılık (6. Basımdan Çeviri) | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kara, İ. (1991). Doğrusal Programlama. Eskişehir: Bilim Teknik.2. Kara, İ. (1986). Yöneylem Araştırması. Eskişehir: Anadolu Üniversitesi.3. LINGO, (1999). User’s Guide. Chicago: LINGO Systems Inc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to optimization applications in mining |
| 2 | Linear programming applications in mining |
| 3 | Solving problems by using LINGO |
| 4 | Nonlinear programming applications in mining |
| 5 | Integer and dynamic programming applications in mining |
| 6 | Midterm Examination 1 |
| 7 | Decision making applications in mining |
| 8 | Decision making using AHP in mining |
| 9 | Decision making using Yager's Method in mining |
| 10 | Decision making using TOPSIS in mining |
| 11 | Midterm Examination 2 |
| 12 | Network theory applications in mining |
| 13 | Solving CPM/PERT problems by using MS Project |
| 14 | Expert system applications in mining |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Mahmut YAVUZ | **Date:** | | 13/05/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602514 | **TITLE** | Grinding Kinetics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | x | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction, review of the older lows of grinding, conventional grindability test and mill sizing, batch grinding equation, laboratory tests, grinding circuit simulation, methods for direct experimental determination of the breakage functions, back calculation of breakage parameters from batch and continuous mill data | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to inform students, describe to grinding principle, to explain the relationship between between size reductionand and energy,descripe grinding models and how the models changeplant conditions.. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding of the importance of grinding kinetics | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Be able to formulate the problems facing the designer of grinding circuits Learn the fundamentals of comminution Learn the grindability tests and mill sizing Be able to calculate batch grinding equation Be able to simulate grinding circuits Be able to determine breakage functions Be able to back calculation of breakage parameters from batch and continuous mill data | | | | | | | |
| **TEXTBOOK** | | | | | Lecturer notes | | | | | | | |
| **OTHER REFERENCES** | | | | | Lynch, A. J., (1977). “Mineral Crushing and Grinding Circuit”, Elsevier Scientific Publishing Co. Napier, T.J., Morrel, S., Morisson, R. D., Kojoviç, T., (1996). “Mineral Comminution Circuit, Their Operation and Optimization”, JKMRC, The Univeristy of Queensland. Austin, L.G., Klimpel, R.R., Luckie, P.T., (1984). Process Engineering of Size Reduction | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to grinding lows |
| 2 | Grindability test |
| 3 | Grindability test |
| 4 | Model applications |
| 5 | Model applications |
| 6 | Midterm Examination 1 |
| 7 | Grinding Models |
| 8 | Kinetic model |
| 9 | Calculation of grinding rate parameters |
| 10 | Calculation of |
| 11 | Midterm Examination 2 |
| 12 | Changing of parameters witn plant conditions |
| 13 | Model applications |
| 14 | Model applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Halil İpek | **Date:** | | 8.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602515 | **TITLE** | Field Stresses |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Stress tensor and its components, classification of field stresses, field stress measurement methods, in situ stresses, induced stresses. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Showing the stress tensor components according to global reference axes, types of field stresses, the measurement methods of field stresses, methods for determining the in situ stresses, stress redistribution around the mining openings. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is to teach how to define stress tensor at particular depth before and after an underground opening is excavated. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To be able to define the stress tensor,  To be able to analyze the field stresses for a depth before and after an underground opening is excavated.  To teach the overcoring, flatjack, hydraulic fracturing and acoustic emission field stress measurement methods,  To teach back analysis method. | | | | | | | |
| **TEXTBOOK** | | | | | Course notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | HUDSON J.A., CORNET F.H. and CHRISTIANSSON R., 2003, “ISRM Suggested Methods for Rock Stress Estimation—Part 1:Strategy for Rock Stress Estimation”, International Journal of Rock Mechanics and Mining Sciences, 15:40, 991-998. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Aim of the course and general review of subjects, |
| 2 | Stress tensor and its components, |
| 3 | Classification of field stresses, |
| 4 | Field stress measurement methods: Overcoring method, |
| 5 | Field stress measurement methods: Flatjack method, |
| 6 | Midterm Examination 1 |
| 7 | Field stress measurement methods: Hydraulic fracturing method, |
| 8 | Field stress measurement methods: Hydraulic fracturing method, |
| 9 | Field stress measurement methods: Acoustic emission method, |
| 10 | Field stress measurement methods: Back analysis, |
| 11 | Midterm Examination 2 |
| 12 | In situ stresses, |
| 13 | Induced stresses: stress redistribution around the circular openings, |
| 14 | Induced stresses: stress redistribution around the tunnel openings, |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assist.Prof.Dr. Ercan EMİR | **Date:** | | 08.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602516 | **TITLE** | Modelling of air quality in underground mines |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The definition of effective factors (heat, humidity, etc.) on the air quality. The definition of thermoregulation of the human body. The definition of commonly used heat stress indices. Computer simulation of human thermoregulation system. The definition of psychrometric relationships. The analysis of air quality by using simulation program. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to determine of the effective fundamental component on the air quality, air quality analysis by using psychrometric relationships, the design of working condition according to international standards, computer aided air quality design. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Increased knowledge on air quality design application for Mining Industry | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Analysis of mine air.  2.Learn psychrometry.  3.Learn how to design the proper working condition of underground mines.  4.Learn the detailed mine climate.  5.Learn the thermoregulation of the human body.  6.Learn the elements of simulation programs  7.Learn the international standards.  8.Learn how to analyze and evaluate the data.  9.Learn how to solve the problems related to mine air quality. | | | | | | | |
| **TEXTBOOK** | | | | | 1.McPherson, M.J., 1993, “Subsurface Ventilation and Environmental Engineering”, Chapman&Hall, 905 p.2.Hartman, H.L., 1991, “Heat in Mines”, Mine Ventilation and Air Conditioning.3.MVS, 1997, “CLIMSIMTM for Windows Version 1.0”, Users Manual and General Theory, Mine Ventilation Services, Inc.4.Environmental Engineering in South African Mines.5.Güyagüler, T., 1991, “Ocak Havalandırması”, TMMOB Maden Mühendisleri Odası Yayını, Ankara, 148 s.6.Güyagüler, T., Karakaş, A. and Güngör, A., 2005; “Occupational Health and Safety in Mining Industry”, 140 pp. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Concept of air quality |
| 2 | Basic parameters effected air quality |
| 3 | Basic parameters effected air quality |
| 4 | Psychrometry |
| 5 | Psychrometry |
| 6 | Midterm Examination 1 |
| 7 | Mine climate |
| 8 | Mine climate |
| 9 | The model of thermal regulation of human body |
| 10 | The model of thermal regulation of human body |
| 11 | Midterm Examination 2 |
| 12 | The design of proper working conditions in underground mines |
| 13 | Computer aided design |
| 14 | Computer aided design |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Mustafa ÖNDER | **Date:** | | 13.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602517 | **TITLE** | Environmental Effects on Natural Building Stones |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Natural building stone usage from past to present, porosity, moisture and water sorption, heat and freeze resistance, mineralogical composition and clay content, salts and effect of salts, loss of color, required specifications of some natural building stones, test methods. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To analyze environmental effects on natural building stones, to choose appropriate natural stone according to environmental conditions, to make provision against damage of existing structures made of natural stones, to determine strength of natural building stones exposed to environmental conditions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is to give ability about deciding where the natural building stones will be used appropriately by considering the natural stones’ features and experimental data related with it. Also, the protection methods of naturalbuilding stones against environmental effects will be thought through the course. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To be able to measure porosity, moisture and water sorption, and heat and freeze resistance and to assess its impact,  To evaluate clay type and content effects,  To know salts effects and conservation methods against them,  To be able to choose appropriate natural building stone according to usage,  Ability of suggesting source of damage on natural stone structures,  To learn the test methods. | | | | | | | |
| **TEXTBOOK** | | | | | Course notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | Borelli E (1999). Conservation of architectural heritage, Historic structures and materials, ARC Laboratory handbook, ICCROM, Rome. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Aim of the course and general review of subjects, |
| 2 | Natural stone usage from past to present |
| 3 | Porosity and its influences, |
| 4 | Moisture and water sorption, |
| 5 | Heat and freeze resistance, |
| 6 | Midterm Examination 1 |
| 7 | Mineralogical composition and clay content, |
| 8 | Basic salts chemistry, |
| 9 | Main characteristics of some salts, |
| 10 | Discoloration, |
| 11 | Midterm Examination 2 |
| 12 | Main properties of some natural stones affecting their usage, |
| 13 | Test methods, |
| 14 | Test methods, |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assist.Prof.Dr. Ercan EMİR | **Date:** | | 08.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602518 | **TITLE** | RESPONSE SURFACE METHODS IN MINERAL PROCESSING |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General desaign of experiments methods, knowledge about full factorial and Taguchi design methods. The importance of response surface method  Response surface methods according to the number of parameters and test levels  Surface response designs at three and five test levels and their analyses  Box-Behnken Design (BBD)  Central Composite Design (CCD)  Box-Wilson Design(BWD)  Mixed designs and triangle surfaces and their interpretations  Constitution of quadratic models  Presentation of the results at two dimensional contour plots and 3D dimensional graphs and their interperetations | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main objective of the course is to teach the response surface analysis methods which is used in experimental design to reduce the large number of required experiments in mineral processing, to analyse the 2-Dimensional and 3-Dimensional plots, to analye quadratic models and to interpret the validity of the models and results obtained. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge information about a specific topic in details  Ability to design and to perform laboratory experiments  Learn the response surface methods and perform them  Application of Box-Behnkken Design (BBD) method and interpretation of the results  Design a multi factor and multi levels experimental design such as Central Composite Design (CCD)  Learn and apply Box-Wilson Design (BWD)  Learn special response surface methods at different parameters and levels  Perform and apply 2-dimensional contour plots and 3-dimensional surface graphs obtained from the models  Perform the models for designs and determine their validity  Use some statistical softwares achieving surface response methods and report the results obtained lease write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Box, G. E. P. and Draper, N. R., Response Surfaces, Mixtures and Ridge Analyses, Second Ed., John Wiley and Sons, 2007.2. Khuri, A. I., Response Surface Methodology and Related Topics, World Scientific Publishing, 2006.3. Boddy, R. and Smith, G., Effective Experimentation for Scientists and Technologists, John Wiley&Sons, 20104. Box, G. E. P., Hunter, J. S. and Hunter, W. G., Statistics for Experimenters: Design, Innovation and Discovery, Second Edition, John Wiley and Sons, 2005.5. Myers, R. H. and Montgomery, D. C., Response Surface Methodology, Process and Product Optimization Using Designated Experiments, Second Edition, John Wiley & Sons, 2002.6. Khuri, A. I. and Cornel,J. A., Response Surfaces, Designs and Analyses, Second Edition, Revised and Expanded, Marcel and Dekker, 1996.7. Box, G. E. P. and Draper, N. R., Empirical Model Building and Response Surfaces, John Wiley & Sons, 1987.8. Montgometry, D.C., Design and analysis of experiments, Fifth edt., Wiley, New York, 2001.9. Shalabh, H. T., Statistical Analysis of Designed Experiments, Third Edition (Springer Texts in Statistics), 2009.10. Antony, J., Design of Experiments for Engineers and Scientists, Elsevier, 2003.11. Freund, R. J., Wilson, W. J. and Sa, P., Regression Analysis-Statistical Modeling of a Response Variable, Elsevier, 2006.12. Montgomery, D. C., and Runger, G. C., Student Workbook with Solutions, App. Sta. and Pro.for Engineers, Wiley, 2003.13. Hinkelmann, K., Kempthorne, O., Design and Analysis of Experiments, Vol. 1, Introduction to Experimental Design, John Wiley & Sons, 2008. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to design of experiments |
| 2 | Two levels (full factorial) experimental design |
| 3 | General information about Taguchi design |
| 4 | Responce surface methods according to number of parameters and levels |
| 5 | Response surface methods with three levels |
| 6 | Midterm Examination 1 |
| 7 | Box-Behnken Design (BBD) |
| 8 | Response surface methods with five levels |
| 9 | Application of Box-Behnken design with statsitical software |
| 10 | Central Composite Design (CCD) |
| 11 | Midterm Examination 2 |
| 12 | Application of CEntral COmposite Designn with statsitical software |
| 13 | Box-Wilson Design |
| 14 | Other experimenatl designs with different parameters and levels |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Adem TAŞDEMİR | **Date:** | | 12.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611601 | **TITLE** | Special Topics in Mineral Processing |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | o | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Physical and chemical separatoins in the field of mineral processing conducted in detail on special topics in each terms. Comminution (Crushing and grinding), theories of comminution, comminution flow sheets, grinding open-circuits calculations, industrial sieving, calculation of necessary screen's area, separation of feldspar ores by electrostatic method, seaparion of magesite and chromite ores by magnetic separation, production of gold and silver metal by cyanide leaching. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Main aim of the course is to transfer necessary information to the students and to enable them to design related flow-sheets. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1.Comminution Theories  2.deveolping crushing flow-sheets for special cases. deveolping grinding flow-sheets for special cases  4.The calculations of closed-circuits of crushing and grinding  5.To determine parameters affecting the necessary surface area of screen in industrial sieving  6.Application of electrostatic method to feldspar ores  7.Application of magnetic separation to magnesite and chromite ores  8.Production of gold and silver by cyanide leaching | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Have theoretical and practical knowledge in mireal processing at advanced level  2.Work effectively as an individual, in teams and multidisciplinary setting  3.Develop and evaluate minerals engineering processand project  4.Design and conduct theoretical and experimnnental studies, and analyse and interpret the data generatedfrom these studiies at highly specialized level | | | | | | | |
| **TEXTBOOK** | | | | | 1.Magnetic Methods for the Treatment of Minerals, D.W. Fursteanu-Advisory Editor, J. Svoboda; Elsevier, 1982.2. Handbook of Mineral Processing. AIMM.3.Textbook of Hydrometallurgy, HABBASHI, F., Deparment of Mining and Metallurgy, Laval University, Quebec City, Canada, 1993 | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Comminution Theories |
| 2 | Deveolping crushing flow-sheets for special cases |
| 3 | Deveolping grinding flow-sheets for special cases |
| 4 | The calculations of closed-circuits of crushing and grinding |
| 5 | To determine parameters affecting the necessary surface area of screen in industrial sieving |
| 6 | Midterm Examination 1 |
| 7 | Application of electrostatic method to feldspar ores |
| 8 | Application of electrostatic method to feldspar ores |
| 9 | Application of magnetic separation to magnesite ores |
| 10 | Application of magnetic separation to magnesite ores |
| 11 | Midterm Examination 2 |
| 12 | Production of gold by cyanide leaching |
| 13 | Production of gold by cyanide leaching |
| 14 | Production of gold and silver by cyanide leaching |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Prof. Dr. Hüseyin ÖZDAĞ | **Date:** | 30.04.205 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611602 | **TITLE** | Colloid and Surface Chemistry |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Colloid state, kinetics properties, liquid-gas-solid interface phenomena, contact angle, surface tension, spreading, adhesion, cohesion, adsorpsion, absorpsion, froth phase. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this coarse colloid and surface chemistry subjects will be covered by mineral processing especially flotation specialities. Liquid-solid-gas phase interactions, contact angle, absorpsion, adsorpsion, spreading, electrokinetic properties will be described with applicable examples. In every chapter, descriptions, classifications, measuring methods and importance from mineral processing point of view will be explained in detail. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Surface interactions and phenomena taking place in mineral processing especially in flotation will be grasped be detail. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The importance of colloidal phase, surface phenomena, absorption, adsorption mechanisms, surface tension and contact angle will be grasped. Clasification and measuring methods will be analyzed. Reactive selection methods will be evaluated. The effects of surface chemistry on metallurgical performance will be understood. | | | | | | | |
| **TEXTBOOK** | | | | | M. Kaya, Kolloid ve Yüzey Kimyası Ders Notları, ESOGÜ. 2010 | | | | | | | |
| **OTHER REFERENCES** | | | | | D.J.Shaw, Introduction to colloid and surface chemistry, Butterworths, 1970.J.Leja, Surface Chemistry of Froth Flotation, Plenum Press, 1982, N.Y.S. Baykut M. Biran, Yüzey aktif maddeler ve fizikokimyası, İstanbul Üniversitesi, Yayın No: 3385, İst. 1986 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Colloidal state, classification, dispersions |
| 2 | Interface and its importance, diffusion, settling and osmotic pressure |
| 3 | Liquid-gas and liquid-liquid interfaces |
| 4 | Surface tension and it's measurement |
| 5 | Adsorpsion and absorption at interfaces |
| 6 | Midterm Examination 1 |
| 7 | Gibbs adsorption equations |
| 8 | Classification of adsorpsion and identification |
| 9 | Determination of adsorption by IR and UV |
| 10 | Micelle and spreading |
| 11 | Midterm Examination 2 |
| 12 | Adhesion, cohesion, gas adsorption, solid-liquid interfaces |
| 13 | Contact angle and measuring methods |
| 14 | Charged surfaces, electrical duble layer, electrokinetic potential |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Muammer KAYA | **Date:** | | 11 05 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611603 | **TITLE** | Productivity Analyses in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The concept and importance of productivity;  importance of productivity in mining, factor productivity measurement, the aim productivity, profitability productivity, value-added productivity, productivity measurement of production functions, measurement of production productivity by using breakeven analysis, performance evaluation of mining machines | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce the productivity measurements that can be used for different purpose. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Increased knowledge on productivity measurements for Mining Industry. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge of productivity measurements  Analyzing by selecting the appropriate productivity measurement method  Making the performance evaluation of mining machines  Be able to analyze the production productivity | | | | | | | |
| **TEXTBOOK** | | | | | Konuk, A. (1991). Madencilikte verimlilik analizleri, Anadolu Üniversitesi Müh.Mim.Fak Maden Mühendisliği Bölümü ders notları | | | | | | | |
| **OTHER REFERENCES** | | | | | Önder, S. (2006). Türkiye Bor Madenciliğinde Verimlilik Analizleri, Eskişehir Osmangazi Üniversitesi, Fen Bilimleri Enstitüsü, Doktora tezi | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The concept and importance of productivity |
| 2 | Importance of productivity in mining |
| 3 | Factor productivity measurement (total factor and partial factor productivity) |
| 4 | The aim productivity |
| 5 | Profitability productivity |
| 6 | Midterm Examination 1 |
| 7 | Value-added productivity |
| 8 | Value-added productivity |
| 9 | Productivity measurement of production functions |
| 10 | Productivity measurement of production functions |
| 11 | Midterm Examination 2 |
| 12 | Measurement of production productivity by using breakeven analysis (conditions of certainty and uncertainty) |
| 13 | Measurement of production productivity by using breakeven analysis (conditions of certainty and uncertainty) |
| 14 | Performance evaluation of mining machines |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assoc.Prof.Dr.Seyhan ÖNDER | **Date:** | 13.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611604 | **TITLE** | Gravity Separation |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | x | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Principles of gravity separation,, methods and equipment .Systematic description the different gravity separation methods, application of methods, efficiency determination | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To equip the students with principle and application of gravity methods used in mineral processing. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding of the basic prinsiples and importance of grativy separation in mineral proıcessing | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding the role of gravimetric methods in Mining Industry  Ability to selection of appreciate treatment methods and process design. | | | | | | | |
| **TEXTBOOK** | | | | | Lecturer notes | | | | | | | |
| **OTHER REFERENCES** | | | | | B.A. Wills 1988, Mineral processing Technology, Pergamon press Oxford-UK, 377- 457 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction of gravity separation |
| 2 | Principles of gravity separation |
| 3 | The effect of particle size, specific gravity and shape on the velocity of particle; free and hindered settling |
| 4 | Gravity separators, Jigs |
| 5 | Types of Jigs ; Denver, Coal jigs |
| 6 | Midterm Examination 1 |
| 7 | Pinched sluices and Cones, Spirals |
| 8 | Shaking tables |
| 9 | Bartles- Mozley tables |
| 10 | Heavy medium separation (HSM) |
| 11 | Midterm Examination 2 |
| 12 | Heavy mediums, properties, specifications, Separation equipment |
| 13 | HMS Circuits |
| 14 | Efficiency of heavy medium separation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Prof. Dr. Haldun KURAMA | **Date:** | 5.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611605 | **TITLE** | Special Topics in Fully Mechanized Coal Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (Seminar) | | | | | 1 | | 20 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Design principles of fully mechanized coal panels; introduction to powered support; design principles of powered support; powered support applications in underground conditions; introduction to transportation unit in fully mechanized coal mining; principles of design and selection of face conveyor; face conveyor operation and maintenance applications; principles of longwall face move in fully mechanized coal mining and applications | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to have the students to comprehend fully mechanized coal mining and using equipments, design and selection principles, longwall face move. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Know fully mechanized coal mining and using equipment in detail. Design longwall equipments. Select longwall equipments. Organize longwall face move. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students know fully mechanized longwall equipment in detail.  The students know the design principles of fully mechanized longwall equipment.  Students can choose the fully mechanized longwall equipment.  Students can plan a longwall move. | | | | | | | |
| **TEXTBOOK** | | | | | Peng, S., S. & Chiang, H., S., (1984), Longwall Mining, A Wiley-Interscience Publication, New York, ISBN 0-471-86881-7, p. 708. | | | | | | | |
| **OTHER REFERENCES** | | | | | Destanoğlu, N., vd, (2000), GLİ Tunçbilek-Ömerler Yeraltı Mekanizasyon Uygulaması, TKİ yayınları, Kozan Ofset, Ankara, s 211.Stefenko, R., (1983), Coal Mining Technology Theory and Practice, SME Publication, New York, ISBN 0-89520-404-5, p. 410. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Design principles of fully mechanized coal panels |
| 2 | Design principles of fully mechanized coal panels |
| 3 | Introduction to powered support |
| 4 | Design principles of powered support |
| 5 | Powered support applications in underground conditions |
| 6 | Midterm Examination 1 |
| 7 | Powered support applications in underground conditions |
| 8 | Introduction to transportation unit in fully mechanized coal mining |
| 9 | Principles of design and selection of face conveyor |
| 10 | Face conveyor operation and maintenance applications |
| 11 | Midterm Examination 2 |
| 12 | Principles of longwall face move in fully mechanized coal mining and applications |
| 13 | Principles of longwall face move in fully mechanized coal mining and applications |
| 14 | Principles of longwall face move in fully mechanized coal mining and applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Mahmut YAVUZ | **Date:** | 13/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611606 | **TITLE** | Occupational Health and Safety Analysis in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The definition and purpose of occupational safety  Description of the accident and work accident  Occupational diseases  The organization of occupational safety  Analysis and evaluation of occupational accidents  Risk analysis methods of occupational safety  Personal protective equipment  OHS analysis of the mining sector in Turkey | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to identificate of the most important hazards and risk factors in mining especially in respect of Occupational Health and Safety (OHS) , to analyse the risks by using risk analysis techniques, evaluate and interpret of results. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learn the basic concepts of Occupational Health and Safety (OHS).  Analyze the hazards and risks in mining.  Understand and apply of the commonly used accident risk assessment methods.  Understanding the importance of ergonomics in mining and learning the ergonomic design.  Analysis and interpretation of the accidents in Turkey mining sector.  Learn how to reduce occupational accidents in mining.  Learn how to interpret the risk analysis techniques used by the international studies. | | | | | | | |
| **TEXTBOOK** | | | | | 1.6331 sayılı kanun ve ilgili yönetmelikler2.Özkılıç, Ö, 2005. İş Sağlığı ve Güvenliği Yönetim Sistemleri ve Risk Değerlendirme Metodolojileri, Türkiye İşveren Sendikaları Konfederasyonu, Ankara, 244 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Yiğit, A., 2005, "İş güvenliği ve iş sağlığı", 170 s.2. Güyagüler, T., Karakaş, A. and Güngör, A., 2005; “Occupational Health and Safety in Mining Industry”, 140 pp.3. Maden işletmelerinde iş sağlığı ve güvenliği sempozyumları, 2007,2009.4. Sengupta, M, 1988, Mine Environmental Engineering, Vol:I-II, CRC Press, USA | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The definition and purpose of occupational safety |
| 2 | The definition and purpose of occupational safety |
| 3 | Description of the accident and work accident |
| 4 | Occupational diseases |
| 5 | The organization of occupational safety |
| 6 | Midterm Examination 1 |
| 7 | Analysis and evaluation of occupational accidents |
| 8 | Analysis and evaluation of occupational accidents |
| 9 | Risk analysis methods of occupational safety |
| 10 | Risk analysis methods of occupational safety |
| 11 | Midterm Examination 2 |
| 12 | Personal protective equipment |
| 13 | OHS analysis of the mining sector in Turkey |
| 14 | OHS analysis of the mining sector in Turkey |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assoc.Prof.Dr.Seyhan ÖNDER | **Date:** | 13.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503612601 | **TITLE** | Flowsheet Developing Techniques |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In Turkey and in the world, boron, feldspar, kaolin, coal, gold, silver and thorium concentration methods will be covered and compared. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Reasons for mineral processing, separability curves and concentration methods of many minerals will be described in detail. Turkish and world flowsheets will be compared. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Concentration flowsheets of metallic minerals, industrial minerals and valuable minerals will be grasped. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | In this course, flowsheet development for metals, industrial minerals and valuable minerals will be introduced and described in detail. Comparisons between Turkish and world flowsheets will be performed to see strength and weaknesses. | | | | | | | |
| **TEXTBOOK** | | | | | M. Kaya, Akım Şeması Geliştirme Teknikleri Ders Notları, 2012, ESOGÜ. | | | | | | | |
| **OTHER REFERENCES** | | | | | D.E. Pickeet, Milling Practice in Canada, CIM, 1978. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Reasons for mineral processing, classification according to size |
| 2 | Boron concentration methods, Turkish and world boron concentraion flowsheet |
| 3 | Feldspar concentration methods, Turkish and world feldspar concentraion flowsheet |
| 4 | Kaolin concentration methods, Turkish and world kaolin concentraion flowsheet |
| 5 | Clay concentration methods and reological properties of clays |
| 6 | Midterm Examination 1 |
| 7 | Coal preparation and concentraion plants |
| 8 | Iron pelletization and concentration plants |
| 9 | Mineral separability curves |
| 10 | Gold concentration technology and flowsheets |
| 11 | Midterm Examination 2 |
| 12 | Silver concentration technology and flowsheets |
| 13 | Thorium concentraion technologies |
| 14 | Movies from world mineral processing |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Prof.Dr. Muammer KAYA | **Date:** | 11 05 2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503612602 | **TITLE** | Environmental Problems in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 45 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The legislations involved in mining and environment in the World and Turkey;. Waste management: environmental assessment and management of mine wastes; Assessment of the reliability of tailings dam; Treatment of radioactive miner; Environmental issue and waste management in energy production; water pollution: Effects of flushing of water from mines and plants; Environmental impacts of pollutants migrations in underground water; Environmental impacts of biological and chemical beneficiation methods; Environmental impacts of gold mining and concentration; Environmental impacts of power plants consumed natural gas | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. Analyze problems, and evaluate data .  2. Understand responsibility to their profession and society and the ethics associated with it  3. Gain a knowledge of contemporary issues in mining.  4. Understand and appreciate the issues of environmental responsibility . | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To evaluate the environmental impacts of mining and mineral processing industry | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Aware of conserving our natural resources.  2. Comprehend current mining law and regulations.  3. Gain a talent of evaluating the relationships of mining and environmental on a scientific base.  4. Gain a knowledge of contemporary issues in mining. | | | | | | | |
| **TEXTBOOK** | | | | | Nelson, J.D.. (2003). Tailings and mine waste. Balkema. USA: Proceeding of the tenth int. conference on tailings and mine waste. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Singhal, R., Mehrotra, A. K. (2000). Environmental issues and managements of waste in energy and mineral production. | | | | | | | |

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| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to environmental problems in mining |
| 2 | Solid wastes in mining |
| 3 | Solid wastes in mineral processing |
| 4 | Waste streams and tailings dam |
| 5 | Wastes in chemical and biological processing |
| 6 | Midterm Examination 1 |
| 7 | Preventing/diminishing harmful effects of wastes |
| 8 | Preventing/diminishing harmful effects of wastes |
| 9 | Pollutants in energy production and precautions |
| 10 | Handling of radioactive wastes |
| 11 | Midterm Examination 2 |
| 12 | Recycling of wastes |
| 13 | Reclamation |
| 14 | Environmental impact assessment (EIA) in mining |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** |  | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 503612603 | **TITLE** | Preventing Methods For Dust and Silicosis in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 3 | COMPULSORY  (   ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | To teach the dust occuring and dust problems in Mining activities and elimineting dust problems in mining | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach physical characteristics of dust, dust resources, dust controls, dust hazard, preventing techniques from dust, reduction of dust in underground mining. Students learn importance of dust, dust hazards for health. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To teach the dust occurring and dust problems in Mining activities and eliminating dust problems in mining | | | | | | | |
| **TEXTBOOK** | | | | | SALTOĞLU, S., 1970, Maden İşletmelerinde Toz ve Silikozla Mücadele, İTÜ, Sayı:805.(IN Turkish) | | | | | | | |
| **OTHER REFERENCES** | | | | | Howard L. HARTMAN, 1961, Mine Ventilation and air conditioning,. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Dust and characteristics of dust |
| 2 | Measurements of dust and measurement techniques |
| 3 | Dust resources in underground mines |
| 4 | Dust control techniques in underground mines |
| 5 | Dust occurrence during drilling activities and preventing techniques |
| 6 | Midterm Examination 1 |
| 7 | Dust occurrence and resources in open pit mines |
| 8 | Dust occurrence during the blasting operations |
| 9 | Dust occurrence |
| 10 | Dust occurrence |
| 11 | Midterm Examination 2 |
| 12 | Dust control by using water and importance |
| 13 | Decreasing the dust in mines by ventilation |
| 14 | Special cases for dust and developments |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
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| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
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| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Prof. Dr. Hürriyet AKDAŞ | **Date:** | 09.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503612604 | **TITLE** | System Reliability in Mining System |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Reliability definition, concept ve history. System description. Basic reliability, availability and probability functions. Distribution functions. Mining System. Reliability and availability calculations in mining system. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Reliability and availability applications in mining systems | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Kapur, K.C, Lamberson, L.R., Reliability in Engineering Design, Jhon W. And Sons,1987.Kara, İ., Olasılık,Bilim Teknik Yayınevi, 2000. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | System concept |
| 2 | Basic Probability |
| 3 | Basic Probability |
| 4 | Reliability definition, concept |
| 5 | Reliability functions |
| 6 | Midterm Examination 1 |
| 7 | Mining System |
| 8 | Distribution functions in reliablitiy |
| 9 | Distribution functions in reliablitiy |
| 10 | Markov process |
| 11 | Midterm Examination 2 |
| 12 | Application in mining systems |
| 13 | Application in mining systems |
| 14 | Application in mining systems |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Hüseyin Ankara | **Date:** | 30.April.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503612605 | **TITLE** | Modern Rock Blasting Techniques |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | - | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | x | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to have the students provide the beginner as well as the professional with a beter understanding of today’s blasting technology in mining operation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Rock fragmentation process by blasting, influence of rockmass characteristics on blasting, evaluation of blasting results, initiation system sequence and delay timing, designing surface blasting rounds, tunnel blasting, blasting in underground coal mines, underground hard rock blasting, specialised blasting operations, controlled blasting. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Blasting should be designed by considering the economic efficiency and safety accordance with science and technical. In this course, about blasting techniques and applications in open pit mines, underground mines, tunnel, channel etc. given technical information. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Learn explosives, the ignition systems and components  2.Learn mechanical fragmentation of rock with explosives  3. Learn techniques of bench blasting, trenching, tunnel blasting  4.Recognize the blast-induced environmental problems  5.Use a device practically for measuring the blast-induced vibrations  6.Learn techniques of estimation and measurement of the ground vibrations.  7.Learn the standards related with the subject | | | | | | | |
| **TEXTBOOK** | | | | | Erkoç Ö.M, Kaya Patlatma Tekniği, 1990. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Engineering Rock Blasting Operations, Sushil Bhandari, Department of Mining Engineering, J.N.V. University, Jodhpur, India, A.A. Balkema/Rotterdam/Brookfield, 1997.2. Surface Blast Design, Calvin J. Konya and Edward J. Walter, Prentice Hall, Englewood Cliffs, New Jersey, 1990.3. The Modern Technique of Rock Blasting, U. Langefors and Kihlström, Stockholm, 1967 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The Importance of Drilling and Blasting |
| 2 | Definition and Characteristics of Explosives |
| 3 | Explosive Products and Ignition Systems |
| 4 | Ignition systems and components |
| 5 | Rock Structures in Blasting Technique, Theory of Fracture of Rocks |
| 6 | Midterm Examination 1 |
| 7 | Surface Blasting and Components |
| 8 | Bench Blasting |
| 9 | Channel Blasting |
| 10 | Specific Blasting Applications |
| 11 | Midterm Examination 2 |
| 12 | Tunnel Blasting |
| 13 | Tunnel Blasting |
| 14 | Blast Induced Ground Vibrations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assoc.Prof.Dr. Hakan AK | **Date:** | 11.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503611608 | **TITLE** | Stability Analysis with Numerical Methods in Mining |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 4 | | 80 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (Seminar) | | | | |  | |  |
| **Final Examination** | | | | | | | 20 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Finite element method and applications, Finite Difference Method and applications, Boundary element method and applications, Slope Stability analysis. learning to use computer softwares and to perform stability analyis by using these softwares | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Within the scope of this course, it is targeted that students will learn numerical methods used in stability analysis and be able to perform stability nalysis using computer softwares based on these methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students taking the course will have the knowledge of numerical methods and softwares used in underground structure stability analysis. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Finite element method and applications,  Finite Difference Method and applications,  Boundary element method and applications,  Slope Stability analysis. | | | | | | | |
| **TEXTBOOK** | | | | | Course notes, software manuals and tutorials | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Elasticity theory |
| 2 | Stresses and Strain |
| 3 | Finite Element Methods |
| 4 | Phases 2D and 3D software |
| 5 | Finite Element Method Application |
| 6 | Midterm Examination 1 |
| 7 | Finite Difference Methods |
| 8 | FLAC3D software |
| 9 | Finite Difference Method Application |
| 10 | Boundary Element Method |
| 11 | Midterm Examination 2 |
| 12 | Examine3D software |
| 13 | Boundary Element Method Application |
| 14 | Slope stability analysis and Slide software |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | | **CONTRIBUTION LEVEL** | | |
| **NO** | | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for specialized level solution of problems in mining and mineral processing. | |  |  |  |
| **LO 2** | Ability to develop new and original ideas and methods and innovative solutions in system, part or process designing. | |  |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies at highly specialized level. | |  |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | |  |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic at highly specialized level, and present her/his findings through written technical reports and oral presentation. | |  |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of highly specialized level engineering problems. | |  |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | |  |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | |  |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | |  |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | |  |  |  |

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| **Prepared by :** | Assit. Prof. Dr. Mehmet AKSOY | **Date:** | 20/11/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | Joint Course for the Institute | **SEMESTER** | Fall-Spring |

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| **COURSE** | | | |
| **CODE** | 501011101 | **TITLE** | The Scientific Research Methods and Its Ethics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| MSc-  Ph.D | 3 | | 0 | 0 | | | 3+0 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 1,5 | | 1,5 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Science, the scientific thought and other fundamental concepts, the scientific research process and its techniques, Methodology: Data Collecting-Analysis-Interpretation, Reporting the scientific research (Preparation of a thesis, oral presentation, article, project), Ethics, Ethics of scientific research and publication. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main objectives are: To examine the foundations of scientific research and the scientific research methods, to teach the principles of both the methodology and the ethics, to realize the process on a scientific research and to evaluate the results of research, to teach reporting the results of research (on a thesis, presentation, article). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Applying the scientific research methods and the ethical rules in their professional life. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Gaining awareness on ethical principles at basic research methods, becoming skillful at analyzing and reporting the data obtained in scientific researches, being able to have researcher qualification with occupational sense of responsibility, having the scientific and vocational ethics’ understanding and being able to defend this understanding in every medium. | | | | | | | |
| **TEXTBOOK (Turkish)** | | | | | Karasar, N. (2015). Bilimsel Araştırma Yöntemi. Nobel Akademi Yayıncılık, Ankara. | | | | | | | |
| **OTHER REFERENCES** | | | | | **1-**Büyüköztürk, Ş., Çakmak, E. K., Akgün, Ö. E., Karadeniz, Ş., Demirel, F. (2012). Bilimsel Araştırma Yöntemleri. Pegem Akademi Yayınevi, Ankara.  **2-**Tanrıöğen, A. (Editör). (2014). Bilimsel Araştırma Yöntemleri. Anı Yayıncılık, Ankara.  **3-**Türkiye Bilimler Akademisi Bilim Etiği Komitesi. Bilimsel Araştırmada Etik ve Sorunları, Ankara: TÜBA Yayınları, (2002).  **4-**Ekiz, D. (2009). Bilimsel Araştırma Yöntemleri: Yaklaşım, Yöntem ve Teknikler. Anı Yayıncılık, Ankara.  **5-**Day, Robert A. (Çeviri: G. Aşkay Altay). (1996). Bilimsel Makale Nasıl Yazılır ve Nasıl Yayımlanır?, TÜBİTAK Yayınları, Ankara.  **6-**Özdamar, K. (2003). Modern Bilimsel Araştırma Yöntemleri. Kaan Kitabevi, Eskişehir.  **7-**Cebeci, S. (1997). Bilimsel Araştırma ve Yazma Teknikleri. Alfa Basım Yayım Dağıtım, İstanbul.  **8-**Wilson, E. B. (1990). An Introduction to Scientific Research. Dover Pub. Inc., New York.  **9-**Çömlekçi, N. (2001). Bilimsel Araştırma Yöntemi ve İstatistiksel Anlamlılık Sınamaları. Bilim Teknik Kitabevi, Eskişehir. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts) |
| 2 | Science, scientific thought and other basic concepts (University, history of university, higher education, science, scientific thought and other related concepts) |
| 3 | The scientific research and its types (Importance of the scientific research, types of science, scientific approach) |
| 4 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 5 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 6 | The scientific research process and its techniques (Access to the scientific knowledge, literature search, determining the research issue, definition of the problem, planning) |
| 7 | The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data) |
| 8 | The method and the approach: Collecting, analysis and interpretation of the data (Data, data types, measurement and measurement tools, collecting data, organizing data, summarizing data, analysis and the interpretation of data) |
| 9 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 10 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 11 | Finalizing the scientific research (Reporting, preparing the thesis, oral presentation, preparing an article and a project) |
| 12 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 13 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 14 | Ethics, scientific research and publication ethics (Ethics, rules of ethics, occupational ethics, non-ethical behaviors) |
| 15,16 | Mid-term exam, Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INSTITUTE’S GRADUATE PROGRAMME’S LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (M.Sc.-Ph.D.)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Having the scientific and vocational ethics’ understanding and being able to defend this understanding in every medium. | | |  | |  |  |
| **LO 2** | Being able to have researcher qualification with occupational sense of responsibility. | | |  | |  |  |
| **LO 3** | Becoming skillful at analyzing and reporting the data obtained in scientific researches. | | |  | |  |  |
| **LO 4** | Gaining awareness on ethical principles at basic research methods. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | | 14.06.2016 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503602504 | **TITLE** | Open Pit Mines Production Planning |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Ultimate Pit Limit Analysis, Concept of Cutoff Grade and Optimization, Capacity Optimization, Open Pit Mining Equipment Selection. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce open pit mines production planning. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Open Pit Block Modelling  2.Moving Cones Method  3.Dynamic Programming Method  4.The Concept of Cotoff Grade  5.Cutoff Grade Optimization Methods  6.Capacity Optimization  7.Open Pit Mining Equipment Selection | | | | | | | |
| **TEXTBOOK** | | | | | 1. Eskikaya, Ş., Karpuz, C., Hindistan M.A. ve Tamzok N., (2005), Açık Ocak İşletmeciliği El Kitabı, TMMOB Maden Mühendisleri Odası Yayını, ANKARA.2. Parlak, T, (1993), Uygulamalı Kömür Açık İşletmeciliği, TKİ Yayınları, Bursa. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Seymour, F.H., (1985), Open Pit Limit Analysis on A Microcomputer, Master of Science Thesis, Colorado School of Mines, USA.2. Köse, H., Yalçın, E., Şimşir, F., Konak, G., Onargan, T. ve Kızıl, S., (2006), Açık İşletme Tekniği, Dokuzeylül Üniversitesi Müh. Fak. Yayınları, No:256, İzmir. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Open Pit Block Modelling |
| 2 | Open Pit Block Modelling |
| 3 | Moving Cones Method |
| 4 | Dynamic Programming Method |
| 5 | Dynamic Programming Method |
| 6 | Midterm Examination 1 |
| 7 | The Concept of Cotoff Grade |
| 8 | Cutoff Grade Optimization Methods |
| 9 | Cutoff Grade Optimization Methods |
| 10 | Capacity Optimization |
| 11 | Midterm Examination 2 |
| 12 | Open Pit Mining Equipment Selection |
| 13 | Open Pit Mining Equipment Selection |
| 14 | Open Pit Mining Equipment Selection |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Adnan KONUK | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | MODELLING AND SIMILATION APPLICATIONS IN MINERAL PROCESSING |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | | x | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | | 2 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Teaching the model structures of size reduction, classification and processing unit operations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course aims to describe the general modelling techniques and teaching the model strutures of size redution, classification and concentration unit operations. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1.Ability to get the general modeling techniques in ore dressing and mineral processing,  2. Learns the role of software in the modeling of mineral processing and enrichment processes,  3.To have the knowledge about the use of various modelling and simulation programs,  4.Learning the mathematical modelling , they can produce solutions to the problems faced in this area in the future.  5.To have the knowledge needed for postgraduate studies and research in the scientific modelling. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Mathematical Modelling Techniques Mathematical Modelling Techniques  2.Modelling of grinding circuits Modelling of grinding circuits  3.Modelling of classifying circuits Modelling of classifying circuits  4.Modelling of processing circuits Modelling of processing circuits | | | | | | | |
| **TEXTBOOK** | | | | | Lecture notes | | | | | | | |
| **OTHER REFERENCES** | | | | | T. Napier-Munn, 1996, Mineral Comminution Circuits: Their Operation and Optimisation, Julius Kruttschnitt Mineral Research Centre, 1996 - 413 pagesA. Mular, R.B. Bhappu, 1980, Mineral Processing Plant Design, Society of Mining Engineers of the American Institute of Mining, Metallurgical, and Petroleum Engineers, 1980 - Technology & Engineering - 946 pagesR.P. King, 2001, Modelling and Simulation of Mineral Processing Systems, Elsevier 403 pages | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to modeling, terminology in modeling, mass balance |
| 2 | Crushing model structures |
| 3 | Modelling Exercise on a Typical Crushing Circuit |
| 4 | Classification, model structures |
| 5 | Modelling Exercise on a Classification Circuit Case Study |
| 6 | Grinding Model Structures |
| 7 | Modelling Exercise on a Grinding Circuit-Case Study |
| 8 | 1st midterm exam |
| 9 | Beneficiation Circuits Model Structures |
| 10 | Modelling Exercise on Various Beneficiation Circuits |
| 11 | Industrial Case Studies and Discussions |
| 12 | Industrial Case Studies and Discussions |
| 13 | Introduction to Simulation using the model structures |
| 14 | Testing of different simulation scenarios |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Arş Gör Dr. Hasan Serkan Gökçen | **Date:** | | 30/10/2019 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Rheology of Mineral Suspensions |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | | 1 | | 15 |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Comprehending the rheology importance in mineral processing, the explanation of the basic terms which are necessary to understand the rheology like newtonian/non-newtonian flows and viscosity, the rheology importance on the transportation and dewatering of the product obtained before and after the mineral processing, impact mechanisms in rheology and DLVO relationship,mineral processing processes which rheology is imporatnt and their applications | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Main object of the course is having enough information about the mineral rheology before and after mineral processing, understanding its importance in the process,evaluating and control the rheology performance | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To have enough knowledge to manage the critical units of mineral processing plants where rheology is important and have ability to apply it in the plant | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To have information about rheology, to understand the importance of rheology in mineral processing, able to manage the mineral process plant performance based on rheology | | | | | | | |
| **TEXTBOOK** | | | | | H.A. Barnes, J.F. Hutton,K. Walters F.R.S., 1989, An Introduction to Rheology, Elsevier C.W., Macosko, 1994 , Rheology Principles, Measurements, and Applications, Wiley-VCH R. Lapasin, S. Pricl, 1995, Rheology of Industrial Polysaccharides, Theory and Applications, Springer US J. Mewis, N.J. Wagner, 2012, Colloidal Suspension Rheology, Cambridge University Press | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition and importance of rheology in mineral processing, rheology terms; newtonian/non-newtonian flows, apparent/ kinematical/dynamic/relative viscosity, viscoelasticity, stability, thixotropy, shear stress/rate, yield stress, flow models |
| 2 | Definition and importance of rheology in mineral processing, rheology terms; newtonian/non-newtonian flows, apparent/ kinematical/dynamic/relative viscosity, viscoelasticity, stability, thixotropy, shear stress/rate, yield stress, flow models |
| 3 | Surface chemistry of minerals and its importance on rheology; dispersion, coagulation, solid-solid interactions and correlation of these effects on rheology-1 |
| 4 | Surface chemistry of minerals and its importance on rheology; dispersion, coagulation, solid-solid interactions and correlation of these effects on rheology-1 |
| 5 | Rheometers/viscometers, and additives controlling the rheology of mineral suspensions |
| 6 | Effect of rheology on initial mineral processes: grinding and classification |
| 7 | Effect of rheology on mineral processing: dense medium separation, hydrocycloning and flotation |
| 8 | Effect of rheology on mineral processing: dense medium separation, hydrocycloning and flotation |
| 9 | Effect of rheology on transportation and dewatering processes of mineral suspensions/products |
| 10 | Industrial application of rheology: coal-water slurry technology. |
| 11 | Coal-oil slurry technology |
| 12 | Water/solvent based bentonite slurries, some applications on bentonite and sepiolite |
| 13 | Rheology of mineral based additives in paint industry. |
| 14 | Rheology in ceramic slips/boron pastes and cement |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Develop skills to exploit the fundamental knowledge of mathematics, science and engineering acquired during B.Sc. degree for advanced solution of problems in mining and mineral processing. | | |  | |  |  |
| **LO 2** | Demonstrate analytical skills at advanced level to identify, analyse, and solve engineering problems in mining and mineral processing applications. | | |  | |  |  |
| **LO 3** | Design and conduct theoretical and experimental studies, and analyse and interpret the data generated from these studies. | | |  | |  |  |
| **LO 4** | Develop and evaluate mining and minerals engineering processes and projects. | | |  | |  |  |
| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
| **LO 7** | Develop an understanding of global an social impacts of mining and mineral processing solutions, an awareness of the responsibilities for the exploitation of natural resources in most efficient and appropriate ways, and for professional codes of conduct and engineering ethics. | | |  | |  |  |
| **LO 8** | Comprehend the importance of life-long learning for professional development, follow new developments in mining and minerals engineering and effectively exploit information resources. | | |  | |  |  |
| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Res. Asst. Dr. Işıl Tokcan | **Date:** | | 13.11.2019 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **MINING ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Systematic Analysis, Modeling and Simulation of Ore Beneficiation Plants |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 0 | |  |  | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | NOT EXIST | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Purpose and importance of ore beneficiation, application principles of gravity concentration, Advantages of gravity concentration, advances in gravity concentration, modern gravity concentration methods and comparison of methods. For this purpose, if there is a difference in physical properties of the minerals, it was revealed the ways to be followed to make the separation in fine size. The beneficiation principles of Knelson concentrator, Falcon concentrator, multi gravity separator (MGS) and other modern gravity concentration devices will be discussed. Then, how can do the design the related concentration plant and determining the product features by means of package programs, are within the scope of this course. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Today, due to the increasing demand, productive and high-grade mineral deposits are depleted. With this situation caused by consumption, the tendency towards low grade and fine size materials has increased. As a result of two important trends, the necessity of processing low grade and fine size materials in ore beneficiation plants has come to the fore as a worldwide evaluation. As a result of this evaluation, new devices are emerged that will beneficiation fine sizes depending on their physical properties. To gain knowledge about the development of current gravity enrichment methods and the application principles and application areas of these methods, to gain the ability to investigation and evaluate modern gravity methods from a technical and economic point of view. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The importance of physical properties in ore beneficiation  Differences from traditional methods  Increasing students' application abilities with industrial applications of ore beneficiation  Making statistical analysis by evaluating the ore beneficiation results  How to make modeling and simulation applications with the obtained data is provided as a contribution. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The importance of ore beneficiation  Advances in gravity concentration methods  Advantages and disadvantages of modern gravity methods  Factors limiting the application of new gravity methods  Comparison of modern gravity separation methods  Gaining the ability to choose between methods  Evaluation of systematic analysis results | | | | | | | |
| **TEXTBOOK** | | | | | Barry A. Wills ve Tim Napier-Munn. Mineral Processing Technology, Elsevier Science & Technology Books | | | | | | | |
| **OTHER REFERENCES** | | | | | Ore Beneficiation-gravity concentration Lecture Notes, Yakup UMUCU 2011.Minerals Engineering, Elsevier.I.J. Mineral Processing Tecnology, Elsevier. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Preliminary information about ore beneficiation based on physical property difference |
| 2 | The importance of particulate mechanics in methods are made beneficiation according to physical properties |
| 3 | Traditional devices are made beneficiation according to physical property difference |
| 4 | Problems encountered in the beneficiation of fine size |
| 5 | Fundamentals of modern gravity concentration practice |
| 6 | Multi Gravity Separator (MGS) and applications |
| 7 | Knelson concentrator and applications |
| 8 | Falcon concentrator and applications |
| 9 | Kelsey jig and applications |
| 10 | Magnetic Seperation |
| 11 | Recent developments in magnetic and electrostatic separators |
| 12 | Investigation and performance measurements of plants that make beneficiation according to the difference of physical properties in fine size |
| 13 | Plant design and simulation to improve product quality in gravity concentration |
| 14 | General evaluation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MINING ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
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| **LO 5** | Independently conduct scientific and technical research on a topic, and present her/his findings through written technical reports and oral presentation. | | |  | |  |  |
| **LO 6** | Utilize modern engineering, computer modelling and simulation tools for development of mining and minerals engineering projects and processes, and solution of complex engineering problems. | | |  | |  |  |
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| **LO 9** | Work effectively as an individual, in teams and multidisciplinary settings. | | |  | |  |  |
| **LO 10** | Have theoretical and practical knowledge in mining and mineral processing at advanced level | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Yakup UMUCU | **Date:** | | 19.11.2021 | | | |

**Signature**: