**GEOLOGICAL ENGINEERING MSc PROGRAMME**

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| **First Year** | | | | | | |
| **I. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501001101 | [THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS](#C100) | 7.5 | 3+0+0 | 3 | **C** | Turkish |
| 503401504 | [NEOTECTONICS](#EN1) | 7.5 | 3+0+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | Elective Course-2 | 7.5 | 3+0+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+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | Elective Course-5 | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402001 | Seminar | 7.5 | 0+1+0 | - | **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 |
| 503401702 | MSc THESIS STUDY | | 25 | | 0+1+0 | - | **C** | Turkish |
| 503401703 | SPECIALIZATION FIELD COURSE | | 5 | | 3+0+0 | - | **C** | Turkish |
|  | | Total of III. Semester | 30 |  | |  |  |  | |
| **IV. Semester** | | | | | | | | | |
| Code | | Course Title | ECTS | T+P | | Credit | C/E | Language | |
| 503401702 | | MSc THESIS STUDY | 25 | 0+1+0 | | - | **C** | Turkish | |
| 503401703 | | SPECIALIZATION FIELD COURSE | 5 | 3+0+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 |
| 503401508 | [ACTIVE FAULTS OF TURKEY AND SEISMICITY](#EN2) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412605 | [ACTIVE STRIKE-SLIP FAULTS](#EN3) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402513 | [ADVANCED HYDROCHEMISTRY AND WATER](#EN4)  [QUALITY](#EN4) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401512 | [ADVANCED HYDROGEOLOGY](#EN5) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401511 | [ADVANCED IGNEOUS PETROGRAPHY](#EN13) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402509 | [ADVANCED ORE DEPOSITS](#EN18) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401509 | [ADVANCED ORE GEOLOGY](#EN17) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401519 | [ADVANCED ORE MICROSCOPY](#EN16) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402514 | [APPLIED CHEMICAL AND ISOTOPIC GROUNDWATER HYDROLOGY](#EN7) | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | [PLATE TECTONİCS AND MAGMATİSM](#EN43) | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | [PHYSICAL VOLCANOLOGY](#EN44) | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | [SHALLOW GEOPHYSİCAL METHODS İN ACTİVE TECTONİC INVESTİGATİONS](#EN45) | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | [VOLCANOSEDİMENTARY ENVİRONMENTS](#EN46) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401505 | [ARCHAEOSEISMOLOGY](#EN8) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402506 | [BASIN ANALYSIS](#EN9) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401506 | [CARBONATE AND EVAPORITE MIN.DEPOSITION ENVIRONMENT](#EN22) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412601 | [CLAY GEOLOGY](#EN23) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402505 | [CLAY MINERALOGY](#EN24) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503411603 | [COMPUTER APPLICATIONS IN GEOCHEMISTRY](#EN20) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401515 | [DYNAMICS OF CONTINENTAL DEPOSITIONAL ENVIRONMENTS](#EN10) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401525 | [ENGINEERING GEOLOGY CASE STUDIES](#EN11) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401521 | [ENGINEERING ROCK MECHANIC](#EN12) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402519 | [FIELD INVESTIGATION AND GEOTECHNICAL EVALUATION](#EN14) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401523 | [FLUVIAL GEOMORPHOLOGY](#EN15) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401606 | [GROUND IMPROVEMENT](#EN37) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401507 | [INSTRUMENTAL METHODS OF ANALYSIS](#EN6) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503411602 | [ISOTOPE GEOLOGY](#EN19) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402504 | [PALEOSEISMOLOGY](#EN25) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412607 | [PALYNOLOGICAL APPLICATIONS](#EN26) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401522 | [PALYNOLOGY](#EN27) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401503 | [PETROLOGY AND PETROCHEMISTRY](#EN28) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401524 | [PHYSIOGRAPHIC ANALYZE METHODS](#EN29) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401516 | [PRINCIPLES OF SEQUENCE STRATIGRAPHY](#EN30) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401514 | [QUATERNARY I](#EN31) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412606 | [QUATERNARY II](#EN32) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401513 | [SEDIMENTARY ENVIRONMENTS AND FACIES ANALYSIS I](#EN33) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402517 | [SEDIMENTARY ENVIRONMENTS AND FACIES ANALYSIS II](#EN34) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412603 | [SEQUENCE STRATIGRAPHY IN DEEP SEA SYSTEMS](#EN35) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402520 | [SLOPE STABILITY](#EN36) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503401517 | [STABLE ISOTOPES IN GEOLOGY](#EN21) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402512 | [TECTONICS OF TRAVERTINES](#EN38) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503402521 | [VOLCANIC SYSTEMS IN TURKEY](#EN39) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 503412608 | [VOLCANOSEDIMENTARY ENVIRONMENTS](#EN40) | 7.5 | 3+0+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** | **GEOLOGICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503401504 | **TITLE** | Neotectonics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  ( x ) | | 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 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Research the structural component which are built up as a consequences of neotectonic regime | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To understand our countries neotectonic position, the importance, the reason of neotectonic studies and to have a knowledge of general properties of neotectonic structures. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To understand the nature of structure which has a tectonic origin will be a contribution to envision of natural event results concern to the society | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The person who wants to take a proficiency at the subject of neotectonic are going to be a knowledge of this subject | | | | | | | |
| **TEXTBOOK** | | | | | Every kind of neotectonic books | | | | | | | |
| **OTHER REFERENCES** | | | | | Every kind of article or scientific publication related to archaeoseismology | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | The importance of neotectonic studies |
| 3 | Related disciplines with neotectonics |
| 4 | The importance of dating at neotectonics |
| 5 | Dating techniques |
| 6 | Midterm Examination 1 |
| 7 | Neotectonic cracks |
| 8 | Normal Faults |
| 9 | Thrust Faults |
| 10 | Strike-Slip Faults |
| 11 | Midterm Examination 2 |
| 12 | Neotectonic situation of our country |
| 13 | Examples of archaeoseimological studies at foreign countries |
| 14 | General assessment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Erhan Altunel | **Date:** | | 21.4.2015 | | | |

**Signature**:

**T.R.**

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**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401508 | **TITLE** | Active faults of Turkey and seismicity |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 40 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | North Anatolian Fault Zone, East Anatolian Fault Zone, Dead Sea Fault Zone, Western Anatoian extensional region faults and Turkey secondary faults;  -geometrical features like position, extention and width ,  -characteristic features like earthquake magnitude, recurrance time, slip rate and offset. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain a knowledge on active faults in Turkey which is the one of the most active regions of the world | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The person who wants to take a proficiency about seismicity of Turkey are going to be a knowledge of this subject. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. design and conduct experiments as well as to analyze and interpret data  2. identify, formulate, and solve engineering problems  3. understand the broad education necessary to understand the impact of engineering solutions in a global and societal context  4. use techniques, skills, and modern engineering tools necessary for engineering practic | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Neotectonic of Turkey (Bozkurt, 2001)2. Recent papers on active faults of Turkey3. Tectonic Geomorphology (Burbank and Anderson, 2001)4. Geomorphology I-II (Erinç et al., 2000) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Neotectonic studies and active tectonics |
| 3 | Active faults and parameters |
| 4 | Methods in active fault studies |
| 5 | Neotectonic situation of our country |
| 6 | Midterm Examination 1 |
| 7 | Active faults of our country and using methods |
| 8 | East Anatolian Collision Regime |
| 9 | Central Anatolian Ova Province |
| 10 | Western Anatolian Extension Area |
| 11 | Midterm Examination 2 |
| 12 | North Anatolian Fault Zone |
| 13 | East Anatolian Fault Zone and Dead Sea Fault Zone |
| 14 | Normal faults of western Anatolia |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Doç. Dr. Volkan KARABACAK | **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** | **GEOLOGICAL ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503402601 | **TITLE** | Active strike-slip faults |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | |  |  | | | 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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | | 1 | | 40 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Active strike-slip fault zones;  -general surface features  -geometrical features like position, extension and width ,  -characteristic features like earthquake magnitude, recurrence time, slip rate and offset. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain knowledge about general features of active strike-slip fault, to introduce active strike-slip fault around the world and our country | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The person who wants to take a proficiency about seismicity of Turkey are going to be a knowledge of this subject. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. design and conduct experiments as well as to analyze and interpret data  2. identify, formulate, and solve engineering problems  3. understand the broad education necessary to understand the impact of engineering solutions in a global and societal context  4. use techniques, skills, and modern engineering tools necessary for engineering practic | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Active Tectonics2. Continental strike-slip faults (Hancock)3. Tectonic Geomorphology (Burbank and Anderson, 2001)4. Paleoseismology (McCalpin) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Strike-slip faults |
| 3 | Active faults and parameters |
| 4 | Active strike-slip faults |
| 5 | Surface and offset physiographic features |
| 6 | Midterm Examination 1 |
| 7 | Pull-apart basins |
| 8 | Triple junctions and general features |
| 9 | Geomorphological studies on active strike-slip faults |
| 10 | Paleoseismological studies on active strike-slip faults |
| 11 | Midterm Examination 2 |
| 12 | Archeoseismological studies on active strike-slip faults |
| 13 | Important active strike-slip faults around the world |
| 14 | Active strike-slip faults from Turkey |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Doç. Dr. Volkan KARABACAK | **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** | **GEOLOGICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503402513 | **TITLE** | Advanced Hydrochemistry and Water  Quality |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  | 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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 35 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Groundwater quality, drinking water standards, groundwater sampling, rainwater, solution of minerals, ion exchange and sorption, corbonate minerals, solute transport in aquifer | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To give advanced knowledge on groundwater quality and standarts for drinking. to gain the phlisophy of groundwater pollution mechanism in field. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To understand the mechanism of the pollution in aquifer and to evaluate in detailed more sophisticated analyses | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate conclude and apply this knowledge in geological engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve this problem and ability to apply innovative methods for solutions, ability to design and apply the theorotical, experimental and modelling resource activities, having the social, scientific and ethical responsibilities in all stage of collecting, interpretating and presenting the related data and in all professional activities, ability to complete and apply limited or insufficient datathrough scientific methods and ability to use together the knowledge of different disciplines. | | | | | | | |
| **TEXTBOOK** | | | | | A.J. Postma, Geochemistry, Groundwater and Pollution, Amsterdam, 1992.L. Doğan, Hidrojeolojide Su Kimyası, DSİ Yayını, Yayın No: 906,Ankara,1981. | | | | | | | |
| **OTHER REFERENCES** | | | | | J.I. Drever, The Geochemistry of Natural Waters Surface and Groundwater Environments, Third Edition, Prentice-Hall, New Jersey-USA, 1997P. B. Bedient, H.S. Rifai, C. J. Newell, Greoundwater Contamination, Prenticel-Hall, New Jersey-USA, 1994.F. G. Bell, Environmental Geology (Principles and Practice), Blackwell Science, Edinburgh, 1998.J. E. Andrews, P. Brimblecombe, T. D. Jickells and P. S. Liss, An Introduction to Environmental Chemistry, Blackwell Science, Edinburgh, 1996 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to groundwater geochemistry |
| 2 | Chemical analyses of groundwater |
| 3 | From rainwater to groundwater |
| 4 | Solubility of minerals |
| 5 | Mass action constant and termodinamics |
| 6 | Midterm Examination 1 |
| 7 | Carbonate minerals carbonate equilibria, calcite, dolomite solubility in field |
| 8 | Cation exchange in salt/fresh water intrussion |
| 9 | Salt water mixing |
| 10 | Ion exchange and sorption |
| 11 | Midterm Examination 2 |
| 12 | Groundwater flow, retardation factor |
| 13 | Organic pollutions |
| 14 | Advection, Dispersion, Diffusion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | | **3**  High | **2**  Mid | **1**  Low | |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | |  |  |  | |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | | |  |  |  | |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | | |  |  |  | |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | | |  |  |  | |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | | |  |  |  | |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | | |  |  |  | |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | | |  |  |  | |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | | |  |  |  | |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | | |  |  |  | |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | | |  |  |  | |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | | |  |  |  | |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | | |  |  |  | |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | | |  |  |  | |
| **Prepared by :** | | | Asist.Prof.Dr.Didem YASİN | **Date:** | 05.21.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 3401512 | **TITLE** | Advanced Hydrogeology |

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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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 35 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Advanced hydrologic and hydrogeologic concepts, hydrogeologic data in the field detailed, view of hydrogeologic, karst hydrogeology, tracer techniques, what is hydrogeological mapping? | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain for students hydrogeological surveys in field and tracer techniques. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To give student hydrogeological investigation methods and prepearing of the final report of hydrogeologic research | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate conclude and apply this knowledge in geological engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve this problem and ability to apply innovative methods for solutions, ability to design and apply the theorotical, experimental and modelling resource activities, having the social, scientific and ethical responsibilities in all stage of collecting, interpretating | | | | | | | |
| **TEXTBOOK** | | | | | R.A.Freeze and J. A. Cherry, Groundwater, Prentice –Hall, Englewood Cliffs, N.J.,1979.R.A.Freeze and J. A. Cherry, (Çeviren Kamil Kayabalı), Yeraltı suyu, Gazi Kıtapevi, Ankara, 2003K. Erguvanlı ve E. Yüzer, Yeraltısuları Jeolojisi (Hidrojeoloji),İTÜ Maden Fak., İstanbul, 1973. | | | | | | | |
| **OTHER REFERENCES** | | | | | C. W. Fetter, JR., Applied Hydrogeology, Columbus, Ohio,1980.A. Şahinci, Karst, İzmir, 1991DSİ, Su Sondajı Eğitim Programı-I, Ankara, 1991.DSİ, Hidrolojide İzotoplar ve Nükleer Teknikler, Ankara, 1987 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General view of hydrogeology |
| 2 | Hydrogeological cycle and origin, occurrence and management |
| 3 | Purposed of hydrogeologic investigations |
| 4 | Hydrogeologic Research Planning |
| 5 | Geologic and Hydrogeologic data |
| 6 | Midterm Examination 1 |
| 7 | Hydrochemical data |
| 8 | Evaluation of all data |
| 9 | Karst Hydrogeology |
| 10 | General description of karst hydrogeology |
| 11 | Midterm Examination 2 |
| 12 | Research techniques in karst hydrogeology |
| 13 | Tracer techniques in groundwater research |
| 14 | Artifical tracers |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asist. Prof. Dr.Didem YASİN | **Date:** | | 21.05.2015 | | | |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401507 | **TITLE** | Instrumental Methods of 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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (Seminar) | | | | | 1 | | 30 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | X-ray diffraction method (XRD)  Differantial Thermal Analysis and Thermal Gravimetry (DTA-TG)  Infrared Spectroscopy (IR)  Scanning Electron Microskope (SEM-EDX)  Chemical analysis  Sample preparation methods for XRD, DTA-TG, IR ve SEM-EDX | | | | | | | |
| **COURSE OBJECTIVES** | | | | | X-ray diffraction method (XRD)  Differantial Thermal Analysis and Thermal Gravimetry (DTA-TG)  Infrared Spectroscopy (IR)  Scanning Electron Microskope (SEM-EDX)  Chemical analysis  Sample preparation methods for XRD, DTA-TG, IR ve SEM-EDX | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Analys methods for mineralogical idenification | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | X-ray diffraction method (XRD)  Differantial Thermal Analysis and Thermal Gravimetry (DTA-TG)  Infrared Spectroscopy (IR)  Scanning Electron Microskope (SEM-EDX)  Chemical analysis  Sample preparation methods for XRD, DTA-TG, IR ve SEM-EDX write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Saka A. H. (1997) Mineralojik Analizlerde X-Işınları Toz Kırınım Yönteminin Temel Prensipleri ve Laboratuar Şartlarının Standardizasyonu. Maden Tetkik ve Arama Genel Müdürlüğü, Ankara. | | | | | | | |
| **OTHER REFERENCES** | | | | | Carroll D. (1970) Clay Minerals: A Guide to Their X-ray Identification. The Geological Society of America.Grim R. E. (1968) Clay Mineralogy. MacGraw-Hill Internation Series in the Earth adn Planatary Sciences.McGraw-Hill Book Company. Sydney, 596s.Clays and Clay MineralsClay MineralsCanadian MineralogistNues Jahrbuch für Mineralogie, Monatshfte ve AbhandlungenMineralium DepositaCarbonate and EvaporiteSedimentary Geology…etc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | X-ray diffraction method (XRD) |
| 2 | X-ray diffraction method (XRD) Interpretation of the analysis results |
| 3 | Sample preparation technique for X-ray diffraction method (XRD) |
| 4 | Differential Thermal Analysis ve Thermal Gravimetry (DTA-TG) |
| 5 | Sample preparation technique for Differential Thermal Analysis ve Thermal Gravimetry (DTA-TG) |
| 6 | Midterm Examination 1 |
| 7 | Infrared Spectroscopy (IR) |
| 8 | Sample preparation technique for Infrared Spectroscopy (IR) |
| 9 | Scanning Electron Microscopy (SEM-EDX) |
| 10 | Sample preparation technique for Scanning Electron Microscopy (SEM-EDX) |
| 11 | Midterm Examination 2 |
| 12 | Chemical analysis |
| 13 | Sample preparation technique for Chemical analysis |
| 14 | General repeat |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Selahattin KADİR | **Date:** | | 15.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 3402514 | **TITLE** | Applied Chemical and Isotopic Groundwater Hydrology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | 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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 35 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic hydrogeological concepts, elements, ions, chemical parameters, planning hydrochemical studies, stable ısotopes, tritium, radiocarbon, monitoring of contaminants. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To give more detailed knowledge on isotope techniques in groundwater exploration | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To make familiar with some special cases using ısotopes in groundwater research. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate conclude and apply this knowledge in geological engineering, ability to design and apply the theorotical, experimental and modelling resource activities, having the social, scientific and ethical responsibilities in all stage of collecting, interpretating and presenting the related data and in all professional activities. | | | | | | | |
| **TEXTBOOK** | | | | | E., Mazor, Applied Chemical and Isotopic, Buckingham, 1991 | | | | | | | |
| **OTHER REFERENCES** | | | | | R.A.Freeze and J. A. Cherry, Groundwater, Prentice –Hall, Englewood Cliffs, N.J.,1979.8. DSİ, Hidrolojide İzotoplar ve Nükleer Teknikler, Ankara, 1987.J. E. Andrews, P. Brimblecombe, T. D. Jickells and P. S. Liss, An Introduction to Environmental Chemistry, Blackwell Science, Edinburgh, 1996. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Structure of water, hydrologic cycle |
| 2 | Basic hydrologic concepts |
| 3 | Geologic data |
| 4 | Physical parameters |
| 5 | Elements, isotopes, ions, units, errors |
| 6 | Midterm Examination 1 |
| 7 | Chemical parameters, data processing |
| 8 | Planning of hydrochemical studies |
| 9 | Stable hydrogen and oxygen ısotopes |
| 10 | Tritium |
| 11 | Midterm Examination 2 |
| 12 | Noble gases |
| 13 | Monitorring of contaminants |
| 14 | Hidrokimya raporlarının hazırlanması |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asist.Prof.Dr.Didem Yasin | **Date:** | | 21.01.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401505 | **TITLE** | Archaeoseismology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  ( x ) | | 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 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | How we can benefit from archaeological datas for investigations of big historical earthquakes | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To determine the basic parameters of big historical earthquake's by using archaeological data | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Knowing the parameters of an earthquake at an area will conrtibute to understand the seismicity of this area | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The person who is a candidate to take a proficiency at the subject of active tectonic is going to be a knowledge of how he/she can be benefit from different disciplines | | | | | | | |
| **TEXTBOOK** | | | | | There is no only a single/ basic course book. | | | | | | | |
| **OTHER REFERENCES** | | | | | Every kind of article or scientific publication related to archaeoseismology | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Archaeoseismological potential of our country |
| 3 | The principals of archaeoseismological studies |
| 4 | Examples of archaeoseimological studies in our country |
| 5 | Examples of archaeoseimological studies in our country |
| 6 | Midterm Examination 1 |
| 7 | Student presentation |
| 8 | Student presentation |
| 9 | Student presentation |
| 10 | Student presentation |
| 11 | Midterm Examination 2 |
| 12 | Examples of archaeoseimological studies at foreign countries |
| 13 | Examples of archaeoseimological studies at foreign countries |
| 14 | General assessment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Erhan Altunel | **Date:** | | 21.4.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402506 | **TITLE** | Basin Analysis |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 0 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of sedimentary basins, geometry, controls and infill architecture of each sub-class, Different examples of basins from Anatolia. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Study of basic driving factors in the formation of sedimentary basins; classification of basins; investigation of each types separately in terms of drivers, geometry, vertical stacking features of basin fill; critaical handling of case studies belonging to basic basin types. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Informing students about the driving factors of large scale geometry of sedimentary basins. By doing this, enlighting the  geological history and enabling further clues fır the prospection of certain energy and endustrial resources.. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Relating inner and outer dynamics of Earths, learning fundamentals of Sedimentary basin classification. | | | | | | | |
| **TEXTBOOK** | | | | | JBasin Analysis, Principles and Applications. (Allen and Allen, 1990)Principles of Sedimentary Basin Analysis. (Miall, 1984)Additionally, some papers related to the conceptual context and case studies for certain basin types will also be considered. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Sedimentary basins: general characteristics regarding their classification, age, size etc. |
| 2 | Classification criteria of sedimentary basins, main basin types |
| 3 | Rift basins: Dynamics, basinfill architecture, main sedimentary facies types |
| 4 | Rift basins: Discussion of several well-known literature cases. |
| 5 | Passive margin basins: Dynamics, basinfill architecture, main sedimentary facies types |
| 6 | Midterm Examination 1 |
| 7 | Passive margin basins: Discussion of several well-known literature cases. |
| 8 | Basins related with the arc-trench system: Dynamics, morphology |
| 9 | Forearc basins: Basinfill architecture, main sedimentary facies types |
| 10 | Forearc basins: Discussion of several well-known literature cases. |
| 11 | Midterm Examination 2 |
| 12 | Trenches: Dynamics, basinfill architecture, main sedimentary facies types |
| 13 | Foreland basins: Dynamics, basinfill architecture, main sedimentary facies types |
| 14 | Foreland basins: Discussion of several well-known literature cases. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Faruk Ocakoğlu | **Date:** | | 22.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401515 | **TITLE** | Dynamics of Continental Depositional Environments |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 0 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of continental environments, evaluation of major controls on the continental environments (climate, topography, flow regime etc.), Discussion of mass transport processes with special emphasis on the resulting sedimentary facies, recognition criteria for the continental facies. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Recognition of recent continental environments with respect to morphology and facies and interpreting the stratigraphic record via this knowledge. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding autocyclic and allocyclic controls in continental deposition environments and interpreting the ancient continental facies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding autocyclic and allocyclic controls in continental deposition environments and interpreting the ancient continental facies. | | | | | | | |
| **TEXTBOOK** | | | | | Sedimentologié, Herve Chamley, 1987.Principles of sedimentology and stratigraphy, Sam Boggs, JR, 1995. İkinci baskı+Many papers relating the topic | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Classification of continental deposional environments |
| 2 | Ways of control of climate on continental environments |
| 3 | Mass transport processes: overview |
| 4 | Fluvial environments: Morphologic and hydrologic characteristics of various recent streams |
| 5 | Fluvial environments: Characteristics of recent stream sediments and comparison with ancient deposits |
| 6 | Midterm Examination 1 |
| 7 | Lake environments: Morphologic and facies characteristics in various sub-environments |
| 8 | Sedimentation on steep slopes: Morphology, dominating mass transport processesSedimentation on steep slopes: Common facies |
| 9 | Sedimentation on steep slopes: Common facies |
| 10 | Reading and discussion of related papers: Rust, Structure and proceses in a braided river |
| 11 | Midterm Examination 2 |
| 12 | Reading and discussion of related papers: Puigdefabregas and Vliet, Meandering strem deposits from the tertiary of the southern Pyrenees |
| 13 | Reading and discussion of related papers: Blair, Sedimentology of the debris flow dominated warm spring ... |
| 14 | Reading and discussion of related papers: Blair, Sedimentary proceses and facies of the waterlaid Anvil.. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Faruk Ocakoğlu | **Date:** | | 22.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401525 | **TITLE** | ENGINEERING GEOLOGY CASE STUDIES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 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 | | | | | 1 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 15 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction and definition; Dams, underground excavations (tunnels), landslides, rock mass weathering, nuclear power plants, earthquake effects, liquefaction. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | to give types of engineering geological problems and their solutions related with engineering projects using various typical case studies both from Turkey and abroad. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning the solution of geological and geotechnical problems | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering,  -Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs,  -Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering,  -Ability to design and apply the theoretical, experimental and modelling research activities and ability to discuss and solve the complex problems arisen in these processes. | | | | | | | |
| **TEXTBOOK** | | | | | Bell, F.G., 1980. Engineering Geology and Geotechnics. Newnes-Butterworths, London, | | | | | | | |
| **OTHER REFERENCES** | | | | | -Attawel, P.B., and Farmer, I.W., 1976. Principles of Engineering Geology. Chapman & Hall, London, 1045p.- Bell, F.G., 1980. Engineering Geology and Geotechnics. Newnes-Butterworths, London, 497 p.- Bell, F.G., 1993. Engineering Geology. Blackwell Scientific Publications. London, 359 p. –- Bell, F.G., 1994. Engineering in Rock Masses. Butterworth-Heinemann Ltd., Oxford, 580 p.- B.S.I., 1981. Code of Practice for Site Investigations. British Standarts Institution, BS 5930, 147 p.- Goddman, R.E., 1993. Engineering Geology-Rock in Engineering Construction. John Wiley and Sons, Inc., 472 p.- Hoek, E. and Brown, E.T., 1980. Underground Excavations in Rock. IMM, London, 527 p.- Hoek, E. and Bray, J.W., 1981. Rock Slope Engineering. IMM, Stephen Austin and Sons Ltd., London, Revised 3rd Edition, 358 p.- Johnson, R.B. and DeGraff, J.V., 1988. Principles of Engineering Geology. John Wiley and Sons, Inc., 497 p.-Rahn, P.H., 1986. Engineering Geology: An Environmental Approach. Elsevier, NewYork, 589 p.- Zaruba, Q. & Mencl, V., 1976. Engineering Geology. Elsevier, Amsterdam, 504 p. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Dams |
| 2 | Underground structures |
| 3 | Underground structures |
| 4 | Slope stability |
| 5 | Rock weathering and its effects in engineering applications |
| 6 | Midterm Examination 1 |
| 7 | Rock weathering and its effects in engineering applications |
| 8 | Earthquakes, liquefaction, lateral spreads and remedial measures |
| 9 | Nuclear power plants |
| 10 | Presentations and discussions on selected case histories |
| 11 | Midterm Examination 2 |
| 12 | Presentations and discussions on selected case histories |
| 13 | Presentations and discussions on selected case histories |
| 14 | Presentations and discussions on selected case histories |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Associate Prof Dr Ali KAYABAŞI | **Date:** | | 28.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401521 | **TITLE** | ENGINEERING ROCK MECHANIC |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkısh |
| **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 | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (Presentation) | | | | | 1 | | 20 |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction, rock mechanic applications, rock mass stresses, stress-strain relation, failure teories, rock mechanic tests, slope stability in rock mass, rock mass classification systems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To experience rock mechanic applications, to lecture about engineering project on rock masses | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gives the experience about the rock mass beheaviour for Projecting on rock masses. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -Ability to obtain necessary knowledge deeply throug scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering.  -Awarenes of new and improving applications in geological engineering and the ability to learn and study on these applications.  -Ability to design and apply theoretical, experimental and modelling research activities and ability to discuss and solve the complex problems arisen in these processes.  -Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data in all professional activities. | | | | | | | |
| **TEXTBOOK** | | | | | Karpuz, C. Hindistan, A.Mehmet !1988). Kaya mekaniği ilkeleri ve uygulamaları, TMMOB Maden Mühendisleri Odası, Ağustos 2008. ANKARA | | | | | | | |
| **OTHER REFERENCES** | | | | | Kayabalı, K. (2003) Kaya Mekaniğine giriş (Introduction to Rock Mechanics/Richard E. Goodman. 2 nd ed) çeviri Ankara Üniversitesi Mühendislik Fakültesi. ANKARA.Ulusay, R. Gökceoğlu, C. Binal, A. (2001). Kaya Mekaniği Laboratuvar Deneyleri. TMMOB Jeoloji Mühendisleri Odası Yayınları no 58, ANKARA | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, and definition of rock mechanic terms. |
| 2 | Rock mechanic applications |
| 3 | Rock mass stresses |
| 4 | Stress-strain measurement |
| 5 | Failure theories. |
| 6 | Midterm Examination 1 |
| 7 | Rock slope stability |
| 8 | Rock slope stability |
| 9 | Rock foundation |
| 10 | Rock mass classification systems |
| 11 | Midterm Examination 2 |
| 12 | Rock mas classification systems |
| 13 | Rock mass failure theories |
| 14 | Hoek Brown Failure Criteria |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Associate Prof. Ali KAYABAŞI | **Date:** | | 28.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 50340511 | **TITLE** | Advanced Igneous Petrography |

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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** | | | | | Classification of magmatic rocks, relationships of structure-texture, detailed examination of different magmatic mineral paragenesis under the microscope and alterations in magmatic rocks | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach how to use specific textures and structures in identification and classification of igneous rocks. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Igneous rocks of the tissue under a microscope, to identify the texture, mineralogical composition and the alterations will shed light on future studies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this course the students are comprehend mineral paragenesis and textures in magmatic rocks. These knowledge is applied in representative plutonic and volcanic sampes under microscope. They comment datas and then identificate of igneous rocks, expect to do genesis and origin of these rocks. | | | | | | | |
| **TEXTBOOK** | | | | | Erkan, Y. 2006. Magmatik Petrografi, TMMOB Jeoloji Mühendisleri Odası Yayın No: 93, 176 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Gençalioğlu-Kuşcu, G. 2000. Magmatik Kayaç Dokuları Atlası, TMMOB Jeoloji Mühendisleri Odası Yayın No: 55, 56 s.Mackenzie W.S., Donaldson, C.H., ve Guilford, C., 1982. Atlas of Igneous Rocks and Their Textures. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to igneous rocks |
| 2 | General petrographic terms and textures |
| 3 | Textures of plutonic rocks-granitic rock textures |
| 4 | Disequilibrium textures |
| 5 | Magma mixing textures in granitic rocks |
| 6 | Midterm Examination 1 |
| 7 | Gabbroic rock textures |
| 8 | Syenite and diorite rock textures |
| 9 | Volcanic rock textures |
| 10 | Pyroclastic rock textures |
| 11 | Midterm Examination 2 |
| 12 | Basaltic rock textures |
| 13 | Types of alterations |
| 14 | Alteration of igneous rocks in pegmatitic, pneumatolytic, and hydrothermal stages of crystallization |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Assistant Prof. Dr. Hülya ERKOYUN | **Date:** | | 21.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402519 | **TITLE** | FIELD INVESTIGATION AND GEOTECHNICAL EVALUATION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 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 | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction, relationship between engineering geology and rock-soil mechanic, discontinuity data on field, gathering data from drillings, sampling, the types of in-situ tests, preparation of soil investigation reports, engineering geology maps, the principals of geologic-geotechnic study planning. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To develop appliance and evaluation ability of students both in field and laboratory results | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To teach application, evaluation of both field and laboratory study results. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering.  -Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions.  -Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities  -Ability to design and apply the theoretical, experimental and modelling research activities and ability to discuss and solve the complex problems arisen in these processes. | | | | | | | |
| **TEXTBOOK** | | | | | Joyce, Michael D. (1982). Site Investigation Practice, J.W. Arrowsmith Ltd, Bristol, Great Britain. | | | | | | | |
| **OTHER REFERENCES** | | | | | Ulusay, R. (1989). Uygulamalı Jeoteknik Bilgiler, TMMOB, Jeoloji Mühendisleri Odası. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The relationship between engineering geology and soil mechanic-rock mechanic |
| 2 | Getting discontinuity datas and evaluation |
| 3 | Showing discontinuitie on streonet and evaluation. |
| 4 | Geotechical boreholes and evaluation of datas. |
| 5 | The rules for disturbed and undisturbed soil samples. |
| 6 | Midterm Examination 1 |
| 7 | Principals and purpose of in situ tests |
| 8 | Principals and purpose of insitu tests |
| 9 | The principal rules for foundation studies |
| 10 | The principal rules for foundation studies |
| 11 | Midterm Examination 2 |
| 12 | The principal rules for foundation studies |
| 13 | Engineering geology maps |
| 14 | he principals for preparation of geologic-geotechnical reports |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Associate Prof Ali KAYABAŞI | **Date:** | | 28.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401523 | **TITLE** | Fluvial Geomorphology |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 0 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Understanding how the rivers reshape the surface of Earth, making some observation and interpretation practices on topography maps from Eskişehir region. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | TThe course will focus on the ways of erosion and deposition by rivers. Dynamics of erosion processes (discharge, uspended and bed loads, base level etc.), the resulting drainage types and their evolution according to different climatic and geologic conditions will also be considered. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding the ways by which the erosion takes place, Discussing the consequences of erosion under varying climatic conditions, to approach quantitatively the questions of erosion and deposition. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learning the way of operation of fluvial processes on landscape and quantification of these processes. | | | | | | | |
| **TEXTBOOK** | | | | | Jeomorfoloji-I. Sırrı Erinç, DER yayınları: 284, İstanbul, 2000. 614 s.Fundamentals of Geomorphology, 2. Baskı. R.J. Rice. Longman Scinetific and Technical, 407 s. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Overview of the shaping agents on Earth |
| 2 | Concept of base level |
| 3 | The ways of erosion of rivers |
| 4 | Transportation and deposion by rivers |
| 5 | Longitudinal profiles of rivers: basic types and relation to the history of rivers and climate. |
| 6 | Midterm Examination 1 |
| 7 | The concepts of balanced profile |
| 8 | Cross sections of river valleys: its implications to climate and youth of river |
| 9 | Main stages of valley development |
| 10 | Valley initiation and drainage types |
| 11 | Midterm Examination 2 |
| 12 | Valley initiation and drainage types |
| 13 | Migration of watersheds and river capture |
| 14 | Evolution of fluvial topography on various structures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Faruk Ocakoğlu | **Date:** | | 22.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401509 | **TITLE** | Advanced Ore Microscopy |

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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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General descrition of the ore microscope, the optical properties of ore minerals, textures of ore minerals. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Identify the characteristics of ore minerals under the microscope, examination of paragenesis and succession issues | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Identification of ore minerals, Making environmental review | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, coclude and apply this knowledge in geological engineering, Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines, Awareness of new improving applications in geological engineering and the ability to learn and study on these applications, Ability to design and apply yhe theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Ore Microscopy Cameron E.N. John Willey &Sons | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.The ore minerals and their intergrowts Ramdohr, P, 1969, 2. Maden mikroskopisi Dr. Namık Çağatay JMO Yayınları, 3. Cevher mikroskobisi Yurdal Genç, 1998, 4. Cevher mikroskobisi ve petrografisi Prof. Dr. Özkan Pişkin DEÜ Yayınları, 2002 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General Definitions |
| 2 | Presentation ore microscop and use it |
| 3 | Presentation ore microscop and use it |
| 4 | Preparation of polish sections |
| 5 | Physical properties of research minerals |
| 6 | Midterm Examination 1 |
| 7 | Optical properties of ore minerals; color, anisotropy |
| 8 | Optical properties of ore minerals; reflectivity, internal reflection, ganges |
| 9 | Microstructure properties of ore minerals |
| 10 | Fabric properties of ore minerals |
| 11 | Midterm Examination 2 |
| 12 | Fabric properties of ore minerals |
| 13 | Research of paragenesis and succession |
| 14 | Research of paragenesis and succession |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Hüseyin SENDİR | **Date:** | | 30.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401509 | **TITLE** | Advanced Ore Geology |

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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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General definitions, mineral prospecting techniques, mineral assemblages, ore placement, mining geology mapping techniques, density and grade calculations, environmental problems | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Examination of the mines exploration and evaluation techniques, various application | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Data analysis and evaluation  2. Defining and solving problems  3. to follow the current issues of professional | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, coclude and apply this knowledge in geological engineering, Having comprehensive knowledge about up-to-date technologies and methods anf their limitations in engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions, ability to design and apply yhe theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Maden Jeolojisi ve Arama Yöntemleri Prof. Dr. Ömer Akıncı, 2003, SDÜ yayınları, Isparta. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Maden Jeolojisi Prof. Dr. Altan Gümüş, 1995, İzmir2. Madenlerin Değerlendirilmesi Prof. Dr. Kadir Sarıiz, 2000, Esogü Yayınları, Eskişehir3. Maden Arama ve Değerlendirme Yöntemleri Prof. Dr. Ahmet Gökçe, Cü yayınları, 2005, Sivas4. Introduction to Ore-Forming Processes, L. Robb, Blackwell Sci., 2006. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General Definitions |
| 2 | Mineral Prospecting Techniques |
| 3 | Mineral Prospecting Techniques |
| 4 | Mineral Prospecting Techniques |
| 5 | Mineral assemblages and their general characteristics |
| 6 | Midterm Examination 1 |
| 7 | Ore settlement structures |
| 8 | A mass of magmatic mineralization |
| 9 | Environments affected by plate motions |
| 10 | Mining Geology map applications |
| 11 | Midterm Examination 2 |
| 12 | Mining Geology map applications |
| 13 | Density and grade calculations |
| 14 | Mining and environmental issues |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Hüseyin SENDİR | **Date:** | | 30.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402509 | **TITLE** | Advanced Ore Deposits |

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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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General definitions, classifications, characteristics of ore fluids, wall rock alteration, paragenesis and zoning, geothermometry and Geobarometry applications, isotope applications | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Mineral deposits and formation environments and genetic studies | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Data analysis and evaluation  2. Defining and solving problems  3. to follow the current issues of professional | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, coclude and apply this knowledge in geological engineering, Having comprehensive knowledge about up-to-date technologies and methods anf their limitations in engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions, ability to design and apply yhe theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Maden Yatakları Jeolojisi Prof. Dr. Doğan AYDAL, Ankara Üniv pUB., 1995. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Maden Yatakları Prof. Dr. Ahmet Gökçe, Cumhuriyet Üniv. Yay., 85, 2000, 2. Metalik Maden Yatakları Prof. Dr. Sedat Temur, Nobel Yayın dağıtım, 1997, 3. Magmatic Sulfide Deposits Anthony J. Naldrett, Springer, 2004, 4. Geochemistry of Hydrothermal Ore Deposits Hubert L. Barnes, John Wiley and Sons, 1997, 5. Current articles | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General Definitions |
| 2 | Classification of Ore Deposits |
| 3 | Mineralizing fluids |
| 4 | Mineralizing fluid movements |
| 5 | Ore placement |
| 6 | Midterm Examination 1 |
| 7 | Wall rock alteration and gangue |
| 8 | Wall rock alteration and gangue |
| 9 | Paragenesis and zoning |
| 10 | Geothermometry and Geobarometry applications |
| 11 | Midterm Examination 2 |
| 12 | Stable isotope applications |
| 13 | Stable isotope applications |
| 14 | Radioisotopes applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Hüseyin SENDİR | **Date:** | | 30.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503411602 | **TITLE** | Isotope Geology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | |  |  | | | 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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (Seminar) | | | | | 1 | | 25 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The isotope definition and classification of isotopes, dating of magmatic rocks and minerals with various dating methods such as : K-Ar, Rb-Sr, Nd-Sm, U, Th-Pb and 14C techniques, discussion on crust-mantle evolution on the basis of radiogenic isotope ratios in magmatic rocks. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The use of radiogenic isotopes in petrology and geochemical applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Modeling of mantle-crust interactions with the use of various radiogenic isotopes and trace elements | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas, Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area. | | | | | | | |
| **TEXTBOOK** | | | | | Faure, G. (1986). Principles of Isotope Geology, 2nd Edition, John Wiley and Sons, New York | | | | | | | |
| **OTHER REFERENCES** | | | | | Recent articles on the subject. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What are isotopes? Classicisation of isotopes |
| 2 | The use of radiogenic isotopes for the understanding of the evolution of earth |
| 3 | Dating with K-Ar method |
| 4 | Dating with Rb-Sr method |
| 5 | Dating Nd-Sm method |
| 6 | Midterm Examination 1 |
| 7 | U-Th-Pb dating method |
| 8 | 14C dating method |
| 9 | Modeling of crust-mantle interaction |
| 10 | Article discussion |
| 11 | Midterm Examination 2 |
| 12 | Article discussion |
| 13 | Article discussion |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Asst. Prof. Hüseyin SENDİR | **Date:** | 30.04.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503411603 | **TITLE** | Computer Applications in Geochemistry |

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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 | | | | | 1 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | | 1 | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction and detailed package of programs used to evaluate the use of geochemical analysis (Igpet, Grapher, Surfer, Minpet and the others) | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Using a variety of software packages to analyze data, interpret and report writing. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1.Data analysis and evaluation  2. Defining and solving problems  3. to follow the current issues of professional | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Use Igpet program, 2. Use Surfer program, 3. Use Grapher program, 4. Use Minpet and Newpet programs | | | | | | | |
| **TEXTBOOK** | | | | | Program related books | | | | | | | |
| **OTHER REFERENCES** | | | | | Program related books | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Overview of programs |
| 2 | Igpet program and use |
| 3 | Igpet program and use |
| 4 | Igpet program and use |
| 5 | Grapher program and use |
| 6 | Midterm Examination 1 |
| 7 | Grapher program and use |
| 8 | Surfer program and use |
| 9 | Surfer program and use |
| 10 | Minpet program and use |
| 11 | Midterm Examination 2 |
| 12 | Minpet program and use |
| 13 | Newpet program and use |
| 14 | Newpet program and use |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Hüseyin SENDİR | **Date:** | 04.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401517 | **TITLE** | Stable Isotopes in Geology |

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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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to stable isotopes, standards used in measurement of stable isotopes, isotope fractionation, application of oxygen-hydrogen isotope system to water and rock medium, carbon isotope system to water and source of geologic materials, sulfur isotope system and source of geologic materials, isotope geothermometers | | | | | | | |
| **COURSE OBJECTIVES** | | | | | How to use the stable isotopes for determination the origin, formation temperature and environment of various geologic materials. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Data analysis and evaluation  2. Defining and solving problems  3. to follow the current issues of professional | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, coclude and apply this knowledge in geological engineering, Having comprehensive knowledge about up-to-date technologies and methods anf their limitations in engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions, ability to design and apply yhe theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Maden Jeolojisi ve Arama Yöntemleri Prof. Dr. Ömer Akıncı, 2003, SDÜ yayınları, Isparta. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Maden Jeolojisi Prof. Dr. A. Gümüş, 1995, İzmir, 2. Madenlerin Değerlendirilmesi Prof. Dr. K. Sarıiz, 2000, Esogü Yayınları, Eskişehir, 3. Maden Arama ve Değerlendirme Yöntemleri Prof. Dr. A. Gökçe, Cü yayınları, 2005, Sivas, 4. Int. to Ore-Forming Processes, L. Robb, Blackwell Sci., 2006. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General Definitions |
| 2 | Mineral Prospecting Techniques |
| 3 | Mineral Prospecting Techniques |
| 4 | Mineral Prospecting Techniques |
| 5 | Mineral assemblages and their general characteristics |
| 6 | Midterm Examination 1 |
| 7 | Ore settlement structures |
| 8 | A mass of magmatic mineralization |
| 9 | Environments affected by plate motions |
| 10 | Mining Geology map applications |
| 11 | Midterm Examination 2 |
| 12 | Mining Geology map applications |
| 13 | Density and grade calculations |
| 14 | Mining and environmental issues |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Hüseyin SENDİR | **Date:** | | 30.04.2015 | | | |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401506 | **TITLE** | CARBONATE AND EVAPORİTE MIN.DEPOSITION ENVIRONMENT |

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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 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (Seminar) | | | | | 1 | | 30 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Carbonate mineralogy and geochemistry  Factors of Carbonitization and evaporitization  Diagenesis processes, products and environment  Modern carbonate deposits and dolomitization  Relations between carbonate deposition and dolomitization  Carbonate development in calcrete and paleosole environments  Relations between sesquioxide clays and carbonate minerals  Relations of clay - carbonate and organic matter. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Carbonate mineralogy and geochemistry  Factors of Carbonitization and evaporitization  Relations of carbonate and evaporite minerals  Carbonate and evaporite mineral formations in modern and ancient lake environments.  Diagenesis and dolomitization  Genetical relations between carbonate and evaporite minerals and clay minerals as alteration products. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Carbonate mineralogy and geochemistry  Factors of Carbonitization and evaporitization  Relations of carbonate and evaporite minerals | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Carbonate and evaporite mineral formations in modern and ancient lake environments.  Dİagenesis and dolomitization  Genetical relations between carbonate and evaporite minerals and clay minerals as alteration products. | | | | | | | |
| **TEXTBOOK** | | | | | Lippmann, F. (1973) Sedimentary Carbonate Minerals. Springer – Verlag, Berlin, 229 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Sedimentary GeologySedimentologyCanadian MineralogistNues Jahrbuch für Mineralogie, Monatshfte ve AbhandlungenMineralium Depositave diğer bilimsel dergiler.Grim R. E. (1968) Clay Mineralogy. MacGraw-Hill Internation Series in the Earth adn Planatary Sciences.McGraw-Hill Book Company. Sydney, 596s.Clays and Clay MineralsClay MineralsCanadian MineralogistNues Jahrbuch für Mineralogie, Monatshfte ve AbhandlungenMineralium DepositaCarbonate and EvaporiteSedimentary Geology … etc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Carbonate mineralogy |
| 2 | Carbonate chemistry |
| 3 | Factors controlling carbonitization and evaporation |
| 4 | Diagenesis processes, products and environments |
| 5 | Modern carbonate deposits and dolomitization |
| 6 | Midterm Examination 1 |
| 7 | Relations between carbonate deposition and dolomitization |
| 8 | Carbonate development in calcrete and paleosoil environments |
| 9 | Relations between sesquioxide clays and carbonate minerals |
| 10 | Relations between sesquioxide clays and carbonate minerals |
| 11 | Midterm Examination 2 |
| 12 | Relations of clay - carbonate and organic matter |
| 13 | Relations of clay - carbonate and organic matter |
| 14 | General repeat |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Selahattin KADİR | **Date:** | | 15.05.2015 | | | |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503412601 | **TITLE** | Clay Geology |

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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 | | | | |  | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (seminar) | | | | |  | | 30 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Soil clays in the geochemical cycle. A brief review of silicate hydrolysis. Geology of clays in continental sediments and marine sediment from point of view of environmental factors. Comparison of ancient and modern clay deposits. Clay mineral genesis by inheritance and transformation, neoformation, and diagenesis. Brief consideration of clay mineral synthesis, hydrothermal origin and low grade metamorphism of layer silicates. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Investigation of the geochemical origin of clay minerals | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To understand the formation process and environments of clay minerals. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Soil clays in the geochemical cycle.  A brief review of silicate hydrolysis.  Geology of clays in continental sediments and marine sediment from point of view of environmental factors.  Comparison of ancient and modern clay deposits. Clay mineral genesis by inheritance and transformation, neoformation, and diagenesis.  Brief consideration of clay mineral synthesis, hydrothermal origin and low grade metamorphism of layer silicates. | | | | | | | |
| **TEXTBOOK** | | | | | Millot, G. (1970) Geology of Clays. Chapman & Hall, London, 429 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Clays and Clay MineralsClay MineralsCanadian MineralogistNues Jahrbuch für Mineralogie, Monatshfte ve AbhandlungenMineralium DepositaCarbonate and EvaporiteSedimentary Geology … etc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Geological environments |
| 2 | Origin and occurrence of Clay Minerals |
| 3 | Development of Clay Minerals by Rock Weathering and Soil Formation |
| 4 | Relation of paleoclimatical conditions on development of alteration processes |
| 5 | Mechanical Inheritance (erosion and detrital clay sediments) |
| 6 | Midterm Examination 1 |
| 7 | Transformation, compaction and diagenesis |
| 8 | Hydtrothermal clay minerals and hydrothermal environment |
| 9 | Deep-sea alteration and hydrothermal activity |
| 10 | Wall Rock Alteration of Kuroko type massive sulfide deposit |
| 11 | Midterm Examination 2 |
| 12 | Weathering of volcanic ash and pyroclastic materials |
| 13 | Cation and anion exchange reactions |
| 14 | Specific adsorption of heavy metals in sesquioxide clays |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Prof. Dr. Selahattin KADİR | **Date:** | 15.05.2015 |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401505 | **TITLE** | Clay Mineralogy |

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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 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (Seminar) | | | | | 1 | | 30 |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of structural mineralogy of clay minerals,  Ion exchange capasity, dehydratation and rehydratation reactions and clay minerals | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Classification of structural mineralogy of clay minerals,  Ion exchange capasity, dehydratation and rehydratation reactions and clay minerals | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Classification of structural mineralogy of clay minerals, | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Classification of structural mineralogy of clay minerals,  Ion exchange capasity,  dehydratation and rehydratation reactions and clay minerals | | | | | | | |
| **TEXTBOOK** | | | | | Carroll D. (1970) Clay Minerals: A Guide to Their X-ray Identification. The Geological Society of America, 80 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Grim R. E. (1968) Clay Mineralogy. MacGraw-Hill Book Company, Sydney, 596 s.Saka A. H. (1997) Mineralojik Analizlerde X-Işınları Toz Kırınım Yönteminin Temel Prensipleri ve Laboratuar Şartlarının Standardizasyonu. Maden Tetkik ve Arama Genel Müdürlüğü, Ankara.Clays and Clay MineralsClay MineralsCanadian MineralogistNues Jahrbuch für Mineralogie, Monatshfte and AbhandlungenMineralium DepositaCarbonate and EvaporiteSedimentary Geology … etc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Description of clayey materials. |
| 2 | General chemical, structural properties and crystallography of clay minerals. |
| 3 | Atomic exchange |
| 4 | Clay formations in alteration produts. |
| 5 | Allophane and imogolite |
| 6 | Midterm Examination 1 |
| 7 | Kaoline - Serpentinite Group. |
| 8 | Talc - Pyrophyllite Group. |
| 9 | Sepiolite - Palygorskite Group |
| 10 | Mica minerals |
| 11 | Midterm Examination 2 |
| 12 | Vermiculite, Chlorite, and Smectite minerals. |
| 13 | Oxide, hydroxide and oxyhydroxides. |
| 14 | Sorption, dehydratation and rehydratation of clay minerals. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Selahattin KADİR | **Date:** | | 15.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402504 | **TITLE** | Paleoseismology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  ( x ) | | 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 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | To identify big earthquakes and their parameters occurred in the past | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To obtain the data of ancient earthquakes by wounding the hidden data at young geological formations | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To know the ancient earthquake parameters will contribute to understand the seismicitiy of an area. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The person who is a candidate to take a proficiency at the subject of active tectonic is going to be a knowledge of how he/she can be benefit from different disciplines | | | | | | | |
| **TEXTBOOK** | | | | | Paleoseismology (McCalpin) | | | | | | | |
| **OTHER REFERENCES** | | | | | Every kind of article and scientific publications related to paleoseismology | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Basic principles of paleoseismolgy |
| 3 | Dating tecniques |
| 4 | To wound other disciplines at paleoseismological studies |
| 5 | Paleoseismological datas |
| 6 | Midterm Examination 1 |
| 7 | Paleoseismology at normal faults and example studies |
| 8 | Paleoseismology at thrust faults and example studies |
| 9 | Paleoseismology at strike-slip faults and example studies |
| 10 | Student presentation |
| 11 | Midterm Examination 2 |
| 12 | Student presentation |
| 13 | Student presentation |
| 14 | General assessment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Erhan Altunel | **Date:** | | 21.4.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503412607 | **TITLE** | Palynological Applications |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 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 (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Definition and a brief history of Palynology, sedimentary organic matter, concept of palynofacies and palynomacerals and their use in coal, oil and gas exploration, use of palynomorphs in thermal maturation index studies, application of palynology in biostratigraphical, paleogeographical, paleoenvironmental and paleoclimatological studies, and in other fields such as atmospheric, archeological and forensic studies and melissapalynology. Correlation of marine and terrestrial sequences by means of palynomorphs and construction of paleo-vegetation by palynomorphs. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To introduce application fields of palynology to students and apply this knowledge in solving geological problems. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Contribute to the exploration of energy sources such as coal, oil, and gas and to the evaluation of biostratigraphical, paleoenvironmental and paleoclimatological studies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Student will have 1. knowledge of palynological science, 2. learn application areas of spore, polen, dinoflagellates, acritarchs, chitinozoa and non-pollen palynomorphs in geological researches, 3. will understand contribution of palynomorphs in biostratigraphical, paleoenvironmental and paleoclimatological studies, 4. understand the importance of palynology in coal, oil and gas exploration. | | | | | | | |
| **TEXTBOOK** | | | | | Paleopalynology. Traverse, A., 2007. (eds. D.S. Jones and N.H. Landman). Springer. 813 p. | | | | | | | |
| **OTHER REFERENCES** | | | | | Plankton Stratigraphy. 1989. (eds.H.M.Bolli, J.B.Saunders, and K. Perch-Nelsen) Cambride University Pres,1032 p.Periyodik dergilerde yayınlanmış çeşitli makaleler | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition of Palynology and a brief history of palynological studies |
| 2 | Sedimentary organic matter, concept of palynofacies and palynomacerals |
| 3 | Palynomorphs and palynofacies in coal, oil and gas exploration |
| 4 | Use of palynomorphs in thermal maturation index studies |
| 5 | Article discussion |
| 6 | Midterm Examination 1 |
| 7 | Application of palynology in biostratigraphical studies |
| 8 | Application of palynology in paleogeographical studies |
| 9 | Application of palynology in paleoenvironmental and paleoclimatic studies |
| 10 | Application of palynology in atmospheric, archeological and forensic studies and melissapalynology |
| 11 | Midterm Examination 2 |
| 12 | Correlation of marine and terrestrial sequences by means of palynomorphs |
| 13 | Construction of paleo-vegetation by means of palynomorphs |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Asst.Prof. Dr. Hatice Kutluk | **Date:** | 25 April, 2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401522 | **TITLE** | Palynology |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Definition and a brief history of palynology, concept of palynofacies; morphology and stratigraphy of spore, pollen, dinoflagellate, acritarchs and chitinozoa. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Description of palynomorphs and application of this knowledge in solving geological problems. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Assessment of similar application fields of palynomorphs with other microfossil groups in Micropaleontology and evaluation of palinomorph contribution to biostratigraphical, paleoenvironmental and paleoclimatological studies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Gaining knowledge of: 1. Palynological science; 2. morphology of spore, polen, dinoflagellates, acritarchs, chitinozoa and non-pollen palynomorphs; 3. contribution of palynology to biostratigraphical, paleoenvironmental and paleo-climatological studies; 4. application of palynology in exploration of energy resources. | | | | | | | |
| **TEXTBOOK** | | | | | Pollen Terminology. 2009. An Illustrated Handbook. Hesse,M. Halbritter, H., Zetter, R., Weber, M., Buchner, R., Frosch-Radivo, A., and Ulrich, S. Springer Wien New York. 261 p.Paleopalynology. Traverse, A., 2007. (eds. D.S. Jones and N.H. Landman). Springer. 813 p. | | | | | | | |
| **OTHER REFERENCES** | | | | | Plankton Stratigraphy. 1989. (eds.H.M.Bolli, J.B.Saunders, and K. Perch-Nelsen) Cambride University Pres,1032 p.Pollen and Spore Morphology. Erdtman,G., Almavist & Wiksell-Stockholm.The Ronald Press Company-New York 151 s.An Introduction to Pollen Analysis. Erdtman,G., Roger, Wodehouse,P. Waltham, Mass.,U.S.A. Published by the ChronicaPeriyodik dergilerde yayınlanmış çeşitli makaleler | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | efinition and a brief history of Palynology |
| 2 | Qualitative and quantitative characteristics of palynomorphs in palynofacies studies, production, dispersal, and taphonomy of palynomorphs |
| 3 | Morphology of spores |
| 4 | Morphology of pollen |
| 5 | Morphology of dinoflagellates, acritarchs, chitinozoa |
| 6 | Midterm Examination 1 |
| 7 | Non-pollen palynomorphs and particulate organic matter |
| 8 | Stratigraphic palynology-Paleozoic and Mesozoic |
| 9 | Stratigraphic palynology-Paleogene and Neogene |
| 10 | Stratigraphic palynology-Quaternary |
| 11 | Midterm Examination 2 |
| 12 | Holocene palynology |
| 13 | Article discussion |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst.Prof. Dr. Hatice Kutluk | **Date:** | | 25 April, 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401503 | **TITLE** | Petrology and Petrochemistry |

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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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Presentation of rocks, magma differentiation, plutonic rocks, surface and vein rocks, alkaline plutonic rocks, ultramafic rocks | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Petrological and petrochemical examination of the rocks | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Data analysis and evaluation  2. Defining and solving problems  3. to follow the current issues of professional | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, coclude and apply this knowledge in geological engineering, Having comprehensive knowledge about up-to-date technologies and methods anf their limitations in engineering, ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions, ability to design and apply yhe theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Petrology Loren A. Raymond, Mc.GrawHill, 2002. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Igneous and metamorphic petrology Second edit., Blackwell Yayın., 2006, 2. Current articles | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Rocks and Earth structure |
| 2 | Magma and Differentiation |
| 3 | Magma and Differentiation |
| 4 | Plutinic Rocks (structure and texture) |
| 5 | Chemistry, Mineralogy and Classification of plutinic rocks |
| 6 | Midterm Examination 1 |
| 7 | Granite, granodiorite and related rocks |
| 8 | Granite, granodiorite and related rocks |
| 9 | Volcanic and vein rocks |
| 10 | Volcanic and vein rocks |
| 11 | Midterm Examination 2 |
| 12 | Alkaline plutonic rocks and carbonates |
| 13 | Ultramafic-mafic complex and Related Rocks |
| 14 | Ultramafic-mafic complex and Related Rocks |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Hüseyin SENDİR | **Date:** | | 30.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401524 | **TITLE** | Physiographic Analyze Methods |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 40 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Training students and gaining knowledge about geological surface features and physiographic analyze of them. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To have knowledge of geological structures by using the surface features. To have knowledge of new technological devices, software and methods (e.g. Geographic Position System, Topographic Measurements) which are used on geomorphological field studies. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To understand the surface features that developed related to active tectonics and to succeed in use these data for active tectonic studies | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The person who is a candidate to take a proficiency at the subject of geological surface features is going to be a knowledge of how he/she can be benefit from physiographic analyze methods. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Optech Ilris 3D Terresterial Lidar manuel2. Polyworks software manuel3. Tectonic Geomorphology (Burbank and Anderson, 2001)4. Jeomorfoloji I-II (Erinç et al., 2000)5. Topcon Total Station manuel | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Surface features of Earth |
| 3 | Morphological Indexes and meaning |
| 4 | Geomorphological research instruments |
| 5 | Global Positioning Systems and general features |
| 6 | Midterm Examination 1 |
| 7 | Topographic measurement devices |
| 8 | “Teodolite (Total-Station)” systems and general features |
| 9 | "Lidar” systems, general features and applications |
| 10 | Lidar” systems, general features and applications |
| 11 | Midterm Examination 2 |
| 12 | Software related physiographic analyze |
| 13 | Physiographic analyze applications |
| 14 | Physiographic analyze applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
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| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
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| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Doç. Dr. Volkan KARABACAK | **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** | **GEOLOGICAL ENGINEERING (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503401516 | **TITLE** | Principles of Sequence Stratigraphy |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 0 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Causes, amplitude and period of sea level changes, Effects of sea level changes in various environments (particularly continental, deltaic and deep sea environments) | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course especially aims at understanding the architecture of basin fills, predictable facies shifts (progradation and retrogradation) with time due to relative change of sea level. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning that the sea level changes are common events in geological past and they exert a major control on facies distribution and geometries in sedimentary basins. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding the depositional features in stratigraphic record that would be related to sea level change, and contribution of these features in forecasting the underground distribution of sedimentary bodies. | | | | | | | |
| **TEXTBOOK** | | | | | Many papers on the sequence stratigraphy concept and its application to outcrops. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Historical development of sequence stratigraphy |
| 2 | Seismic stratigraphy |
| 3 | Basic concepts of sequence stratigraphy: accommodation, causes of tectonic subsidence |
| 4 | Basic concepts of sequence stratigraphy: causes of sea level changes |
| 5 | Parasequences: definition, origin of parasequences, bed architecture within the parasequences. |
| 6 | Midterm Examination 1 |
| 7 | Parasequence set and stacking patterns: progradational stacking, aggradational stacking and retrogradational stacking. |
| 8 | Depositional sequences: lowstand systems tract |
| 9 | Depositional sequences: transgressive systems tract |
| 10 | Depositional sequences: highstand systems tract |
| 11 | Midterm Examination 2 |
| 12 | Surfaces: sequence boundary, transgressive surface, maximum flooding surface, type 1 and type 2 sequences. |
| 13 | Outcrop applications: applications on siliciclastic systems (continental env.) |
| 14 | Outcrop applications: applications on siliciclastic systems (coastal env.) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Faruk Ocakoğlu | **Date:** | | 22.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401514 | **TITLE** | Quaternary 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  (   ) | 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 | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Definition of Quaternary in relation to geological time-scale, causes and duration of climatic changes during Quaternary, effects of Quaternary changes in various parts of the World; marine, fluvial, lake, glacial environments and the formation of paleosols. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Analyzing the effects of Quaternary changes in various parts of the World, assessment of the causes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn to apply these knowledge to geological past by understanding and evaluating the changes during the Quaternary period. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be acquainted with 1. theory, principals, and methods in Quaternary, 2. will understand the importance of Quaternary in geological time, 3. will assess the causes of various changes and their duration during Quaternary period, 4. will develope the skill of evaluating the present-day and future. | | | | | | | |
| **TEXTBOOK** | | | | | Reconstructing Quaternary Environments. Lowe, J.J. and Walker, M.J.K., 1984. Longman Press, London, 389 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Various articles published in periodicals. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition of Quaternary within geological time-scale |
| 2 | The nature of climatic changes |
| 3 | Orbital and axial variations of the Earth effecting the receipt of solar radiation (Milankovitch parameters) |
| 4 | Comparison of Quaternary stratigraphies in Europe, North America, Mediterranean, Caspian and Black Sea |
| 5 | Relative sea level changes (eustatic changes, effect of tectonic activity, glacio-eustasy) |
| 6 | Midterm Examination 1 |
| 7 | River terraces |
| 8 | Lake level variations |
| 9 | Glacial sediments, ice sheets, and ice caps |
| 10 | Periglacial sediments and permafrost |
| 11 | Midterm Examination 2 |
| 12 | Article discussion |
| 13 | Article discussion |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst.Prof. Dr. Hatice Kutluk | **Date:** | | 25 April, 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503412606 | **TITLE** | Quaternary II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Quaternary stratigraphy, oxygene isotope techniques in the evaluation of paleo-temperature, dating methods used in Quaternary,  correlation between marine and terrestrial records. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Evaluation of the effects of environmental changes in Quaternary period in various parts of the World, assessment of the cause of changes and learning the techniques in this period. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn the ability to apply these knowledge into geological past by understanding and evaluating the changes during the Quaternary period. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be acquainted with 1. theory, principals, and methods in Quaternary, 2. will understand the importance of Quaternary in geological time, 3. will assess the causes of various changes and their duration during Quaternary period, 4. will develope the skill of evaluating the present-day and future. | | | | | | | |
| **TEXTBOOK** | | | | | Reconstructing Quaternary Environments. Lowe,J.J. and Walker, M.J.K., 1984. Longman Press, London, 389 s. | | | | | | | |
| **OTHER REFERENCES** | | | | | Various articles published in periodicals | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | A brief introduction to the ‘Quaternary Period’, character and duration of the Quaternary |
| 2 | A brief summary of the Quaternary stratigraphical schemes in northern hemisphere |
| 3 | Paleotemperature curves and subdivision of Quaternary by oxygene isotope stages |
| 4 | Radiometric dating techniques in Quaternary |
| 5 | Radiocarbon dating, Potassium/Argon (40K/40Ar) dating, Thermoluminescens dating |
| 6 | Midterm Examination 1 |
| 7 | Incremental dating methods in Quaternary |
| 8 | Dendrochronology, dendroclimatology |
| 9 | Varve chronology, tephra chronology |
| 10 | Plant microfossil analysis |
| 11 | Midterm Examination 2 |
| 12 | Pollen zones, interpretation of pollen diagrams, reconstruction of paleo-vegetation |
| 13 | Correlation between marine and terrestrial records |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Asst.Prof. Dr. Hatice Kutluk | **Date:** | 25 April, 2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401513 | **TITLE** | Sedimentary Environments and Facies Analysis 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  (   ) | 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 | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Evaluation of clastic, carbonate and evaporite depositing environments, examination of the facies of coarse alluvial deposits, eolian sands, turbidites and associated coarse clastic deposits; reefs, barrier island systems, continental and supratidal (sabkha) evaporates, volcanoclastic rocks and glaciers. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Application of recent clastic, carbonate and evaporite deposition to the geological records. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Contribute to the applications by data evaluation and applying the methods relevant to clastic, carbonate and evaporite environments. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Recognition and definition of various facies environments, 2. Enhance the knowledge of various facies modelling techniques, 3. Practising in sediments deposited in clastic, carbonate and evaporite facies, 4. Evaluation of examples from geological record. | | | | | | | |
| **TEXTBOOK** | | | | | Facies Models. R.G. Walker. Geoscience Canada, Reprint Series 1, 1980. Geological Association of Canada Publication | | | | | | | |
| **OTHER REFERENCES** | | | | | Various articles published in periodicals. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | A general introduction to facies and facies models |
| 2 | Coarse alluvial deposits |
| 3 | Eolian Sands |
| 4 | Turbidites and associated coarse clastic deposits |
| 5 | Article discussion |
| 6 | Midterm Examination 1 |
| 7 | Reefs |
| 8 | Barrier island systems |
| 9 | Continental and supratidal (sabkha) evaporites |
| 10 | Article discussion |
| 11 | Midterm Examination 2 |
| 12 | Volcanoclastic rocks |
| 13 | Glacial Facies |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst.Prof. Dr. Hatice Kutluk | **Date:** | | 25 April, 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402517 | **TITLE** | Sedimentary Environments and Facies Analysis 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  (   ) | 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 | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Evaluation of clastic and carbonate depositing environments, examination of the facies of fluvial systems, deltas, and clastics in shallow marine environment and carbonates in the marine realm. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Application of recent clastic and carbonate deposition to the geological record. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Using data obtained from carbonate and clastic sediments, learning methods and applying this knowledge to solve geological problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Recognition and definition of various facies environments, 2. Enhance the knowledge of various facies modelling techniques, 3. Practising in sediments deposited in clastic s deposited in fluvial systems, deltas and shallow marine environment, and 4. Practising in carbonate deposits in the marine realm. | | | | | | | |
| **TEXTBOOK** | | | | | Facies Models. R.G. Walker. Geoscience Canada, Reprint Series 1, 1980. Geological Association of Canada Publication | | | | | | | |
| **OTHER REFERENCES** | | | | | Various articles published in periodicals. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | A general introduction to facies and facies models |
| 2 | Sandy fluvial systems |
| 3 | Deltas |
| 4 | Shallow marine sands |
| 5 | Article discussion |
| 6 | Midterm Examination 1 |
| 7 | Introduction to carbonate facies models |
| 8 | Shallowing upward sequences in carbonates |
| 9 | Carbonate slopes |
| 10 | Article discussion |
| 11 | Midterm Examination 2 |
| 12 | Subaqueous evaporites |
| 13 | Seismic-stratigraphic facies models |
| 14 | Article discussion |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Asst.Prof. Dr. Hatice Kutluk | **Date:** | | 25 April, 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503412603 | **TITLE** | Sequence Stratigraphy in Deep Sea Systems |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Scope of deep sea sytems, facies and processes, and impact of sea level changes on deep marine sediments | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course is supposed to be important since it will provide an insight in the issues such as depositional processes, geometry, distribution of reservoir and host rocks of petroleum. I will help on the petroleum prospection in deep sea depositional systems. Throughout the course, after the reminiscence of the outlines of sequence stratigraphy, it will be provided a comprehension of stratigraphic and geometric pecularities caused by relative sea level changes For this aim, fisrt various facies models of deep sea environments will be evaluated, afterward, the impact of sea level changes on these facies will be discussed . | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course will provide significant insights in terms of petroleum exploration, spatial distribution of source and reservoir rocks. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Reconnaisance of deep marine depositional environments and impact of sea level changes on it; grasping the importance of this upon petroleum exploration. | | | | | | | |
| **TEXTBOOK** | | | | | • Sequence Stratigraphy and Facies Associations, Posamentieer et al., 1993. International Association of Sedimentologists. Special Publ. No: 18.• Depositional Sedimentary Environments, Reineck, H.E., Singh, I.B., 1980.• Facies Models, Walker, R.G., 1984. | | | | | | | |
| **OTHER REFERENCES** | | | | | Aşağıda listelenen makaleler:• Ten turbidite myths, Earth science Reviews, 58 (2002), 311-341.• Distributary Channel Meandering and Bifurcation…• Submarine fan deposition within a sequence stratigraphiv framework…• Submarine fans: characteristics, models, classification and reservoir potential.• Turbidite systems and their relation to depositional sequences…• Timing of turbidite deposition on the Missisipi fan..• Turbidite systems: state of art and future directions. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Factors governing the sea level changes |
| 2 | Historical development of sequence stratigraphy |
| 3 | Principles of Sequence Stratigraphy |
| 4 | Deep Marine depositional Environments |
| 5 | Submarine Fan facies models |
| 6 | Midterm Examination 1 |
| 7 | Submarine Fan facies models |
| 8 | Submarine Fan facies models |
| 9 | Impact of relative sea level changes upon deep marine sediments |
| 10 | Impact of relative sea level changes upon deep marine sediments |
| 11 | Midterm Examination 2 |
| 12 | Impact of relative sea level changes upon deep marine sediments |
| 13 | Impact of relative sea level changes upon deep marine sediments |
| 14 | General Remarks, examples from Turkey |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Prof. Dr. Faruk Ocakoğlu | **Date:** | 22.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401520 | **TITLE** | SLOPE STABILITY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 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 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 15 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction and definitions, economical importance of slope studies, factors causing slope instabilities, classification of slope instabilities, slope stability analyzing methods, investigation of mass movements, preventation of mass movements, rock slope instabilities, numerical and graphical methods, examples. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To learn basıc principals of instability types and to learn how to solve these problems both theoretically and practically. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To learn how to solve instability problems | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -Ability to obtainnecessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering,  -Having comprehensive knowledge about up to date technologies and methods and their limitations in endgineering  -Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines,  -Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | | | | | | |
| **TEXTBOOK** | | | | | Bromhead, E.N. (1992). The Stability of Slopes, 2nd Edition, Blackie Academic & Professional, UK. | | | | | | | |
| **OTHER REFERENCES** | | | | | Paşamehmetoğlu, A.G. Özgenoğlu, A. ve Karpuz, C. (1991). Kaya Şev Stabilitesi, Çeviri Hoek, E. & Bray, J.W., TMMOB Maden Mühendisleri Odası Yayını.Tarhan, F. (1989). Mühendislik Jeolojisi Prensipleri, KTÜ, Trabzon.Utku, T. (1975). Teori ve Tatbikatta Heyelanlar, Karayolları Genel Müdürlüğü Matbaası, Ankara. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition of mass movements |
| 2 | Evaluation of the factors effecting mass movements |
| 3 | Classification mass movements |
| 4 | Rock slope analyzing methods |
| 5 | Inspection of mass movements |
| 6 | Midterm Examination 1 |
| 7 | How to prevent mass movements |
| 8 | Mechanisms of rock mass instability |
| 9 | Numerical and graphical methods |
| 10 | Economical importance of mass movements |
| 11 | Midterm Examination 2 |
| 12 | Back analysis |
| 13 | Limit equilibrium methods |
| 14 | Knematical Analysing methods |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Associate Pro Dr Ali KAYABAŞI | **Date:** | | 28.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503401600 | **TITLE** | GROUND IMPROVEMENT |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 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 | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 35 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 15 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction; definition of soils; compaction improvement; reinforcement techniques; lime, electro-osmaz and termic improvement techniques; additive improvement techniques; drainage techniques; grouting and mixing techniques; verification of soil improvement (field, laboratory and geophysical methods). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to teach what a ground improvement is, what are the considered criteria’s for ground improvement and how to do application | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To learn increasing methods of soil strength | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | -Ability to obtain neccessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering,  -Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering,  -Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines,  -Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications | | | | | | | |
| **TEXTBOOK** | | | | | Bell, F.G. (1993). Engineering Treatment of Soils, E&FN Spon. | | | | | | | |
| **OTHER REFERENCES** | | | | | Moseley, M.P. (1992). Ground Improvement, Macmillan Publishers New Zealand Ltd.. Impe, V. (1989). Soil Improvement Techniques and Their Evolution, Balkema.Kramer, S. L. (1996). Geoteknik Deprem Mühendisliği, Çeviren: Kamil Kayabalı, 2003, Gazi Kitabevi, Ankara. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition of soils in detail. |
| 2 | Selection importance of improvement method according to soil kind. |
| 3 | How to do compaction improvement. |
| 4 | How to do reinforced improvement. |
| 5 | How to use lime, electro-osmaz and termic improvement techniques. |
| 6 | Midterm Examination 1 |
| 7 | How to use additive improvement techniques. |
| 8 | How to apply drainage techniques. |
| 9 | How to apply grouting and mixing techniques. |
| 10 | How to verify a used soil improvement (field, laboratory and geophysical methods). |
| 11 | Midterm Examination 2 |
| 12 | Definition of soils in detail. |
| 13 | Selection importance of improvement method according to soil kind. |
| 14 | How to do compaction improvement. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Associate Prof Dr Ali KAYABAŞI | **Date:** | | 28.04.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402512 | **TITLE** | Tectonics of Travertines |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  ( x ) | | 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 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The importance of travertine sediments at neotectonic studies | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To benefit from travertines at neotectonic studies by understanding the relationship between the forming the travertines and neotectonic structures | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | By coming to light the secret data of travertines to succeed in use these data at neotectonic studies | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | TThe person who is a candidate to take a proficiency at the subject of neotectonics is going to be a knowledge of how he/she can be benefit from different sources | | | | | | | |
| **TEXTBOOK** | | | | | There is no only a single/ basic course book | | | | | | | |
| **OTHER REFERENCES** | | | | | Every kind of article or scientific publication related to travertine tectonics | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Forming of travertine and its relationship with tectonic structures |
| 3 | Forming of travertine and its relationship with tectonic structures |
| 4 | Classification of travertines |
| 5 | Tectonically important travertine types |
| 6 | Midterm Examination 1 |
| 7 | Tectonically important travertine types |
| 8 | Student presentation |
| 9 | Student presentation |
| 10 | Student presentation |
| 11 | Midterm Examination 2 |
| 12 | Examples of travertine's tectonic studies in our country |
| 13 | Examples of travertine's tectonic studies in our country |
| 14 | General assessment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr.Erhan Altunel | **Date:** | | 21.4.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** | 503402521 | **TITLE** | Volcanic systems in Turkey |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | To better understanding the volcanoes in Turkey | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Giving information for methodology about reworked and reworked volcanosedimentary rocks following to volcanic activity and their applications in earth sciences | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The participants learn the volcano-sedimentary basin evolution which is very crucial as economically in terms of the geological view | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Fundamentals of volcanism and methodology Fundamentals of volcanism and methodology  2.A general outline of the volcanic systems in turkey A general outline of the volcanic systems in turkey  3.Classification and introduction of the volcanic edifices Classification and introduction of the volcanic edifices  4.Erosional processes on the volcanic regions Erosional processes on the volcanic regions  5.Facies concept for volcanosedimentary environments Facies concept for volcanosedimentary environments | | | | | | | |
| **TEXTBOOK** | | | | | Volcanic Successions (R.A.F. CAS & J.V. WRIGHT) | | | | | | | |
| **OTHER REFERENCES** | | | | | Encyclopedia of Volcanoes (H. SIGURDSSON) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General outline |
| 2 | The fundamentals of volcanism |
| 3 | The volcanic edifices |
| 4 | The main agents controlling the erosional processes of the volcanic edifices |
| 5 | Properties of the volcanic mountains |
| 6 | Midterm Examination 1 |
| 7 | Post-Miocene volcanism in Turkey |
| 8 | Volcanic systems in western Anatolia |
| 9 | Volcanic systems in central Anatolia |
| 10 | Volcanic systems in eastern Anatolia |
| 11 | Midterm Examination 2 |
| 12 | Stratovolcanoes in Turkey |
| 13 | Shield volcanoes in Turkey |
| 14 | Quaternary volcanoes in Turkey and volcanic risks |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Özgür KARAOĞLU | **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** | **GEOLOGICAL ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503412608 | **TITLE** | Volcanosedimentary environments |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | |  |  | | | 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 (√)]** | | | | | | |
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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** | | | | | Relationships between basin development and coeval volcanism | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Giving information for methodology about reworked and reworked volcanosedimentary rocks following to volcanic activity and their applications in earth sciences | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The participants learn the volcano-sedimentary basin evolution which is very crucial as economically in terms of the geological view | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Classification and origin of the volcaniclastic rocks  2. Volcanosedimentary environments  3. Classification and introduction of the volcanic edifices  4. Erosional processes on the volcanic regions  5. Facies concept for volcanosedimentary environments | | | | | | | |
| **TEXTBOOK** | | | | | Volcaniclastic Rocks From Magmas to Tephras (H. LEYRIT & C. MONTENAT) | | | | | | | |
| **OTHER REFERENCES** | | | | | Pyroclastic Rocks (R. FISHER) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Classification and origin of the volcaniclastic rocks |
| 2 | Erosion and transportation processes at the volcanosedimentary environments |
| 3 | Classification of the volcanic edifices as morphological and genetic aspects |
| 4 | The main agents controlling the erosional processes of the volcanic edifices |
| 5 | Facies discriminations between subaerial and submarine environments |
| 6 | Midterm Examination 1 |
| 7 | Textures of the volcaniclastic rocks |
| 8 | Mapping training on the volcanosedimentary environments |
| 9 | Facies concept for volcanosedimentary environments |
| 10 | Volcaniclastic rocks in lacustrine settings |
| 11 | Midterm Examination 2 |
| 12 | Hydrothermal fluid circulation and alteration in the volcanosedimentary environments |
| 13 | Techniques for scaled-stratigraphical sections in volcanosedimentary environments |
| 14 | Texture and fabric relations in volcanosedimentary environments |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Özgür KARAOĞLU | **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** | **GEOLOGICAL ENGINEERING (PhD)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Shallow Geophysical Methods in Active Tectonic Investigations |

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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** | | | | | Investigation of active tectonic zones using high resolution shallow geophysical methods | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Investigation of active faults with geological observaitons and geophysical data | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | There is no specific textbook | | | | | | | |
| **OTHER REFERENCES** | | | | | All published materials related with the topic. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Overview of active tectonic structures |
| 3 | Overview of shallow geophysical methods |
| 4 | Significance of shallow geophysical methods in active tectonic studies |
| 5 | Significance of shallow geophysical methods in active tectonic studies |
| 6 | Midterm Examination 1 |
| 7 | Application of shallow geophysical methods in strike-slip faults |
| 8 | Application of shallow geophysical methods in normal faults |
| 9 | Application of shallow geophysical methods in reverse faults |
| 10 | Application of shallow geophysical methods in other structures |
| 11 | Midterm Examination 2 |
| 12 | Application of shallow geophysical methods in archaeoseismology |
| 13 | Application in the field |
| 14 | Application in the field |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Prof. Dr. Erhan Altunel | **Date:** |  |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | PHYSICAL VOLCANOLOGY |

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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 | | | | | 3 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 30 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Understanding of volcanoes, volcanic products, volcanic dynamics | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Teaching the basic concepts of volcanism. Classification of volcanoes according to explosion types, teaching basic parameters controlling volcano's activities, explosion types, their dynamics and teaching of the products and volcanic products are aimed. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1) Basic principles and working methods of volcanism  2) Classification of lava and pyroclastic products from volcanic products  3) Understanding physicochemical conditions from magma chamber to surface  4) Classification of volcanic mountains in Turkey | | | | | | | |
| **TEXTBOOK** | | | | | Volcanic Successions (R.A.F. CAS & J.V. WRIGHT) | | | | | | | |
| **OTHER REFERENCES** | | | | | Encyclopedia of Volcanoes (H. SIGURDSSON) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What is volcanology? |
| 2 | Relationship between volcanic activity and tectonism |
| 3 | Magma generation and types of magma |
| 4 | Classification of volcanoes |
| 5 | Classification of volcanic eruption types |
| 6 | Midterm Examination 1 |
| 7 | Lava flow types |
| 8 | Student presentations and discussion |
| 9 | Explosive volcanoes and products |
| 10 | Working methods in Ignimbrits |
| 11 | Midterm Examination 2 |
| 12 | Student presentations and discussion |
| 13 | Student presentations and discussion |
| 14 |  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Ability to obtain necessary knowledge deeply through scientific investigation, ability to evaluate, conclude and apply this knowledge in geological engineering. | | |  | |  |  |
| **LO 2** | Having comprehensive knowledge about up-to-date technologies and methods and their limitations in engineering. | | |  | |  |  |
| **LO 3** | Ability to complete and apply the limited or insufficient data through scientific methods and ability to use together the knowledge of different disciplines. | | |  | |  |  |
| **LO 4** | Awareness of new and improving applications in geological engineering and the ability to learn and study on these applications. | | |  | |  |  |
| **LO 5** | Ability to define and formulate the problems related to geological engineering, ability to improve methods to solve these problems and ability to apply innovative methods for solutions. | | |  | |  |  |
| **LO 6** | Ability to develop new and/or original ideas and methods, ability to design complex systems and processes and develop innovative/alternative solutions in the designs. | | |  | |  |  |
| **LO 7** | Ability to design and apply the theoretical, experimental and modeling research activities and ability to discuss and solve the complex problems arisen in these processes. | | |  | |  |  |
| **LO 8** | Ability to study effectively in teams for in-discipline and interdisciplinary activities, ability to lead these teams, ability to develop useful problem-solving approaches in complex situations, and ability to have responsibilities and to study independently and individually in all cases. | | |  | |  |  |
| **LO 9** | Ability of written and oral communication using a foreign language sufficiently. | | |  | |  |  |
| **LO 10** | Ability to present properly, clearly and systematically all processes and results of their studies oral or in written form in all kinds of national and international media. | | |  | |  |  |
| **LO 11** | To have the knowledge of social, environmental, health, safety and legal aspects in engineering applications and the knowledge of project management and engineering activities, and awareness of all of their limitations in engineering operations. | | |  | |  |  |
| **LO 12** | Having the social, scientific and ethical responsibilities in all stages of collecting, interpreting and presenting the related data and in all professional activities. | | |  | |  |  |
| **LO 13** | Ability to necessity lifelong learning gaining in an advanced way. | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Özgür KARAOĞLU | **Date:** | | 20.11.2017 | | | |

**Signature**:



**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**



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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Plate Tectonics and Magmatism |

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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 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Investigation of magma formation processes by giving the theory of plate tectonics | | | | | | | |
| **COURSE OBJECTIVES** | | | | |  | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | In the process of different plate tectonics, it is aimed to teach all the processes related to magma formation, settlement, lithospheric movement and ultimately volcanic eruption from the lower mantle to the upper crust conditions in the conclusion of all geodynamic and physicochemical conditions leading to formation of the magma. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Igneous Petrogenesis (M. Wilson, 1989) | | | | | | | |
| **OTHER REFERENCES** | | | | | Magmatic Processes and Plate Tectonics (in eds Prichard et al., 1993) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Magmatism and global tectonic proceses |
| 2 | What is plate tectonics? |
| 3 | Geochemistry of Igneous rocks |
| 4 | Partial melting processes in the Earth's upper mantle |
| 5 | Magmatism at constructive plate margins |
| 6 | Midterm Examination 1 |
| 7 | Magmatism at destructive margins |
| 8 | Student presentations ve discussion |
| 9 | Active continental margins, continental rift zones, and magmtism within plates |
| 10 | Back-arc margns, oceanic ridges and magmatism |
| 11 | Midterm Examination 2 |
| 12 | Student presentations ve discussion |
| 13 | Student presentations ve discussion |
| 14 | potassic magmatism within continental plates |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE GEOLOGICAL ENGINEERING PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Ability to understand and apply the most advanced levels of mathematics, science and engineering knowledge in chemical engineering and other related areas |  |  |  |
| **LO 2** | Ability to design, plan, supervise, conduct, conclude and apply the original research and investigation processes for innovative scientific and technological studies, by obtaining the up-to-date knowledge, in chemical engineering and other related areas |  |  |  |
| **LO 3** | Ability to design, plan, supervise, conduct, conclude and apply the innovative multi-disciplinary studies |  |  |  |
| **LO 4** | Ability to submit and publish the outcomes of academic studies in all kinds of respectable academic media |  |  |  |
| **LO 5** | Ability of written, oral and visual communication, in advanced level, in at least one foreign language |  |  |  |
| **LO 6** | Ability to analyze, synthesize, evaluate and criticize the arisen, suggested and/or submitted ideas in the study area |  |  |  |
| **LO 7** | Ability to analyze recent scientific, technologic, social, culturel and environmental improvements; and to have scientific impartiality, ethic and responsibility |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Özgür KARAOĞLU | **Date:** | 21.11.2017 |

**Signature**: