**CIVIL ENGINEERING MSc PROGRAMME**

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| **First Year** | | | | | | |
| **I. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501011101 | [THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS](#EN60) | 7.5 | 3+0 | 3 | **C** | Turkish |
| 503301513 | [THEORY OF ELASTICITY](#EN1) | 7.5 | 3+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-2 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Total of I. Semester | 30 |  | 12 |  |  |
| **II. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
|  | Elective Course-3 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-5 | 7.5 | 3+0 | 3 | E | Turkish |
| 503302001 | Seminar | 7.5 | 0+1 | - | **C** | Turkish |
|  | Total of II. Semester | 30 |  | 9 |  |  |
|  | TOTAL OF FIRST YEAR | 60 |  | 21 |  |  |

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| **Second Year** | | | | | | | | |
| **III. Semester** | | | | | | | | |
| Code | Course Title | | ECTS | | T+P | Credit | C/E | Language |
| 503301702 | MSc THESIS STUDY | | 25 | | 0+1 | - | **C** | Turkish |
| 503301703 | SPECIALIZATION FIELD COURSE | | 5 | | 3+0 | - | **C** | Turkish |
|  | | Total of III. Semester | 30 |  | |  |  |  |
| **IV. Semester** | | | | | | | | |
| Code | | Course Title | ECTS | T+P | | Credit | C/E | Language |
| 503301702 | | MSc THESIS STUDY | 25 | 0+1 | | - | **C** | Turkish |
| 503301703 | | SPECIALIZATION FIELD COURSE | 5 | 3+0 | | - | **C** | Turkish |
|  | | Total of IV. Semester | 30 |  | |  |  |  |
|  | | TOTAL OF SECOND YEAR | 60 |  | |  |  |  |

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| **Elective Courses** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 503301530 | [ADMIXTURES FOR CONCRETE](#EN17) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302504 | [ADVANCED CONCRETE TECHNOLOGY](#EN14) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301604 | [ADVANCED FOUNDATION ENGINEERING](#EN52) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302502 | [ADVANCED SOIL MECHANICS](#EN2) | 7.5 | 3+0 | 3 | E | TR-EN |
| 503301534 | [APPLICATIONS OF ADVANCED MECHANICS OF FLUIDS](#EN53) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302524 | [BINDING MATERIALS](#EN16) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302517 | [COASTAL PROTECTION STRUCTURES](#EN8) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302505 | [COMPOSITE MATERIALS](#EN18) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301531 | [COMPUTATIONAL FLUID DYNAMICS](#EN15) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302527 | [CONSTRUCTION PROJECT MANAGEMENT](#EN51) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301605 | [CRITICAL STATE SOIL MECHANICS](#EN27) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302513 | [DAM FAILURE](#EN46) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302528 | [DESIGN AND CONSTRUCTION OF TALL BUILDINGS](#EN56) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302531 | [DISCRETE CHOICE MODELLING](#EN61) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301502 | [DYNAMICS OF STRUCTURES](#EN37) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302512 | [EARTH STRUCTURES](#EN48) | 7.5 | 3+0 | 3 | E | Turkish |
| 503312602 | [EARTHQUAKE ANALYSE OF STRUCTURE](#EN38) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301514 | [ENVIRONMENTAL HYDRAULIC](#EN50) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302529 | [EXPERIMENTAL METHODS IN CIVIL ENGINEERING](#EN55) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302525 | [EXPERIMENTAL SOIL MECHANICS](#EN20) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301507 | [FERROCEMENT TECHNOLOGY](#EN21) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301503 | [FINITE ELEMENT METHOD I](#EN31) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302503 | [FINITE ELEMENT METHOD II](#EN29) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301529 | [GEOSYNTHETICS IN CIVIL ENGINEERING PRACTICES](#EN25) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302519 | [GEOTECHNICAL EARTHQUAKE ENGINEERING](#EN22) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301512 | [GEOTECHNICAL ENGINEERING](#EN23) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301504 | [GEOTECHNICS FOR DAM ENGINEERING](#EN47) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301528 | [INVESTMENT PLANNING IN ENGINEERING](#EN6) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301511 | [MATRIX METHODS](#EN28) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301505 | [MEASUREMENT OF SOİL PROPERTIES](#EN49) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302516 | [Mechanics of Continuous Medium](#EN35) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301520 | [NETWORK ANALYSIS IN CONSTRUCTION MANAGEMENT](#EN5) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301508 | [PLASTIC ANALYSIS OF STRUCTURES](#EN30) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302518 | [PORTS AND IN-PORT STRUCTURES](#EN9) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302508 | [PREFABRICATED STRUCTURES](#EN33) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302520 | [PRINCIPLES OF FLEXIBLE PAVEMENT DESIGN](#EN10) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301536 | [PRINCIPLES OF HIGHWAY PAVEMENT DESIGN](#EN59) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301509 | [RAILWAY ENGINEERING](#EN42) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302507 | [REPAIR & STRENGTHENING OF STRUCTURES](#EN39) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302509 | [RESOURCES ALLOCATION IN CONSTRUCTION MANAGEMENT](#EN7) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301519 | [SEA BED PROFILES](#EN4) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301527 | [SHELL STRUCTURES](#EN26) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302602 | [SLOPE STABILITY ANALYSIS](#EN36) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302512 | [SOIL DYNAMICS](#EN58) | 7.5 | 3+0 | 3 | E | Turkish |
| 503311602 | [SOILS FAILURE MECHANISM](#EN41) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301532 | [SPECIAL TOPICS IN STEEL STRUCTURES](#EN19) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301506 | [STATISTICALS METHODS IN CIVIL ENGINEERING](#EN34) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301535 | [STRUCTURAL OPTIMIZATION](#EN54) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302514 | [THEORY OF PLATES](#EN32) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301522 | [TRAFFIC MANAGEMENT](#EN43) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301521 | [TRANSPORT ECONOMICS](#EN44) | 7.5 | 3+0 | 3 | E | Turkish |
| 503302521 | [TRANSPORTATION MODELING](#EN11) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301537 | [TRANSPORTATION PLANNING](#EN57) | 7.5 | 3+0 | 3 | E | Turkish |
| 503301518 | [WAVE ANALYSIS METHODS](#EN3) | 7.5 | 3+0 | 3 | E | Turkish |

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**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302514 | **TITLE** | Theory of Elasticity |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Mathematical Foundations. Analysis of Stress. Analysis of Strain. Conservation laws. Linear Elasticity. Constitutive Equations. Generalized Hooke's Law. Fundamental Equations of Theory of Elasticity. Stress Problem. Displacement Problem. Compatibility Conditions. General Theory of Plane Elasticity. Plane Stress (Thin Plate Problem). Plane Strain (Long Cylinder Problem). Solutions in Cartesian Coordinates. Stress Functions. Airy Stress Function. Boundary Conditions. Polynomial Solutions. Biharmonik Functions. Examples. Fourier Series Solutions. Examples. Solutions in Polar Coordinates. Examples. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to get students knowledge about definitions of strength and stress-strain equations and also teaching to solve the questions about this subjects and examining some engineering problems depending on boundary conditions | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to have:  1. Basic engineering formation and point of view about the plate problems as an engineer.  2. Knowlegde and ability to solve engineering problems about elasticity | | | | | | | |
| **TEXTBOOK** | | | | | S.P. Timoshenko and J.N. Goodier, Theory of Elasticity (third ed.), McGraw-Hill Int. Ed., Singapore 1970. | | | | | | | |
| **OTHER REFERENCES** | | | | | M. İnan, Düzlem Elastisite Teorisi, Matbaa Teknisyenleri Basımevi, 1969C. Ugural, S. K. Fenster , Advanced Strength and Applied Elasticity, 4nd Edition, Prentice Hall PTR, 2003 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic assumptions |
| 2 | Analysis of Stress. Analysis of Strain |
| 3 | Stress Problem |
| 4 | Displacement Problem |
| 5 | General Theory of Plane Elasticity, Compatibility Conditions. |
| 6 | Midterm Examination 1 |
| 7 | Plane Stress (Thin Plate Problem). |
| 8 | Plane Strain (Long Cylinder Problem) |
| 9 | Solutions in Cartesian Coordinates. |
| 10 | Stress Functions. Airy Stress Function |
| 11 | Midterm Examination 2 |
| 12 | Biharmonik Functions. Examples. |
| 13 | Fourier Series Solutions Examples. |
| 14 | Solutions in Polar Coordinates. Examples |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr.Eşref ÜNLÜOĞLU | **Date:** | 08.09.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | ADVANCED SOIL MECHANICS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 8 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish-English |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (………) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Soil Composition and Strees in Soil, Consolidation Theory, Shear Strength of Soils | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning fundamental concepts of soil physical properties in detail, study on soil shear strength regarding different soils and conditions | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soils mechanical and physical properties | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | An Introdcution to Geotechnical Engineering, Holtz and Kovacs, 2nd Edition | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Soil Composition and Stress in Soil |
| 2 | Soil Consolidation |
| 3 | Rate of Primary Consolidation and Secondary Consolidation |
| 4 | Finite Strain Consolidation Theory |
| 5 | Shear Strength of Soils-Tests for Measuring Shear Strength |
| 6 | Midterm Examination 1 |
| 7 | Critical State Principles for Sands in Drained Shear |
| 8 | Evaluation of Drained Strength of Sand |
| 9 | Undrained Strenth of Sand |
| 10 | Factors Affecting Strength of Clay |
| 11 | Midterm Examination 2 |
| 12 | Evaluation of Strength and Deformation/Pore Pressure Response of Clay |
| 13 | Normalization of Clay Strength |
| 14 | Project |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd.Doç.Dr.Kamil Bekir Afacan | **Date:** | 01.10.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301518 | **TITLE** | WAVE ANALYSIS METHODS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic concepts, small amplitude wave theory, long amplitude wave theory, wave climate and statistical analysis and wave generation, water surface changes. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Explanation of wave theories and wave statistics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It contributes to planning, design and application works of wave theories and wave statistics. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Wave theories and wave statistics are known and commented. | | | | | | | |
| **TEXTBOOK** | | | | | Kıyı Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2009. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Deniz Tabanı Hidrodinamiği ve Kıyı Morfolojisi (Planlama ve Tasarım), Prof.Dr. Yalçın Yüksel,Beta Basım A.Ş. yayını, 2011. 2. Liman Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2010. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic concepts, small amplitude wave theory |
| 2 | Small amplitude wave theory |
| 3 | Small amplitude wave theory |
| 4 | Small amplitude wave theory |
| 5 | Small amplitude wave theory, long amplitude wave theory |
| 6 | Midterm Examination 1 |
| 7 | Long amplitude wave theory, wave climate and statistical analysis and wave generation |
| 8 | Wave climate and statistical analysis and wave generation |
| 9 | Wave climate and statistical analysis and wave generation |
| 10 | Wave climate and statistical analysis and wave generation |
| 11 | Midterm Examination 2 |
| 12 | Wave climate and statistical analysis and wave generation |
| 13 | Wave climate and statistical analysis and wave generation, water surface changes |
| 14 | Water surface changes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. Kemal Günaydın | **Date:** | 13.11.2015 |

**Signature**:

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**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301519 | **TITLE** | SEA BED PROFILES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Sea bed hydrodynamic, sea water and bed material characteristics, current and wave mechanic. initiation of motion, bed shapes, suspend transport, bed load transport, total sediment trasport, cross shore sediment transport, long shore sediment transport, modelling of sediment transport, shore morphology. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Explanation of sediment transport and bed profiles. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It contributes to planning, design and application works of sediment transport and bed morphology. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Current and wave mechanic, sediment transport and bed profiles are known and commented. | | | | | | | |
| **TEXTBOOK** | | | | | Deniz Tabanı Hidrodinamiği ve Kıyı Morfolojisi (Planlama ve Tasarım), Prof.Dr. Yalçın Yüksel,Beta Basım A.Ş. yayını, 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kıyı Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2009. 2. Liman Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2010. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Sea bed hydrodynamic, sea water and bed material characteristics |
| 2 | Current and wave mechanic |
| 3 | Current and wave mechanic |
| 4 | Current and wave mechanic, initiation of motion |
| 5 | Initiation of motion, bed shapes |
| 6 | Midterm Examination 1 |
| 7 | Bed shapes, suspend transport |
| 8 | Bed load transport, total sediment trasport |
| 9 | Cross shore sediment transport |
| 10 | Cross shore sediment transport, long shore sediment transport |
| 11 | Midterm Examination 2 |
| 12 | Long shore sediment transport |
| 13 | Modelling of sediment transport |
| 14 | Modelling of sediment transport, shore morphology. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. Kemal Günaydın | **Date:** | 13.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301520 | **TITLE** | NETWORK ANALYSIS IN CONSTRUCTION MANAGEMENT |

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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 | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to introduce basic information about planning techniques used in construction management. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduction to Planning techniques and their properties: BAR CHART: CPM (Critical Path Method): PERT (Program Evaluation and Review Technique): Precedence Diagrams: LOB (Line of Balance Diagrams): Minimal and maximal route planning: Minimal and Maximal Spanning Trees: Out-Off Kilter Algorithms: PERT-COST analysis: Transportation Problems and some applications: Definitions of Resources Allocation problems: Case studies | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learn basic information about planning techniques used in construction management; apply these techniques for a project in construction management. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn basic information about planning techniques used in construction management.  2. Understand BAR CHART method for planning of construction management.  3. Understand CPM (Critical Path Method methods) for planning of construction management.  4. Understand PERT (Program Evaluation and Review Technique) for planning of construction management.  5. Understand Precedence Diagrams for planning of construction management.  6. Understand LOB (Line of Balance Diagrams) for planning of construction management.  7. Understand Minimal and maximal route planning of construction management.  8. Learn how to use Minimal and Maximal Spanning Trees.  9. Understand the application of Out-Off Kilter Algorithms.  10. Understand transportation problems and their applications.  11. Use PERT-COST analysis.  12. Understand Definitions of Resources Allocation problems and case studies. | | | | | | | |
| **TEXTBOOK** | | | | | 1.Özdemir, İ. (1998), Lecture Notes of Network Analysis In Construction Planning, Eskişehir, | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Levin R. I. and others, (1989). Quantitive Approaches to Management, Seventh Edition, Singapore, McGraw Hill Int. Editions.2. Elmaghraby, S. E., (1977). Activity Network: Project Planning and Control By Network Methods, John Wiley and Sons, New York,3. Phillips D. T., Bolotky, G. R. and others, (1981). Fundamentals of Network Analysis, New Jersey, Prentice Hall Inc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic information about planning techniques used in construction management. |
| 2 | BAR CHART method for planning of construction management. |
| 3 | CPM (Critical Path Method methods) for planning of construction management |
| 4 | PERT (Program Evaluation and Review Technique) for planning of construction management. |
| 5 | Precedence Diagrams and LOB (Line of Balance Method) for planning of construction management. |
| 6 | Midterm Examination 1 |
| 7 | Minimal and maximal route planning of construction management. |
| 8 | Minimal and maximal route planning of construction management. |
| 9 | Minimal and maximal route planning of construction management. |
| 10 | Application of Out-Off Kilter Algorithms. |
| 11 | Midterm Examination 2 |
| 12 | PERT-COST analysis. |
| 13 | Transportation problems and their applications |
| 14 | Definitions of Resources Allocation problems and case studies. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | YRD. DOÇ. DR. OSMAN AYTEKİN | **Date:** | 01.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301528 | **TITLE** | INVESTMENT PLANNING IN ENGINEERING |

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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 | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to introduce basic information about how to prepare the investment planning in engineering. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | \*Properties of engineering economy,  \* Investment problems,  \*Cash flow graphs,  \* Interest rates systems,  \* Single payment compound amount,  \*Equal payment compound amount,  \*Discrete payment compound amount,  \*Basic concept of Choosing Among Investment Alternatives and used techniques (PW, FW, EUAS, EUAC, Rate of Return, Payback Period etc.),  \*Choosing Among Investment Alternatives,  \* Benefit-Cost Ratio Analysis,  \* Equipment Replacement and Retirement,  \* Preparing and Presenting an Economic Feasibility Study | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Capable of Learn basic information about how to prepare the investment planning in engineering | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn basic information about how to prepare the investment planning in engineering.  2. Understand Properties of engineering economy.  3. Understand: Investment problems.  4. Understand Cash flow graphs.  5. Understand interest rates systems.  6. Understand single payment compound amount, equal payment compound amount and, discrete payment compound amount.  7. Learn choosing Among Investment Alternatives and used techniques (PW, FW, EUAS, EUAC, Rate of Return, Payback Period etc.).  8. Understand Benefit-Cost Ratio Analysis.  9. Understand Equipment Replacement and Retirement.  10. Use Preparing and Presenting an Economic Feasibility Study. | | | | | | | |
| **TEXTBOOK** | | | | | 1.Kahya, E., (2003), Lecture Notes of Engineering Economy and Solved Problems, Eskişehir,2.Okka, O., (1985), Mühendislik Ekonomisi I-II, Ankara, Gazi Üniversitesi Basımevi | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. White, J. A. and others, (1984). Principles of Engineering Economic Analysis, Second Edition, Canada, John Wiley and Sons Inc.. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic information about how to prepare the investment planning in engineering. |
| 2 | Properties of engineering economy. |
| 3 | Investment problems. |
| 4 | Understand Cash flow graphs. |
| 5 | Interest rates systems. |
| 6 | Midterm Examination 1 |
| 7 | Single payment compound amount, equal payment compound amount and , discrete payment compound amount |
| 8 | Choosing Among Investment Alternatives and used techniques (PW, FW, EUAS, EUAC, Rate of Return, Payback Period etc.). |
| 9 | Choosing Among Investment Alternatives and used techniques (PW, FW, EUAS, EUAC, Rate of Return, Payback Period etc.). |
| 10 | Choosing Among Investment Alternatives and used techniques (PW, FW, EUAS, EUAC, Rate of Return, Payback Period etc.). |
| 11 | Midterm Examination 2 |
| 12 | Benefit-Cost Ratio Analysis. |
| 13 | Equipment Replacement and Retirement |
| 14 | Preparing and Presenting an Economic Feasibility Study. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | YRD. DOÇ. DR. OSMAN AYTEKİN | **Date:** | 01.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302509 | **TITLE** | RESOURCES ALLOCATION IN CONSTRUCTION MANAGEMENT |

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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 | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to introduce basic information about resources allocation planning techniques used in construction management | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Basic concept of network flows: directed and undirected network flows: limited time-unlimited resources allocation planning techniques: unlimited time-limited resources allocation planning techniques: time-cost optimization problems: GERT (Graphical evaluation and Review technique): Applications of Out-Off Kilter algorithms: GN (Generalized Networks). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Capable of Learn basic information about resources allocation planning techniques used in construction management. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn basic information about resources allocation planning techniques used in construction management.  2. Understand Basic concept of network flows.  3. Understand directed and undirected network flows.  4. Understand limited time-unlimited resources allocation planning techniques.  5. Understand unlimited time-limited resources allocation planning techniques.  6. Understand time-cost optimization problems.  7. Learn how to use GERT (Graphical evaluation and Review technique).  8. Understand Applications of Out-Off kilter algorithms.  9. Understand GN (Generalized Networks). | | | | | | | |
| **TEXTBOOK** | | | | | 1.Özdemir, İ., (1998), Resources Allocation in Construction Managent Course Notes, Eskişehir,2.Whitehouse, G. E., (1973), System Analysis and Design Using Network Techniques, Prentice Hall Inc. New Jersey | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Levin R. I. and others, (1989). Quantitive Approaches to Management, Seventh Edition, Singapore, McGraw Hill Int. Editions.2. Elmaghraby, S. E., (1977). Activity Network: Project Planning and Control By Network Methods, John Wiley and Sons, New York,.3. Phillips D. T., Bolotky, G. R. and others, (1981). Fundamentals of Network Analysis, New Jersey, Prentice Hall Inc. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic information about resources allocation planning techniques used in construction management. |
| 2 | Basic concept of network flows |
| 3 | Directed and undirected network flows |
| 4 | Limited time-unlimited resources allocation planning techniques |
| 5 | Limited time-unlimited resources allocation planning techniques |
| 6 | Midterm Examination 1 |
| 7 | Unlimited time-limited resources allocation planning techniques |
| 8 | Unlimited time-limited resources allocation planning techniques |
| 9 | Time-cost optimization problems |
| 10 | GERT (Graphical evaluation and Review technique). |
| 11 | Midterm Examination 2 |
| 12 | Applications of Out-Off kilter algorithms |
| 13 | GN (Generalized Networks). |
| 14 | Applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | YRD. DOÇ. DR. OSMAN AYTEKİN | **Date:** | 01.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302517 | **TITLE** | COASTAL PROTECTION STRUCTURES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Design critarias with structural and non structural solutions, local erosion on sea structures, sedimentation in channels and trenches, sea structures. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Explanation of coastal protection structures. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It contributes to planning, design and application works of coastal protection structures. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Coastal protection structures and design criterias are known and commented. | | | | | | | |
| **TEXTBOOK** | | | | | 1. Deniz Tabanı Hidrodinamiği ve Kıyı Morfolojisi (Planlama ve Tasarım), Prof.Dr. Yalçın Yüksel,Beta Basım A.Ş. yayını, 2011. 2. Kıyı Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2009. | | | | | | | |
| **OTHER REFERENCES** | | | | | Liman Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2010. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Design critarias with structural and non structural solutions |
| 2 | Design critarias with structural and non structural solutions |
| 3 | Design critarias with structural and non structural solutions |
| 4 | Design critarias with structural and non structural solutions |
| 5 | Design critarias with structural and non structural solutions, local erosion on sea structures |
| 6 | Midterm Examination 1 |
| 7 | Local erosion on sea structures |
| 8 | Local erosion on sea structures, sedimentation in channels and trenches |
| 9 | Sedimentation in channels and trenches |
| 10 | Sedimentation in channels and trenches, sea structures |
| 11 | Midterm Examination 2 |
| 12 | Sea structures |
| 13 | Sea structures |
| 14 | Sea structures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr. Kemal Günaydın | **Date:** | 13.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302518 | **TITLE** | PORTS AND IN-PORT STRUCTURES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Ports, sea transportation, port location selection, plannig and design of water areas, container terminal, general cargo and multi propose terminals, Ro/Ro and ferry terminals, liquid load terminals, dry load terminals, fisher ports, yacht ports, lateral ship forces and fenders, navigation safety systems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Explanatiın of ports and in-port structures and terminals. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It contributes to planning, design and application works of ports. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ports, in-port structures and navigation safety systems are known and commented. | | | | | | | |
| **TEXTBOOK** | | | | | Liman Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2010. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kıyı Mühendisliği, Prof.Dr. Yalçın Yüksel, Prof.Dr. Esin Özkan Çevik, Beta Basım A.Ş. yayını, 2009. 2. Deniz Tabanı Hidrodinamiği ve Kıyı Morfolojisi (Planlama ve Tasarım), Prof.Dr. Yalçın Yüksel,Beta Basım A.Ş. yayını, 2011. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Ports |
| 2 | Ports, sea transportation |
| 3 | Sea transportation, port location selection |
| 4 | Plannig and design of water areas |
| 5 | Plannig and design of water areas, container terminal |
| 6 | Midterm Examination 1 |
| 7 | Container terminal |
| 8 | General cargo and multi propose terminals, Ro/Ro and ferry terminals |
| 9 | Ro/Ro and ferry terminals, liquid load terminals |
| 10 | Dry load terminals, fisher ports |
| 11 | Midterm Examination 2 |
| 12 | Fisher ports, yacht ports |
| 13 | Yacht ports, lateral ship forces and fenders |
| 14 | Navigation safety systems. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr. Kemal Günaydın | **Date:** | 13.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302520 | **TITLE** | PRINCIPLES OF FLEXIBLE PAVEMENT DESIGN |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Content of the course is as follows: highway, highway materials, highway materials experiments, HMA experiments. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to provide the student with a clear and through presentation of the theory and application of plexible pavement. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Elementary design methods. This course provide effort solving plexible pavement. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to use the basic knowlodge of highway design and be familiar with some problems of plexible pavement. | | | | | | | |
| **TEXTBOOK** | | | | | UMAR, Faruk, AĞAR, Emine, “Yol Üstyapısı”. 1985. İ.T.Ü. Matbaası. İstanbulWhiteoak, D., The Shell Bitumen Handbook, 1991.Shell Bitüm El Kitabı, İstanbul Büyükşehir Belediyesi, 2004.Asfalt El Kitabı, İSFALT, İstanbul Büyükşehir Belediyesi, 2004.Asfalt ve Uygulamaları, İSFALT, İstanbul Büyükşehir Belediyesi, 2004Asfalt Laboratuvarı El Kitabı, KGM… | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General highway knowledge |
| 2 | Pavement type |
| 3 | Bitumen and experiments |
| 4 | Aggregates and experiments |
| 5 | Mix and experiments |
| 6 | Midterm Examination 1 |
| 7 | Static and dynamic creep tests |
| 8 | Laboratory studies about bitumen |
| 9 | Laboratory studies about aggregate |
| 10 | Laboratory studies about mix, Superpave |
| 11 | Midterm Examination 2 |
| 12 | Land studies |
| 13 | Core specimen studies |
| 14 | Sample evaluations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Murat KARACASU | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302521 | **TITLE** | TRANSPORTATION MODELING |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Transportion planning and modelling, general problems in modelling transport, trip generation modelling, trip distribution modelling, modal-split modelling, assignment models, public transport assignment models, fuzzy Logic, Electre Method, Group Decision Making Models. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to provide the student with a clear and through presentation of the theory and application of transportation modelling. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is to get students knowledge about definitions of transportation planning models. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to use the basic knowledge and some problems of transportation modeling. | | | | | | | |
| **TEXTBOOK** | | | | | Ortuzar, J.D., Willumsen, L.G.: Modelling Transport, John Wiley and Sons, 1990Erlander, S., Stewart, N.F.: The Gravity Model in Transportation Analysis, VSP, 1990.Gülgeç, İ., Ulaşım Planlaması, Ankara, 1998.Survey Methods for Transport Planning, Anthony J. Richardson, Elizabeth S. Ampt, Arnim H. Meyburg | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General modeling knowledge |
| 2 | The need for modeling |
| 3 | Statistical information |
| 4 | General problems in modeling |
| 5 | Trip generation models |
| 6 | Midterm Examination 1 |
| 7 | Trip distribution models |
| 8 | Modal-split |
| 9 | Traffic assignment models |
| 10 | Fuzzy Logic |
| 11 | Midterm Examination 2 |
| 12 | Electre Method |
| 13 | Group Decision Making Models |
| 14 | Site studies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Murat KARACASU | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302523 | **TITLE** | PRINCIPLES OF HIGHWAY PAVEMENT DESIGN |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Content of the course is as follows: highway, highway design, highway materials and highway materials experiments. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to provide the student with a clear and through presentation of the theory and application of highways. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Elementary design methods. This course provides effort solving highway design. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to use the basic knowledge of highway design and be familiar with some problems of highways. | | | | | | | |
| **TEXTBOOK** | | | | | UMAR, Faruk, AĞAR, Emine, “Yol Üstyapısı”. 1985. İ.T.Ü. Matbaası. İstanbulWhiteoak, D., The Shell Bitumen Handbook, 1991.Shell Bitüm El Kitabı, İstanbul Büyükşehir Belediyesi, 2004.Asfalt El Kitabı, İSFALT, İstanbul Büyükşehir Belediyesi, 2004.Asfalt ve Uygulamaları, İSFALT, İstanbul Büyükşehir Belediyesi, 2004Asfalt Laboratuvarı El Kitabı, KGM… | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General highway knowledge |
| 2 | Highway loads, layers and design |
| 3 | Geometric cross section |
| 4 | Design standards and highway context |
| 5 | Basic design policies |
| 6 | Midterm Examination 1 |
| 7 | Scenic values in planning and design |
| 8 | Material sites and disposal sites |
| 9 | Geometrıc desıgn and structure standards |
| 10 | Pavement type and design |
| 11 | Midterm Examination 2 |
| 12 | Laboratory studies |
| 13 | Laboratory studies |
| 14 | Laboratory studies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Murat KARACASU | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302504 | **TITLE** | ADVANCED CONCRETE TECHNOLOGY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Developing on concrete, aim of concrete laboratory, mission of concrete technology. Ordinary concrete, mixing, transporting, placing, curing and quality control. Preparing the concrete mixture on hot and cold weather. Concrete types, special cements. Ferrocement, concrete used waste and using waste. Pavement coat and runway concrete. Fiber concrete, polymer | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Giving information about developing concrete, explaining the aim of concrete laboratory. Teaching and doing experimental studies on the ordinary concrete, mixing, transporting, placing, curing and quality control. Explaining how and why the precaution of preparing the concrete mixture on hot and cold weather. Giving information about Concrete types | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Know about concrete and its development. Grasp aim of concrete laboratory. Know and apply how to do mixing, transporting, placing, curing and quality control on ordinary concrete. Know the precaution of preparing the concrete mixture on hot and cold weather. Know how to produced the concrete types and their aims. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Teaching of Advanced Concrete Technology information listed above | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Kocataşkın, F., Yeni Gelişen Beton Malzemeleri, İleri Beton Teknolojisi Ders Notları, İTÜ İnşaat Fakültesi, İstanbul, 1987 | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Beton, Prof. Dr. Turhan Y. Erdoğan, ODTÜ Geliş. Vakfı Yay. ve İletişim A.Ş. Yayını, 2003.2.Beton, C. 1, Prof. Bekir Postacıoğlu, Matbaa Teknisyenleri Basımevi, 1986, İstanbul.4. Beton, Necat Cilasun, STFA İnşaat A.Ş. Yayınları, No. 21, İstanbul, 1982. 5.Beton, Türkiye Hazır Beton | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and Development of concrete, Concrete Laboratory, The purpose of the task Concrete Tech. |
| 2 | Normal concrete-Composition, specifications, mixing calculations, manufacture, transport, installation, maintenance, quality control. |
| 3 | Production of concrete in hot weather, cold weather concrete production. |
| 4 | Ready-mixed concrete, Transport concrete, pumped concrete, shotcrete. |
| 5 | Self-consolidated concrete, high strength concrete, high-performance concrete. |
| 6 | Midterm Examination 1 |
| 7 | Architectural Concrete, grout concrete, injection mortar (mortar anchor), a repair mortar. |
| 8 | Prefabricated concrete, Fresh concrete strength, resistance at an early age, |
| 9 | Special Cements, reactive powder concrete. |
| 10 | Massif concrete, Rolkrit, underwater concrete, prepacked concrete, vacuum concrete, Wash. concrete. |
| 11 | Midterm Examination 2 |
| 12 | Heavyweight concrete, lightweight concrete. Self-compacting concrete. |
| 13 | Prestressed concrete, Ferrocement, Use of waste concrete and waste are used. |
| 14 | Fibrous concrete pavement and air space of concrete, polymer concrete, concrete space .. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. İlker Bekir TOPÇU | **Date:** | 29.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301531 | **TITLE** | Computational Fluid Dynamics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 7 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | Fluid Mechanics and Partial Differential Equations courses are recommended to be taken. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Governing equations of fluid mechanics, classification of partial differential equations, Reynolds Averaged Navier-Stokes equations, turbulence models, finite difference methods, stability conditions, finite difference methods for heat, wave, Burgers and Laplace equations, numerical solutions techniques for Navier-Stokes equations, ADI solution, Poisson Equation for pressure, primitive variables approach, marker and cell method, SIMPLE method, artificial compressibility method, finite volume methods, approximation of volume and surface integrals, computation of convective and diffusive fluxes, boundary integrals, numerical simulation methods of unsteady free-surface flows, non-reflecting far-end boundary conditions. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introducing numerical solution methods of model equations such as heat, wave and Laplace equations. Investigation of numerical solution methods for the classical problems faced in fluid mechanics courses without any simplification. Teaching numerical techniques for Navier-Stokes equations which can be applied to numerous fluid flow problems, applying to engineering problems and obtaining numerical result with developing computer codes are the objectives of this course. Comparison of obtained numerical results with existing experimental data, testing of computer code and numerical method are also objectives of this course. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | In recent years numerical simulation techniques with advences in computer technology become an important tool in solving engineering problems. A numerical solution method verified using existing experimental data, in the absence of experimental measurement emerges as a quickly and pratical tool. Besides this course in many parts of the engineering faculty of graduate and PhD studies experimental studies of researchers who will enable them to perform numerical solutions. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Student taking this course will be able to solve an engineering problem with selecting initial and boundary conditions and appropriate numerical methods for the numerical solution of the problem by computer. Comparing the obtained results with existing experimental and other numerical results validating the numerical methods and computer codes able to develop an alternative approach to solving the problem | | | | | | | |
| **TEXTBOOK** | | | | | Computational Techniques for Fluid Dynamics, Lecture Notes, Dr.İsmail AYDIN, Civil Engineering Department, Middle East Technical University. | | | | | | | |
| **OTHER REFERENCES** | | | | | An Introduction to Computational Fluid Dynamics, Finite Volume Method, H.K. Versteeg, W. Malalasekera, Longman, 1995. Computational Fluid Dynamics, K.A. Hoffman, S.T. Chiang, Engineering Education System, P.P. Box. 20078 Wichita, KS 67208-1078, USA, 1993. Numerical Heat Transfer and Fluid Flow, Suhas V. Patankar, Series in Computational Methods in Mechanics and Thermal Sciences, 1980. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Governing equations of fluid mechanics, classification of partial differential equations. |
| 2 | Reynolds averaged Navier-Stokes equations, turbulence models |
| 3 | Finite difference methods for heat equation |
| 4 | Finite difference methods for wave and Burgers equations |
| 5 | Finite difference equations of Laplace equation |
| 6 | Midterm Examination 1 |
| 7 | Voricity-stream function approaches for Navier-Stokes equations, ADI solutions |
| 8 | Poisson equation for pressure, primitive variables approach |
| 9 | Marker and cell method, SIMPLE method |
| 10 | Artificial compressibility method |
| 11 | Midterm Examination 2 |
| 12 | Finite volume method, the generic conservation equation, cell centered schemes on structured grid |
| 13 | Approximations for surface and volume integrals, interpolations for convective and diffusive fluxes |
| 14 | Numerical simulation of unsteady free-surface flows |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Ender Demirel | **Date:** | 05.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302524 | **TITLE** | Binding Materials |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In this course, general information will be given about the binding material, gypsum, lime, natural and artificial pozzolans, cements, sulphate-resistant, with blast furnace slag, fly ash, blended-tras with white-colored, mortar, high early strength, air entrainment, alumina cement, hybrid binders and other cement, bitumen, resin and other binders will be discussed. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To give general information about the binding material,  To identify the type of binding material,  To give information about cement and its types as a binding material | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Identifying the binding materials | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Selection and application of binding materials for environmental conditions and desired properties | | | | | | | |
| **TEXTBOOK** | | | | | Beton, Prof. Dr. Turhan Y. Erdoğan, ODTÜ Vakfı Yay. A.Ş. Yayını, 2003. Admixtures for Concrete, Prof. Dr. T.Y. Erdoğan, METU, 1997. | | | | | | | |
| **OTHER REFERENCES** | | | | | Beton, Prof. Dr. Turhan Y. Erdoğan, ODTÜ Geliştirme Vakfı Yay. ve İletişim A.Ş. Yayını, 2003. Beton Teknolojisine Giriş, Prof. Dr. M. Süheyl Akman, İTÜ, Ağustos 1994. Beton Teknolojisi, M. Kamanlı, F. S. Balık, Atlas Yayın , ss. 77-78, İstanbul, ss. 77-78, 2003. Beton ve Beton Teknolojisi, O. Şimşek, Seçkin Yayıncılık San., Ankara, ss. 69-71, 2004. Betonarme Yapılarda Kalıcılık, B. Baradan, H. Yazıcı, H. Ün, Dokuz Eylül Üni. Yay., 2002. Concrete Admixtures Handbook, Ramachandran VS, Noyes Publications, NJ, USA, 1995. Admixtures for Concrete, Erdoğan, T.Y., METU, 1997. The Chemistry of Cement and Concrete, Lea, F.M, Unwin Brothers Ltd., 1976. The Testing of Concrete in Structures, Bungey JH, Surrey Univ. Pres, UK | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | general information about the binding material |
| 2 | gypsum |
| 3 | lime |
| 4 | natural pozzolans |
| 5 | artificial pozzolans |
| 6 | Midterm Examination 1 |
| 7 | sulphate-resistant cements, blast furnace slag cements |
| 8 | fly ash cements |
| 9 | blended-tras cements |
| 10 | white-colored cements mortar cements high early strength cements |
| 11 | Midterm Examination 2 |
| 12 | air entrainment cements |
| 13 | hybrid binders and other cement |
| 14 | alumina cement, bitumen, resin and other binders |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assist. Prof. Dr. Mehmet Canbaz | **Date:** | 05.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301530 | **TITLE** | Admixtures for Concrete |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Course content is as follows:, concrete properties and the use of admixture, considerations and precaution of admixture, classification admixtures, | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to develop the capabilities of the concrete admixture selection for the desired concrete properties, concrete design related to the selected admixture and the production. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Introduction to admixtures used in the production of concrete  Consciously admixture choice and use | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Explanation of mechanism of admixture effects,  Determination of the effects of the admixture of concrete properties by standard test methods | | | | | | | |
| **TEXTBOOK** | | | | | Beton, Prof. Dr. Turhan Y. Erdoğan, ODTÜ Vakfı Yay. A.Ş. Yayını, 2003. Admixtures for Concrete, Prof. Dr. T.Y. Erdoğan, METU, 1997. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Beton Teknolojisine Giriş, Prof. Dr. M. Süheyl Akman, İTÜ, Ağustos 1994. 2.Beton ve Beton Teknolojisi, O. Şimşek, Seçkin Yayıncılık San. Ve Tic. A.Ş., Ankara, ss. 69-71, 2004. 3.Beton, C. 1-2, Prof. Bekir Postacıoğlu, Matbaa Teknisyenleri Basımevi, 1986-1987, İstanbul. 4. Betonarme Yapılarda Kalıcılık, B. Baradan, H. Yazıcı, H. Ün, Dokuz Eylül Üni. Yay., No. 298, 2002. 5.Concrete Admixtures Handbook, Ramachandran VS, Noyes Publications, NJ, USA, 1995. 6.Admixtures for Concrete, Erdoğan, T.Y., METU, 1997. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | concrete properties and the use of admixture |
| 2 | considerations and precaution of admixture |
| 3 | classification admixtures |
| 4 | air entraining admixtures |
| 5 | water reducing admixtures |
| 6 | Midterm Examination 1 |
| 7 | set retarders |
| 8 | accelerators |
| 9 | corrosion inhibitors |
| 10 | viscosity increasing admixtures |
| 11 | Midterm Examination 2 |
| 12 | admixtures to create gas and foam |
| 13 | coloring admixtures |
| 14 | Other admixtures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assist. Prof. Dr. Mehmet Canbaz | **Date:** | 05.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302505 | **TITLE** | COMPOSITE MATERIALS |

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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 | | | | X | | | | | | |
| **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** | | | | | Composite materials, in general, the overall properties of the composite material, the classification and the main types of composite materials, granular composites, some of the properties of granular composite material of concrete discussed, Fiber-reinforced composites, fiber reinforced composite material as "fibers and wire-reinforced concrete", Ferrocement, structure, the use of fiber reinforced composites, laminated composites, | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Composite materials in general, promote, classify, and the properties of granular composites, to teach some of the properties of granular composite material identification and evaluation of concrete, fiber reinforced composites, introducing Fiber-reinforced composite material "fibers and wire-reinforced concrete" and the introduction of Ferrocement, fiber reinforced composites structure implementation of the use of, | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Composite materials in general, introduces and classes, granular composites knows, identifies and examines some characteristics of granular composite material of concrete, fiber reinforced composites recognizes as Fiber-reinforced composite materials "fibers and wire-reinforced concrete" and Ferrocement knows, the use of fiber reinforced composite structure applies, layered composites recognizes implements the use of layered comp. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Mentioned above, is teaching Composite Material knowledge | | | | | | | |
| **TEXTBOOK** | | | | | Ersoy, H.Y., Kompozit Malzeme, MSÜ, Mimarlık Fakültesi, İstanbul, | | | | | | | |
| **OTHER REFERENCES** | | | | | Kocataşkın, F., Kompozit Malzeme Ders Notları, İTÜ, İnşaat Fak., MMLS Programı, 1985. Demirkesen, E., Kompozit Malzemeler, İTÜ, Kimya-Met.Fak., Yay. No. 3/1991, İstanbul. Holliday, L., Composite Materials, Else. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, General Information, History, |
| 2 | Composite Materials, General, General Properties of Composite Materials, |
| 3 | Classification of Composite Materials And Major Types of Composite Materials, |
| 4 | Grained Composites, General, Grain Composite Materials Used In The Production And Properties |
| 5 | Under Load Behavior of Particulate Composites, Particulate Composite Material Properties of The Investigat |
| 6 | Midterm Examination 1 |
| 7 | Fiber reinforced composites, General, reinforcement types |
| 8 | Fiber-Reinforced Composite Materials Used in the Production and Properties, |
| 9 | Reinforcement type and the properties in the Production of Fiber-Reinforced Composite Material |
| 10 | Fiber-Reinforced Composite Material Behavior Under Load, Stress and Strain diagrams of Fiber-Reinforced |
| 11 | Midterm Examination 2 |
| 12 | Fiber-Reinforced Composite Materials as a "Fiber-Reinforced Concrete and wires", Ferrocement, Use of fiber |
| 13 | Layered Composites Under Load Behavior |
| 14 | In Layered Composite Material Plywood, Laminated Composites Using the structure |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. İlker Bekir TOPÇU | **Date:** | 29.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301532 | **TITLE** | Special Topics in Steel Structures |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | General properties of steel material, loads and load combinations, design of steel structures to AISC and EC3 Specifications, design of members for tension, design of members for compression, design of members for flexure, design of members for shear, built-up members, connection members and design of connection, design of members subject to flexure and axial force. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course provides detailed information in designing steel structures according to various specifications and students develop an understanding of the steel structures. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Steel structures have an important role to civil engineering. Be earthquake resistant, be practical and safe solution in the large span structures and the development of material science, the place and importance of steel structures in civil engineering increase every day. This course will contribute to specialize in design of steel structures. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1-To learn design of steel structures to AISC and EC3 Specifications  2-To make design of structural steel member under different loadings  3-To make design of connection member  4-To gain an educational and comprehensive experience in the design of steel structures. | | | | | | | |
| **TEXTBOOK** | | | | | R. Aydın, A. Günaydın, Çelik Yapılar, 2013. | | | | | | | |
| **OTHER REFERENCES** | | | | | Designers' Guide to En 1993-1-1 Eurocode 3: Design of Steel Structures: General Rules and Rules for Buildings.ANSI/AISC 360-10 Specification for structural steel buildings.Eurocode 3: Design of steel structures. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Properties of structural steel material |
| 2 | Structural steel members and loads in steel structures |
| 3 | Design of members for tension |
| 4 | Design of members for compression |
| 5 | Design of members for compression |
| 6 | Midterm Examination 1 |
| 7 | Design of members for flexure |
| 8 | Design of members for flexure |
| 9 | Design of members for shear |
| 10 | Design of members subject to flexure and axial force |
| 11 | Midterm Examination 2 |
| 12 | Built-up members |
| 13 | Connection members and design of connection |
| 14 | Connection members and design of connection |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd.Doç.Dr. Ayten Günaydın | **Date:** | 04.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302525 | **TITLE** | Experimental Soil Mechanics |

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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 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course covers soil particle size distribution and Atterberg limits, compaction and CBR tests, the relative density test, permeability tests, consolidation and swelling tests, unconfined compression tests, shear box test, veyn test, triaxial compression tests and dynamic triaxial test and evaluate the results of the this experiments. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of this course is to teach the principles of laboratory tests which is used for identifying of the geotechnical parameters for an engineering structure. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | This course will contribute to the development of interpretation skills, analysis, obtaining the required parameters and the evaluation in geotechnical engineering | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | This course will contribute to the identification of all the characteristics of soils | | | | | | | |
| **TEXTBOOK** | | | | | - | | | | | | | |
| **OTHER REFERENCES** | | | | | Aytekin, M., Deneysel Zemin Mekaniği, Teknik yayın evi, 624 sayfa.- Bardet, J.P., Experimental Soil Mechanics, Prentice Hall, 1997, 583 pp- TS1900/1, İnşaat mühendisliğinde zemin laboratuvar deneyleri - Bölüm 1: Fiziksel özelliklerin tayini, 2007.- TS1900/2, İnşaat mühendisliğinde zemin laboratuvar deneyleri - Bölüm 2: Mekanik özelliklerin tayini, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Soil particle size distribution and hydrometer tests |
| 2 | Atterberg limits tests |
| 3 | Compaction and CBR tests |
| 4 | Relative density tests |
| 5 | Permeability tests, a |
| 6 | Midterm Examination 1 |
| 7 | Consolidation test |
| 8 | Consolidation test |
| 9 | Swelling tests |
| 10 | Unconfined compression tests |
| 11 | Midterm Examination 2 |
| 12 | Shear box test |
| 13 | Triaxial compression tests |
| 14 | Triaxial compression tests |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Hasan SAVAŞ | **Date:** | 02.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301507 | **TITLE** | FERROCEMENT TECHNOLOGY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Attending to laboratory application | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic Concrete Knowledge, Introduction and Historical Background, Constituent Materials, Constituent Materials, Construction Procedures, Mechanical Properties, Potential Applications of Ferrocement, Laboratuvar Application of Ferrocement. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Remembering of Basic Concrete Knowledge, Teaching of Introduction and Historical Background, Constituent Materials, Constituent Materials, Construction Procedures, Mechanical Properties, Potential Applications of Ferrocement, Laboratory Application of Ferrocement. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Planning of trained people about application of ferrocement techniques in fields. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Teaching of ferrocement and ite applications. | | | | | | | |
| **TEXTBOOK** | | | | | Ferrocement, Paul, B.K. and Pama, R.P. 1978.. Bangkok: International Ferrocement Information Center. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Sharma, P.C.; Pama, R.P.; Valls, J.; and Gopalaratnam, V.S. 1979. State-of-the-Art review on ferrocement grain storage bins. Journal of Ferrocement 9 (3):131-151. 2.Gopalaratnam, V.S.; Pama, R.P.; and Valls, J. 1980. Review of marine application of ferrocement in Asia. J.of Ferrocement 10 (1): 31-45. 3.Alexander, D.J. 1980. The use of high tensile wire reinforced fibrous ferrocement marine applications. J. of Ferrocement 10 (3): 223-229. 4.Robles-Austriaco, L.; Pama, R.P.; and Valls, J. 1981. Ferrocement – An innovative technology for housing. Journal of Ferrocement 11 (1):23-45. 5.Robles-Austriaco, L.; Pama, R.P.; and Valls, J. 1981. Ferrocement for the water decade. Journal of Ferrocement 11 (3):229-245. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic Concrete Knowledge |
| 2 | Basic Concrete Knowledge |
| 3 | Introduction and Historical Background |
| 4 | Constituent Materials |
| 5 | Constituent Materials |
| 6 | Midterm Examination 1 |
| 7 | Construction Procedures |
| 8 | Construction Procedures |
| 9 | Mechanical Properties |
| 10 | Mechanical Properties |
| 11 | Midterm Examination 2 |
| 12 | Potential Applications of Ferrocement |
| 13 | Potential Applications of Ferrocement |
| 14 | Laboratuvar Application of Ferrocement |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. İlker Bekir TOPÇU | **Date:** | 29.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302519 | **TITLE** | Geotechnical Earthquake Engineering |

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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 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The course covers information on the project design and implementation against the dynamic effect of earthquakes. Definition of earthquake, seismic hazard determination, damage types during and after the earthqauke, liquefaction, dynamic bearing capacity, mitigation of earthquake damages are the main subjects of the lecture. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course provides the students with an in-depth knowledge and engineering skills to solve the probable problems in soils under dynamic loadings | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Graduates will be able to take leading roles in planning, evaluating, designing, constructing, maintaining, and managing the geotechnical infrastructure. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kramer, S., 1996, Geotechnical earthquake engineering, Prentice Hall, 653 p.2. Ishihara, K., 1996, Soil behaviour in earthquake geotechnicsl, Oxford Univ. Press 385 p.3. Das, B. 2010, Principles of soil dynamics, CL-Engineering, 656 p. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Seismology and earthquakes |
| 3 | Strong ground motion |
| 4 | Seismic hazard analysis |
| 5 | Wave propagation |
| 6 | Midterm Examination 1 |
| 7 | Dynamic Characteristics of Soils |
| 8 | Lab tests |
| 9 | Soil response analysis |
| 10 | Dynamic response of sands |
| 11 | Midterm Examination 2 |
| 12 | Dynamic response of clay soils |
| 13 | Liquefaction |
| 14 | Cyclic failure |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301512 | **TITLE** | Geotechnical Engineering |

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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 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The course provides an understanding of: the nature of soils and their variability; and the state and behaviour of a soil. Topics include: The Origin and Composition of Soils: clay mineralogy; phase relationships, grain size analyses, Atterberg limits, soil classification and description; vertical stress in soils: soil suction, total vertical stress, pore water pressure, effective vertical stress; flow of water through soils: water flow, permeability, 2D seepage and measurement; consolidation: introduction to consolidation theory, oedometer test, overconsolidation ratio, consolidation settlement, time rate effects, sand drains; strength of soils: shear strength of sands and clays, Mohr-Coulomb failure criterion, direct shear test, triaxial test, soil improvement: compaction - concepts, measurement and field techniques, overview of other soil improvement techniques. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course provides an understanding of: the nature of soils and their variability; and the state and behaviour of a soil. Topics include: The Origin and Composition of Soils: introduction to geotechnical engineering, processes that form soils, clay mineralogy; phase relationships, Atterberg limits and soil classification: soil state definitions, phase relationships, grain size analyses, Atterberg limits, soil classification and description; vertical stress in soils: soil suction, total vertical stress, pore water pressure, effective vertical stress; flow of water through soils: water flow, permeability, 2D seepage and measurement; consolidation: introduction to consolidation theory, oedometer test, overconsolidation ratio, consolidation settlement, time rate effects, sand drains; strength of soils: shear strength of sands and clays, Mohr-Coulomb failure criterion, direct shear test, triaxial test, soil improvement: compaction - concepts, measurement and field techniques, overview of other soil improvement techniques. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | This course will contribute to the development of interpretation skills, analysis, obtaining the required parameters and the evaluation in geotechnical engineering | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | This course will contribute to the identification of all the characteristics of soils | | | | | | | |
| **TEXTBOOK** | | | | | Holtz, R, Kovacs, W. and Sheahan, T. An Introduction to Geotechnical Engineering, 2nd ed., 2011, | | | | | | | |
| **OTHER REFERENCES** | | | | | Knappett, J. and Craig, R. F., Soil Mechanics, 8th ed., 2012, Spon PressBudhu, M., Soil Mechanics and Foundations, 3rd ed., 2011, Wiley. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The Origin and Composition of Soils |
| 2 | Phase Relationships |
| 3 | Soil Improvement |
| 4 | Vertical Stress |
| 5 | Flow of Water Through Soils |
| 6 | Midterm Examination 1 |
| 7 | Flow of Water Through Soils |
| 8 | Flow of Water Through Soils |
| 9 | Consolidation |
| 10 | Consolidation |
| 11 | Midterm Examination 2 |
| 12 | Strength of Soils |
| 13 | Strength of Soils |
| 14 | Strength of Soils |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assoc. Prof. Dr. Volkan Okur | **Date:** | 25.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | ADVANCED SOIL MECHANICS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 8 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish-English |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (………) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Soil Composition and Strees in Soil, Consolidation Theory, Shear Strength of Soils | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning fundamental concepts of soil physical properties in detail, study on soil shear strength regarding different soils and conditions | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soils mechanical and physical properties | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | An Introdcution to Geotechnical Engineering, Holtz and Kovacs, 2nd Edition | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Soil Composition and Stress in Soil |
| 2 | Soil Consolidation |
| 3 | Rate of Primary Consolidation and Secondary Consolidation |
| 4 | Finite Strain Consolidation Theory |
| 5 | Shear Strength of Soils-Tests for Measuring Shear Strength |
| 6 | Midterm Examination 1 |
| 7 | Critical State Principles for Sands in Drained Shear |
| 8 | Evaluation of Drained Strength of Sand |
| 9 | Undrained Strenth of Sand |
| 10 | Factors Affecting Strength of Clay |
| 11 | Midterm Examination 2 |
| 12 | Evaluation of Strength and Deformation/Pore Pressure Response of Clay |
| 13 | Normalization of Clay Strength |
| 14 | Project |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd.Doç.Dr.Kamil Bekir Afacan | **Date:** | 01.10.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301529 | **TITLE** | Geosynthetics in Civil Engineering Practices |

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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 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course covers physical properties, functions, design methods, design details and construction procedures of geosynthetics. Geosynthetics functions and applications including pavements, filtration and drainage, reinforced embankments, railroads, erosion and sediment control, and earth retaining walls are described. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course aims to provide necessary information for the application and design on the use of geosynthetics in civil engineering. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Enhance awareness of the availability of geosynthetic in Civil engineering applications. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | This course provides the students with an in-depth knowledge and engineering skills to design of structures used in Geosynthetics and to develop adequate solutions to the problems that may be encountered in civil engineering practice. | | | | | | | |
| **TEXTBOOK** | | | | | - | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Ingold, T. S. And Miller, K.S., 1988. Geotextiles handbook. Thomas Telford, London, 152p.2. Jewell, R.A. 1996. Soil reinforcement with geotextiles. UK. 45 p.3. Koerner, R.M. 1994. Designing with geosynthetics. Regents/Prentice Hall, 783p.4. Shukla, S.K. 2002. Geosynthetics and their applications. London : Thomas Telford, 419 p.5. Sarsby, R.W. 2007. Geosynthetics in civil engineering. Boca Raton : CRC ;Cambridge : Woodhead, 295p. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Development of geosynthetics |
| 2 | Definitions and clssification |
| 3 | Basic functions and uses of geosynthetics |
| 4 | Material properties of geosynthetics |
| 5 | Physical and mechanical properties of geosynthetics |
| 6 | Midterm Examination 1 |
| 7 | Hydraulic and chemical properties of geosynthetics |
| 8 | Geosynthetic filter design |
| 9 | Design of geosynthetic-reinforced retaining walls |
| 10 | Filtration design |
| 11 | Midterm Examination 2 |
| 12 | Geosynthetics in erosion control |
| 13 | Geosynthetics in erosion control |
| 14 | Project presentations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Associate Prof. Dr. Murat TÜRKÖZ | **Date:** | 29/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301527 | **TITLE** | SHELL STRUCTURES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 4 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Flexibility method and classical shell theory. Axially symmetric cylindrical shells with free hinged and fixed boundary conditions. Analysis of axially symmetric combined structures (including short circular walls) consisting of structural components such as spherical shell, circular ring and foundation beams, circular roof slab and/or circular foundation slab with different boundary conditions considering soil-structure interaction. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The shell structural system to analysis in the static and concrete constructions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | By the end of this module students will be able to: design a (shell structures) system, component, or process to meet desired needs, identify, formulate, and solve engineering (shell structures) problems, get an understanding of professional and ethical responsibility, understand the broad education necessary to understand the impact of engineering solutions in a global and societal context, gain a knowledge of contemporary issues. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | On completion of the course, the student 1-Will be able to know the different of the shell structures 2-Will be able to get the basics shell structures 3-Will be able to know the static analysis and concrete construction of the shell structures 4-will be able to aware of the numerical solution methods that are concrete construction. | | | | | | | |
| **TEXTBOOK** | | | | | Course notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Billington,D.P.,1975. Betonarme Kabuk Yapılar, Çev: H.Karataş ve M.Pultar, İ.T.Ü. Mimarlık Fak. Yayın, İstanbul.2. Keskinek. F., Kumbasar N.,”Sürekli Temeller ve Dönel Kabuklar”, İstanbul, 1976 3. Özden. K.,”Dönel Kabuklar” Matbaa teknisyenleri Basımevi, 1976 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Index notation in Cartesian coordinates (tensors) |
| 2 | The basic knowledge of the shell structures |
| 3 | Type of the fixed thick spherical shell |
| 4 | Type of the fixed thick spherical shell |
| 5 | Buckling of the shell structures |
| 6 | Midterm Examination 1 |
| 7 | Type of the fixed thick spherical shell with lighting |
| 8 | Type of the fixed thick ojival shell |
| 9 | Type of the fixed thick konik shell |
| 10 | Type of the fixed thick spherical shell with lighting |
| 11 | Midterm Examination 2 |
| 12 | Type of the fixed thick elipticshell |
| 13 | Type of the fixed thick parabolic shell |
| 14 | Konoid shell structures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Ph.D.Prof.Hasan Selim ŞENGEL | **Date:** | 26.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301605 | **TITLE** | Critical State Soil Mechanics |

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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 | | x | | | |  | | | | | | |
| **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** | | | | | Learning applicaiton of project and land detail concept of critical state in soil mechanics | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course is designed to provide a detailed background to Critical State in Soil Mechanics . | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of critical state of soil mechanics. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | Kramer, S. L., Geotechnical Earthquake Engineering, Prentice Hall, 1996 | | | | | | | |
| **OTHER REFERENCES** | | | | | T1. Wood, D. M., Soil Behaviour and Critical State Soil Mechanics, Cambridge, University Press, New York, 1990.2. Chen, W. F., Mizuno, E., Nonlinear Analysis in Soil Mechanics: Theory and Implementation, Elsevier, Amsterdam, Oxford, New York, Tokyo, 1990. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Stresses and strains in soils |
| 3 | Stress and strain paths and invariants |
| 4 | Critical State Line and the Roscoe surface |
| 5 | The behavior of overconsolidated samples |
| 6 | Midterm Examination 1 |
| 7 | Behavior of sand |
| 8 | Elastic and plastic deformation. |
| 9 | Plasticity for soils |
| 10 | Plasticity for soils |
| 11 | Midterm Examination 2 |
| 12 | Soil parameters for design from the Critical State Soil Mechanics Theory. |
| 13 | Soil parameters for design from the Critical State Soil Mechanics Theory. |
| 14 | Soil parameters for design from the Critical State Soil Mechanics Theory. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr.Gülgün YILMAZ | **Date:** | 28.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301511 | **TITLE** | MATRIX METHODS |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Stiffness and loading matrices of frame elements, matrix displacement method, application to two and three-dimensional structures, stiffness and loading martrices of two dimensional frame elements, matrix force method, materially and geometrically non-linear structures, applications of matrix methods to dynamic analysis of structures. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1) Matrix form of equilibrium equations of the stable systems under static and dynamic loads  2) Calculation of stable systems internal forces, transformations and displacements with matrix methods  3) Fast and economic calculations of structural systems different behaviors under different loads, creating algorithms for practical usage software development | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Calculation of structural systems internal forces with computer | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | PCreate algorithms for different cases | | | | | | | |
| **TEXTBOOK** | | | | | Lecture Notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Çakıroğlu, A., Özden, E., Özmen, G. Yapı Sistemlerinin Hesabı İçin Matris Metotları ve Elektronik Hesap Makinesi Programları, Cilt I ve Cilt II, İTÜ Kütüphanesi, Sayı 1005, 1992.2) Meek, J.L. Matrix Structural Analysis, McGraw-Hill, ISBN 0070413169, 1971. 3) Clough, R.W., Penzien, J. Dynamics of Structures, McGraw-Hill, 1996. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to matrix methods, Basic matrix calculations |
| 2 | Sonlu elemanlarda uç kuvvetleri ile uç yerdeğiştirmeleri arasındaki bağıntılar, eksenleri değiştirilmesi |
| 3 | Substitution of matrices |
| 4 | Specific supports, symmetric systems, displacement of supports |
| 5 | Two and three dimesinsional elements |
| 6 | Midterm Examination 1 |
| 7 | Two and three dimesinsional elements |
| 8 | Calculation of structural systems under external dynamic forces, motion equations, free vibrations, harmonic loading, earthquake forces |
| 9 | Forced vibrations, numerical integration technics |
| 10 | Free vibration analyz, calculation technics, properties of vibration mods |
| 11 | Midterm Examination 2 |
| 12 | Superposition of mods method |
| 13 | Examples of superposition of mods mehod |
| 14 | In matrix force method continuity equations and calculations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç Dr. Mizan DOĞAN | **Date:** | 29.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302503 | **TITLE** | Finite Element Method II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Finite element displacement method, Structural idealization, Relation between Rayleigh-Ritz method and FEM. A brief list of element types, choosing the displacement field of an element, Total potential energy of element and principle of minimum. Local stiffness matrix, Transformation matrix, Total potential energy of system and principle of minimum. System stiffness matrix, Equilibrium equations of system. Consideration of boundary conditions, Solution of equations, Examples, Flow chart of FEM software, home works (selected SAP2000 applications). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce basic theory of Finite Element Method (FEM). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To teach a numerical method such as finite element method for computer aided design and analysis works | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | On completion of the course, the student  1-Will be able to know the finite element method  2-Will be able to get the basics of FEM  3-Will be able to use professional FEM software  4- will be able to aware of the numerical solution methods that are used in the solution of engineering problems. | | | | | | | |
| **TEXTBOOK** | | | | | Topçu, A., Corse notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | Tauchert, T. R. (1974). Energy Principles in Structural Mechanics, McGraw-Hill Book, Kogakusha.2. Przemieniecki, J. S. (1968). Theory of matrix structural analysis, McGraw-Hill Book, London.3. Bathe, K. J., (1982). Prentice-Hall, New-Jersey.4. Zienkiewicz, O.C, (1971) The Finite Element Method in Engineering Science, McGraw-Hill, London.SAP2000, Computers&Engineering.5. http://www.sap2000edu.com/sap2000edu.html (Türkçe SAP2000 kullanım kitapları)6. Özmen, G., v.d., Örneklerle SAP 2000, Birsen yayınevi, 2007, İstanbul. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Finite element displacement method |
| 2 | Structural idealization |
| 3 | Relation between Rayleigh-Ritz method and FEM |
| 4 | A brief list of element types choosing the displacement field of an element |
| 5 | Total potential energy of element and principle of minimum |
| 6 | Midterm Examination 1 |
| 7 | Local stiffness matrix |
| 8 | Transformation matrix |
| 9 | Total potential energy of system and principle of minimum |
| 10 | System stiffness matrix |
| 11 | Midterm Examination 2 |
| 12 | Equilibrium equations of system |
| 13 | Solution of equations |
| 14 | Examples |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Hakan Erol | **Date:** | 04.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301508 | **TITLE** | Plastic Analysis of Structures |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 |  | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | COURSE DESCRIPTION Analyzing the inelactic behaviour of structurec under increasing loads, force-deformation relations of the inelastic material, estabishing the moent curvature relations of definite cross-sections, plastic hinges, devolpment of the plastic hinges under increasing loads and the collapse mecanism. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To get familiar with plastic analises | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To apply the plastic teory to engineering problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Being able to judge the damaged structures and analyze them to see their reserve capacities | | | | | | | |
| **TEXTBOOK** | | | | | Prof. Dr. Erkan ÖZER “ Yapı sistemlerinin lineer olmayan analizi”İ.T.Ü. 1985 | | | | | | | |
| **OTHER REFERENCES** | | | | | Prof. Dr. Adnan Çakıroğlu “Lineer olmayan sistemler” İstanbul teknisyenleri basımevi, 1980, İstanbulProf. Dr. Zekai Celep “ Betonarme taşıyıcı sistemlerde doğrusal olmayan davranış ve çözümleme” İstanbul Beta Dağıtım,2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Plastic Analyses of Structures |
| 2 | The importance of Plastic Analyses of Structures |
| 3 | Cross- Sections made of non-linear material |
| 4 | Internal forces and Deformation Characteristics |
| 5 | Yield and Fracture Conditions |
| 6 | Midterm Examination 1 |
| 7 | Cross- Sections made of Elasto Plastic Materils |
| 8 | The Behaviour of Reinforced Concrete,Analyzing The Reinforced Concrete Cross-Sections |
| 9 | Moment –Curvature Relations of Reinforced Concrete Sections |
| 10 | Analyzing the Indetermanate Structures |
| 11 | Midterm Examination 2 |
| 12 | Wang Method |
| 13 | Collapse Mechanisms |
| 14 | Application the Plastic Analyses to Frame Structures |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Associate Prof. Dr. Nevzat KIRAÇ | **Date:** | 04/06/2045 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301503 | **TITLE** | Finite Element Method I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 6 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Index notation in Cartesian coordinates (tensors), Basic equations of elasticity, Classification of Energy methods, Work of internal and external forces, Total potential energy, Principle of minimum of total potential energy, Rayleigh-Ritz method, examples, home works (selected simple SAP2000 applications) | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce basic theory of Finite Element Method (FEM). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To teach a numerical method such as finite element method for computer aided design and analysis works | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | On completion of the course, the student  1-Will be able to know the finite element method  2-Will be able to get the basics of FEM  3-Will be able to use professional FEM software  4-will be able to aware of the numerical solution methods that are used in the solution of engineering problems.. | | | | | | | |
| **TEXTBOOK** | | | | | Topçu, A., Corse notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | Tauchert, T. R. (1974). Energy Principles in Structural Mechanics, McGraw-Hill Book, Kogakusha.2. Przemieniecki, J. S. (1968). Theory of matrix structural analysis, McGraw-Hill Book, London.3. Bathe, K. J., (1982). Prentice-Hall, New-Jersey.4. Zienkiewicz, O.C, (1971) The Finite Element Method in Engineering Science, McGraw-Hill, London.SAP2000, Computers&Engineering.5. http://www.sap2000edu.com/sap2000edu.html (Türkçe SAP2000 kullanım kitapları)6. Özmen, G., v.d., Örneklerle SAP 2000, Birsen yayınevi, 2007, İstanbul. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Index notation in Cartesian coordinates (tensors) |
| 2 | Basic equations of elasticity (Extension element, torsion element) |
| 3 | Basic equations of elasticity (Bending element, Shear element) |
| 4 | Classification of Energy methods |
| 5 | Potential and kinetic energy |
| 6 | Midterm Examination 1 |
| 7 | Work of internal forces |
| 8 | Work of external forces |
| 9 | Total potential energy |
| 10 | Principle of minimum of total potential energy |
| 11 | Midterm Examination 2 |
| 12 | Rayleigh-Ritz method |
| 13 | Some application of the Rayleigh-Ritz method |
| 14 | Some application of the Rayleigh-Ritz method |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Hakan Erol | **Date:** | 04.06.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302514 | **TITLE** | Theory of Plates |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic assumptions, Bending of Rectangular Plates; Pure Bending of Plates; Simply Supported Rectangular Plates; Rectangular Plates with Different Edge Conditions; Navier and Levi Solutions; Minimum Potential Energy; Infinite Series Solution; Approximate Methods in Theory of Plates; Circular Plates | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to get students knowledge about definitions of strength and stress-strain equations and also teaching to solve the questions about plates and examining some engineering problems depending on boundary conditions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to have:  1. Basic engineering formation and point of view about the plate problems as an engineer.  2. Knowlegde and ability to solve engineering problems about plates | | | | | | | |
| **TEXTBOOK** | | | | | Timoshenko, Stephen P., and S. Woinowsky-Krieger. Theory of Plates and Shells. 2nd ed. New York, NY: McGraw-Hill Companies, 1959. ISBN: 0070647798 | | | | | | | |
| **OTHER REFERENCES** | | | | | Ugural, A. C. Stresses in Plates and Shells. 2nd ed. New York, NY: McGraw-Hill, 1998. ISBN: 0070657696.Gould, P.L., 1998, Analysis of Shells and Plates | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic assumptions |
| 2 | Analysis of Stress. Analysis of Strain |
| 3 | Bending of Rectangular Plates |
| 4 | Pure Bending of Plates |
| 5 | Simply Supported Rectangular Plates |
| 6 | Midterm Examination 1 |
| 7 | Navier and Levi Solutions |
| 8 | Navier and Levi Solutions |
| 9 | Minimum Potential Energy |
| 10 | Infinite Series Solution |
| 11 | Midterm Examination 2 |
| 12 | Approximate Methods in Theory of Plates |
| 13 | Circular Plates |
| 14 | Examples |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr.Eşref ÜNLÜOĞLU | **Date:** | 08.09.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302508 | **TITLE** | PREFABRICATED STRUCTURES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction. The aim of prefabricated construction. Definitions. Materials and loads. Design principles. Prefabricated elements. Connecting regions. Connections. Load bearing systems; frame systems, large panel systems, composite concrete construction. Panalisation. Design of structural elements. Non-load bearing elements. Diaphragm design. Earthquake design and analysis. Design of joints and connections. Principles of construction. Tolerances, manufacture, transportation and erection in prefabricated construction. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Parallel to new construction technologies prefabricated construction become more important than before. This course aims to introduct to modern prefabrication technologies and its applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Ability to calculate and design prefabricated structures | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1) Introduction to prefabricated structures and it’s area of use  2) Learning about which materials are using in prefabricated elements | | | | | | | |
| **TEXTBOOK** | | | | | Lecture notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) TS 9967, Yapı Elemanları, Taşıyıcı Sistemler ve Binalar-Prefabrike Betonarme ve Öngerilmeli Betondan-Hesap Esasları ve İmalat ve Montaj Kuralları, TSE, Ankara, 1992.2) TS EN 1339 Öndökümlü beton mamuller - Genel kurallar3) Özden, K., Betonarme ve Öngerilmeli Beton Prefabrike Taşıyıcı Eleman, Sistem ve Yapıların Hesap ve Yapım Kuralları (Öneri), Deprem Mühendisliği T.M.K.Yay. No 4, İstanbul, 1988.4) Emin Tolga Hanmehmet, Zarifa Hanmehmet, Betonarme Yapılar & Prefabrik Ön Gerilmeli Yapı Elemanların Hesap ve Tasarım Örnekleri İle, 2010 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Intoduction to prefabricated structures |
| 2 | Definitions and materials, loads |
| 3 | Types of joints and appliacation |
| 4 | Types of joints and appliacation |
| 5 | Joints of line elements |
| 6 | Midterm Examination 1 |
| 7 | Joints of panel elements |
| 8 | Joints of panel elements |
| 9 | Experiments on joint areas |
| 10 | Static and dynamic analysis of prefabricated systems |
| 11 | Midterm Examination 2 |
| 12 | Damage observations on prefabricated systems, repair and strengthening |
| 13 | Manufacturing of prefabricated elements, quality control and assembly |
| 14 | Manufacturing of prefabricated elements, quality control and assembly |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç. Dr. Mizan DOĞAN | **Date:** | 29.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301506 | **TITLE** | STATISTICALS METHODS IN CIVIL ENGINEERING |

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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 | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Application of Statistics Methods to a engineering problem. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Importance of Statistics in Engineering, Principles of the Theory of Probability, Frequency Analysis and Parameter Estimation, Engineering of the most important Probability Distribution Functions, Sampling Distributions, Control of Statistical Hypothesis, Regression Analysis and Correlation, Quality Control, Reliability Analysis, Markov Chains, Statistical Analysis of Time Series. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Teaching of Importance of Statistics in Engineering, Principles of the Theory of Probability, Frequency Analysis and Parameter Estimation, Engineering of the most important Probability Distribution Functions, Sampling Distributions, Control of Statistical Hypothesis, Regression Analysis and Correlation, Quality Control, Reliability Analysis, Markov Chains, Statistical Analysis of Time Series. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The above-mentioned statistical techniques taught civil engineers will confront this issue allow them to develop solutions to the problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The above-mentioned statistical techniques to teach civil engineers. | | | | | | | |
| **TEXTBOOK** | | | | | Beyazıt, M., Oğuz, B. Y., Mühendisler İçin İstatistik, Birsen Yayınevi. | | | | | | | |
| **OTHER REFERENCES** | | | | | Beyazıt, M., İnşaat Mühendisliğinde Olasılık Yöntemleri, İTÜ, İnşaat Fak. Matbaası, 1996. Çömlekçi, N., İstatistik, İ.T.İ.A., 1978, Eskişehir. Kıcıman, M., Mühendisler için İhtimaller Hesabı ve İstatistiğe Başlangıç, ODTÜ, 1975. Kara, İ., Olasılık, Bilim Teknik Yayınevi, 1983. Akün, F., İstatistik ve Kalite Kontrolü, İTÜ Kütüphanesi, Sayı 923, 1973, İstanbul. Benjamin, J.R. ve Cornell, C.A., Probability, Statistics and Decision for Civil Engineers | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Importance of Statistics in Engineering |
| 2 | Principles of the Theory of Probability Principles of the Theory of Probability |
| 3 | Frequency Analysis and Parameter Estimation |
| 4 | Engineering of the most important Probability Distribution Functions |
| 5 | Sampling Distributions |
| 6 | Midterm Examination 1 |
| 7 | Control of Statistical Hypothesis, |
| 8 | Regression Analysis and Correlation |
| 9 | Quality Control |
| 10 | Reliability Analysis |
| 11 | Midterm Examination 2 |
| 12 | Markov Chains |
| 13 | Statistical Analysis of Time Series |
| 14 | Application of Statistics Methods to a engineering problem. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. İlker Bekir TOPÇU | **Date:** | 29.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302516 | **TITLE** | Mechanics of Conti0nuous Medium |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 4 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction / Stress / Body forces, Surface forces / Stress vector, Components of Stress Tensor / Strain / Small strain and rotation in two dimensions / Relative displacements / Small strain and rotation in three dimensions / Kinematics of a continuous medium / Material derivative / Deformation rate tensor/ Spin tensor / Finite strain / Geometrical meaning of strains and rotations / Rotation and stretch tensors / Rotation theorem / Compatibility conditions / Principles of momentum / Equations of equilibrium / Equations of motion in reference state, Piola-Kirchhoff stress tensors | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Taking into account the properties of objects and environments to produce the equations of stress and strain | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | By the end of this module students will be able to apply knowledge of mathematics, science, and engineering and identify, formulate, and solve engineering problems in the continuous medium which is the act to the outer affects. And the students will able to learned to the modeled which is the continuous medium according to the Newton’s law. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | On completion of the course, the student  1-Will be able to know the theory knowledge  2-Will be able to know the mechanics basic knowledge  3.Will be able to know strain and stress theory. | | | | | | | |
| **TEXTBOOK** | | | | | Corse notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Malvern, L.E.,1969. Introduction to the Mechanics of a Continious Medium, Printice-Hall.Inc. Englewood Cliffs., N.J.2. Eringen, A.C., 1980. Mechanics of Continua, Robert E. Krieger publishing Company, Huntington, New York | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Tensor mathematic study |
| 2 | Tensor mathematic study |
| 3 | Strain |
| 4 | Strain |
| 5 | Kinematics |
| 6 | Midterm Examination 1 |
| 7 | Kinematics |
| 8 | Stress |
| 9 | Stress |
| 10 | Thermodynamics of continuum mechanics |
| 11 | Midterm Examination 2 |
| 12 | Equilibrium equations |
| 13 | Hyper elastic body |
| 14 | Viskoelatic body |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Y.Doç.Dr.Hasan Selim ŞENGEL | **Date:** | 26.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302602 | **TITLE** | Slope Stability 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 | | x | | | |  | | | | | | |
| **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** | | | | | the classification of mass movement and landslide types, a thorough review of limit equilibrium methods of stability analysis, and detailed discussions of current ideas of the conditions leading to the failure of soil slopes. Methods of investigating existing slopes and landslides, and of the main methods of slope design and stabilisation are reviewed. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course is designed to provide a detailed background to slope stability studies. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soil behavior under dynamic loading | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | Önalp, A., Arel, E., 2004. “Geoteknik Bilgisi II – Yamaç ve Şevlerin Mühendisliği”, Birsen Yayınevi, İstanbul, 414s | | | | | | | |
| **OTHER REFERENCES** | | | | | Kramer,S.L. Geotecnical Earthquake Engineering,1996, Ishihara K, Soil BehavTS 8853-1991, Zeminde Yamaç ve Şevlerin Dengesi ve Hesap Metotları.Lambe, T.W., and F.Silva-Tulla, 1992. Stability Analysis of an Earth Slope, Spec. Tech., Publication, ASCE No.31.Duncan, J.M, 1996, Soil Slope Analysis in Landslidesior in Geotechnics, 1996 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Formation of slopes |
| 3 | Identifications and definitions |
| 4 | Mass movements and classifications |
| 5 | Stability of soil slopes, 1-Method of Limit equilibrium |
| 6 | Midterm Examination 1 |
| 7 | Stability of soil slopes, 2-Method of Slices |
| 8 | Slope stabilisation methods |
| 9 | Numerical methods of mass movements, Softwares about slope stability |
| 10 | Numerical methods of mass movements, Softwares about slope stability |
| 11 | Midterm Examination 2 |
| 12 | Softwares about slope stability |
| 13 | Softwares about slope stability |
| 14 | Applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr.Gülgün YILMAZ | **Date:** | 28.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301502 | **TITLE** | DYNAMICS OF STRUCTURES |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Dynamic loads, dynamic characteristics of structural systems. lumped parameter systems. free vibrations of single-degree-of-freedom systems (SDF), damped vibrations, response of SDF systems to harmonic loading, to periodic loading, to general dynamic loading, generalized SDF systems. Rayleigh method, vibration isolation Multi-degree-of-freedom systems (MDS), equations of motions, undamped free vibrations of MDS, free vibrations, orthogonality conditions, dynamic response, mode shapes, forced vibrations, mode superposition analysis, numerical methods for determination of mode shapes and frequencies, Rayleigh method, systems with distributed parameters, equations of motion, axial, shear and bending vibrations, earthquake response of SDF systems, response spectra, earthquake response of MDF systems, methods for modal combination, numerical methods. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Our country, more than 90% of the part of it has very active faults. More than 95% of the total population lives in this region. In this course, the behavior of structures under earthquake forces, analysis and dimensioning of structural elements are given. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | In our country, a large part of its total area is in the earthquake zone. Earthquake; computational methods for the internal forces and displacements caused by general time-dependent loads. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1) Understand the importance of the dynamics of the structure design of modern buildings.  2) To understand the dynamic behavior of structures.  3) Structural dynamics theory and apply practical problems. | | | | | | | |
| **TEXTBOOK** | | | | | Lecture notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Chopra, A.K.; Dynamics of Structures, Prentice Hall, 2002.2) Clough, R. W., Penzien, J.; Dynamics of Structures, McGraw Hill, 2001.3) Celep, Z., Kumbasar, N.; Yapı Dinamiği, Beta Dağıtım, 2001.4) Celep, Z., Kumbasar, N.; Deprem Mühendisliğine Giriş ve Depreme dayanıklı Yapı tasarımı, Beta Dağıtım, 2000.R. R. Craig; Structural Dynamics, John Wiley & Sons, 1981. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Dynamic loads, dynamic characteristics of structural systems |
| 2 | Lumped parameter systems. free vibrations of single-degree-of-freedom systems (SDF) |
| 3 | Damped vibrations, response of SDF systems to harmonic loading, to periodic loading |
| 4 | To general dynamic loading, generalized SDF systems |
| 5 | Rayleigh method |
| 6 | Midterm Examination 1 |
| 7 | Vibration isolation Multi-degree-of-freedom systems (MDS), equations of motions |
| 8 | Undamped free vibrations of MDS, free vibrations, orthogonality conditions, dynamic response, mode shapes |
| 9 | Forced vibrations, mode superposition analysis, numerical methods for determination of mode shapes and frequencies |
| 10 | Systems with distributed parameters, equations of motion, axial, shear and bending vibrations, |
| 11 | Midterm Examination 2 |
| 12 | Earthquake response of SDF systems |
| 13 | Response spectra |
| 14 | Earthquake response of MDF systems, methods for modal combination, numerical methods. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç. Dr. Mizan DOĞAN | **Date:** | 29.03.2016 |

**Signature**:

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**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503312602 | **TITLE** | EARTHQUAKE ANALYSE OF STRUCTURE |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Earthquake mechanism, spectrum concept, multi degree of freedom system, modal analysis in earthquake response, earthquake resistant design, main philosophy of earthquake codes, earthquake codes and design criteria, spectral analysis of structures and simplified approaches, behavior of reinforced concrete structures subjected to earthquake ground motion, plastic hinge concept, capacity concept in design, earthquake resistant design, safety to earthquakes, limit states, general behavior of structures, structural irregularities, design spectra, elastic equivalent earthquake load, effect of earthquake load, acceleration spectrum, ductility of structures, equivalent earthquake load, modal superposition method, structural systems, construction rules for reinforced concrete structures, story displacements, design of base isolated structures, retaining walls. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Our country, more than 90% of the part of it has very active faults. More than 95% of the total population lives in this region. In this course, the behavior of structures under earthquake forces, analysis and dimensioning of structural elements are given. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Determining performances of structures under earthquke forces, design of earthquke-resistant buildings, understanding of DBYBHY-2007 7.Section | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1) Design principles of earthqukes-resistant buildings  2) Understanding of DBYBHY-2007  3) Design of earthquke-resistant buildings | | | | | | | |
| **TEXTBOOK** | | | | | Lecture notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Deprem Bölgelerinde Yapılacak Binalar Hakkında Yönetmelik, 20072) TS500 Betonarme Yapıların Tasarım Ve Yapım Kuralları, 20003) Celep, Z., N., Kumbasar, Deprem Mühendisliğine Giriş ve Depreme Dayanıklı Yapı Tasarımı, Beta Dağıtım, İstanbul, 2000.4) Priestly, M. T. N., Paulay, T.; Seismic Design of RC and Masonry Buildings, John Wiley & Sons, 1992.5) Chopra, A.K.; Dynamics of Structures, Prentice Hall, 2001.6) Okamoto, S.; Introduction to Earthquake Engineering, University of Tokyo Press, 1984. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, Determination of project |
| 2 | Determination of the application region and choosing materials and standarts |
| 3 | Determination of irregularity in project |
| 4 | Static calculations under dead loads and live loads |
| 5 | Determination of Earthquake forces (Superpoisition of mods method) |
| 6 | Midterm Examination 1 |
| 7 | Determination of Earthquake forces (Equivalent Earthquake loads method) |
| 8 | Strong column weak beam check |
| 9 | Calculation of beam dimensions |
| 10 | Calculation of column dimensions |
| 11 | Midterm Examination 2 |
| 12 | Shearwall calculations |
| 13 | Foundation calculations |
| 14 | Drawings (column application etc.) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç. Dr. Mizan DOĞAN | **Date:** | 29.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302507 | **TITLE** | REPAIR & STRENGTHENING OF STRUCTURES |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | Structural Analysis I – II, RC II, Earthquake Resistant Design | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction. Assessment, evaluation and classification of damage. Some information about past earthquakes and definitions of damages. The damage of wall, slab, beam, column, beam-column connection, shear wall and foundation. Emergency measures for temporary protection. General principles of repair. Repair of structural elements. Repair and strengthening materials. Surface preparation and usage of repair mortars. Repair and strengthening by using shotcrete, epoxy resin, steel plates and carbon fiber reinforced plastics. Corrosion damage and its repair. General principles of strengthening. Design of strengthening elements, jacketing of columns, additional shear walls, strengthening of foundations. Strengthening details of structural elements. Damage assessment and evaluation of masonry structures. Repair and strengthening of masonry structures. Practical applications. Rehabilitation of structural systems. Evaluation of earthquake safety of available structures. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Many of the buildings needs to be strengthened or repair due to defects or errors of the structure. Buildings damaged by the earthquake become usable again after we settle the repair and strengthening operations. This course will give basic information on the subject, and the practices in our country after the recent earthquakes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students who attend this course gain knowledge about the repair and strengthening of the structures. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1) Repair or strengthening of structures and techniques  2) Materials used for repair and strengthening and learning techniques.  3) Preparation of repair and strengthening projects | | | | | | | |
| **TEXTBOOK** | | | | | Lecture Notes | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Demir H., Depremden Hasar Görmüş Betonarme Yapıların Onarım ve Güçlendirilmesi, İTÜ İnşaat Fak., İstanbul 1992.2) 2. Repair and Strengthening of Reinforced Concrete, Stone and Brick-Masonry Buildings, UNDP/UNIDOPROJECT RER / 79 / 015, Vienna 1983.3) Celep Z., Kumbasar N., Deprem Müh. Giriş ve Dep. Day. Yapı Tasarımı, Beta Dağıtım, İstanbul 2000.4) N. Bayülke, Depremde Hasar Gören Yapıların Onarım ve Güçlendirilmesi, İMO , 1999 .5) Penelis G.G.,Kappos A.J., Earthquake-resistant concrete structures, E&F Spon, London 1997.6) Emmons P.H., Concrete Repair and Maintenance Illustrated, R. S. Menas Company, Inc. Kingston, MA, 1994.7) Aydoğan M.,Betonarme Binalarda Onarım ve Güçlendirme Sistemleri ve Tasarımı,Lefkoşe,KTMMOB-İMO,Seminer Notları,2001. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction. Assessment, evaluation and classification of damage |
| 2 | The damage of wall, slab, beam, column, beam-column connection, shear wall and foundation. |
| 3 | Emergency measures for temporary protection. General principles of repair. Repair of structural elements. |
| 4 | Repair and strengthening materials. |
| 5 | Repair and strengthening by using shotcrete, epoxy resin, steel plates and carbon fiber reinforced plastics. |
| 6 | Midterm Examination 1 |
| 7 | Corrosion damage and its repair. |
| 8 | Design of strengthening elements, jacketing of columns, additional shear walls, strengthening of foundations. |
| 9 | Strengthening details of structural elements. |
| 10 | Strengthening details of structural elements. |
| 11 | Midterm Examination 2 |
| 12 | Damage assessment and evaluation of masonry structures. |
| 13 | Repair and strengthening of masonry structures. |
| 14 | Rehabilitation of structural systems. Evaluation of earthquake safety of available structures. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç. Dr. Mizan DOĞAN | **Date:** | 29.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | SOIL DYNAMICS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 8 | COMPULSORY  ( X ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (………) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Vibration of elementary systems, wave propagation in elastic, layered, saturated media. Behavior of dynamically loaded soils. Fundamentals of cyclic soil behavior: stress-strain-pore water pressure behavior, shear moduli and damping, cyclic settlement and concept of volumetric cyclic threshold shear strain. Introduction to the modeling of cyclic soil behavior. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning fundamental concepts about soil dynamics and earthquake, study on behaviour of soil under the dynamic loads and design structures having regard to these phenomenons. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soil behavior under dynamic loading | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | B.M.Das, Principle of Soil Dynamics,1993 | | | | | | | |
| **OTHER REFERENCES** | | | | | Kramer,S.L. Geotecnical Earthquake Engineering,1996, Ishihara K, Soil Behavior in Geotechnics, 1996 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | SDOF Systems |
| 3 | Two DOF Systems |
| 4 | Basics of Wave Propagation |
| 5 | Introduction to Earthquakes and Response Spectra |
| 6 | Midterm Examination 1 |
| 7 | Fundamentals of cylic soil behavior |
| 8 | Stress-strain-pore water pressure behavior,shear moduli and damping |
| 9 | Introduction to the modeling of cyclic soil behavior |
| 10 | Modeling of cyclic soil behavior |
| 11 | Midterm Examination 2 |
| 12 | Liquefaction |
| 13 | Liquefaction |
| 14 | Project |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd.Doç.Dr.Kamil Bekir Afacan | **Date:** | 29.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503311602 | **TITLE** | Soils Failure Mechanism |

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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 | | x | | | |  | | | | | | |
| **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** | | | | | Investigation of theory about the failure mechanism of Immigration on the soil.Factor of safety analysis taking into account the effect of ground water and earthquakes. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The course is designed to provide a detailed background to failure mechanism. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soil failure mechanism. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | Kramer, S. L., Geotechnical Earthquake Engineering, Prentice Hall, 1996 | | | | | | | |
| **OTHER REFERENCES** | | | | | T1. Wood, D. M., Soil Behaviour and Critical State Soil Mechanics, Cambridge, University Press, New York, 1990.2. Chen, W. F., Mizuno, E., Nonlinear Analysis in Soil Mechanics: Theory and Implementation, Elsevier, Amsterdam, Oxford, New York, Tokyo, 1990. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Stress; Stain and Effective Stress |
| 3 | Elastic and Plastic Deformations |
| 4 | Relationships Between States of Stress and States of Strain |
| 5 | Two Dimensional States of Stress |
| 6 | Midterm Examination 1 |
| 7 | Mohr’s Circle of Stress |
| 8 | Principal Planes and Principal Strain Paths and Invariant |
| 9 | Elastic-Plastic Constitutive Modeling Soils |
| 10 | Elastic-Plastic Constitutive Modeling Soils |
| 11 | Midterm Examination 2 |
| 12 | Soil Plasticity |
| 13 | Soil Plasticity |
| 14 | Critical State Model |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr.Gülgün YILMAZ | **Date:** | 28.03.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301521 | **TITLE** | Railway Engineering |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 45 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fundamentals and calculations for Railway Engineering | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning of fundamentals and calculations for Railway Engineering | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning of fundamentals of Railway Engineering | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learning of fundamentals of Railway Engineering  mechanics of traction, geometry of a railway line,  Railway capacity | | | | | | | |
| **TEXTBOOK** | | | | | Evren, G., Demiryolu Mühendisliği | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Bozkurt, M., Demiryolları Ders Notları2. Seçkin, İ., Toprak İşleri ve Demiryolu3. Esveld, C., Modern Railway Track | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Transportation modes |
| 2 | Railway systems |
| 3 | Railway components |
| 4 | Railway components |
| 5 | Mechanics of traction |
| 6 | Midterm Examination 1 |
| 7 | Mechanics of traction |
| 8 | Resistances |
| 9 | Geometry of a railway line, |
| 10 | Geometry of a railway line, |
| 11 | Midterm Examination 2 |
| 12 | Railway capacity |
| 13 | Railway superstructure |
| 14 | Railway superstructure |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr. Şafak BİLGİÇ | **Date:** | 16.10.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301522 | **TITLE** | Traffic Management |

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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 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 45 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to get students knowledge about traffic management. Content of the course is as follows: Characteristics of traffic and definitions, level of service, intersection and interchange planning, signalized intersection planning, traffic calming, parking lot design and management | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning general characteristics and fundamental principles of traffic management | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning the principles of traffic management | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding the traffic characteristics, Analysis of level of service, Signalized intersection analysis, Analysis of public transport | | | | | | | |
| **TEXTBOOK** | | | | | Yayla, N. Karayolu Mühendisliği | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Karayolu Tasarımı El Kitabı, KGM yayını2. Tunç, A. Trafik Mühendisliği3. Tunç, A. Yol Tasarımının Esasları ve Uygulamaları4. A Policy on Geometric Design of Highways and Streets, AASHTO yayını | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Traffic characteristics |
| 2 | Traffic elements and the relationship between them |
| 3 | Level of service |
| 4 | Level of service |
| 5 | Level of service |
| 6 | Midterm Examination 1 |
| 7 | Trafik İşaretleri |
| 8 | Signalized intersection calculations |
| 9 | Signalized intersection calculations |
| 10 | Traffic Calming Techniques |
| 11 | Midterm Examination 2 |
| 12 | Public transport facilities |
| 13 | Public transport calculations |
| 14 | Parking lot design and management |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Asst. Prof. Dr. Şafak BİLGİÇ | **Date:** | 16.10.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301521 | **TITLE** | Transport Economics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 45 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is to get students knowledge about engineering economics and economic properties of transportation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning the principles of evaluation of transport investment. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learning the principles of evaluation of transport investment. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Evaluation of transportation investment alternatives, environmental evaluation, investment evaluation in Turkey and World | | | | | | | |
| **TEXTBOOK** | | | | | Polak, J. ve Heertje, A., 1993. European Transport Economics. Blackwell Publishers, Oxford, England. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. EURET, 1996. Cost-benefit and multi-criteria analysis for new road construction. Office for official publications of the European communities, Brüksel, Belçika.2. EURET, 1996. Methodologies for transport impact assessment. Office for official publications of the European communities, Brüksel, Belçika.3. Leleur, S. 1995. Road Infrastructure Planning. Polyteknisk Forlag, Lyngby, Danimarka.4. Özkan, N. 1985. Yatırım Projelerinin Ulusal Ekonomi Açısından Değerlendirilmesi, DPT.. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General principles of engineering economy |
| 2 | General principles of engineering economy |
| 3 | Ulaştırmanın ekonomik açıdan özellikleri |
| 4 | Ulaştırmanın ekonomik açıdan özellikleri |
| 5 | Ulaştırmanın ekonomik açıdan özellikleri |
| 6 | Midterm Examination 1 |
| 7 | Transportation costs |
| 8 | Economic analysis principles |
| 9 | Benefit-cost analysis |
| 10 | Artificial compressibility method |
| 11 | Midterm Examination 2 |
| 12 | Financial and economic assessment |
| 13 | Financial and economic assessment |
| 14 | Environmental impact assessment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Asst. Prof. Dr. Şafak BİLGİÇ | **Date:** | 16.10.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **CIVIL ENGINEERING** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503302513 | **TITLE** | Dam Failure |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 20 |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | | Geotechnics for Dam Enginering | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course includes the factors acting on dam failures and damages, and discusses some case studies in the world. Especially it evaluates overtopping, earthquake and foundation soil problems such as internal erosion, seepage and leakage, etc. It discusses the failures of Teton, Vaiont, Malpasset, Saint Francis dams and lessons learnt. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course gives more detailed information to design engineers about dam failures and their results, and analyzes the effect of innovative technology on dam failure modes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Scientific research and ability for evaluation  Ability for using data  Ability for understanding  Ideas and solutions for complicated situations | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Jansen, R.B., 1988, Advanced dam engineering for design, construction and rehabilitation: Van Nostard Reinhold Co., New York, 811 p.2. Tosun, H., 2002, Dolgu Baraj Depremselliği ve Tasarım Esasları, DSİ Yayınları, 208 s. (in Turkish)3.UBGS1, 2007, Uluslar arası Katılımlı I: Ulusal Baraj Güvenliği Sempozyumu Bildiriler Kitabı, 28-30 Mayıs, Ankara (in Turkish).4.Tosun, H., Zorluer, İ, Savaş, H., Taşkıran, Ö., Demirkol, H., Kar, A., Temel sorunlarından oluşan baraj göçmeleri" Osmangazi Üniversitesi İnşaat Mühendisliği Bölümü, Geoteknik yayınlar serisi:99/l, Mayıs 1999, 95 sayfa (in Turkish) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction: Dam failure, dam safety and public safety |
| 2 | Factors acting on dam damage and failure |
| 3 | Overtopping |
| 4 | Internal erosion |
| 5 | Seepage |
| 6 | Midterm Examination 1 |
| 7 | Leakage |
| 8 | Hydraulic fracturing |
| 9 | Sliding and slope stability |
| 10 | Failure of Teton dam |
| 11 | Midterm Examination 2 |
| 12 | Failure of Malpasset dam |
| 13 | Failure of Saint Fransis dam |
| 14 | Other cases |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES MSc** | **3**  High | **2**  Mid | | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  | |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  | |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  | |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  | |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  | |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  | |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  | |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  | |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  | |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  | |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  | |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  | |  |  |

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| **Prepared by :** | Dr. Hasan TOSUN | **Date:** | 17.04.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301504 | **TITLE** | Geotechnics for Dam Engineering |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 20 |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course includes definition and classification of the dams, summarizes the main principle of the design, describes foundation units (Soil/rock) and evaluates the construction measures such as sand drain, prefabricated band drain, injection curtain, slurry trench, concrete diaphragm walls, crossed pipes for providing stability and impermeability in foundation units. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course introduces information about interaction behavior of structure and soil for dams and reveals the methods and measures for designing and construction. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Scientific research and ability for evaluation  Ability for using data  Ability for understanding  Ideas and solutions for complicated situations | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1 .Walters, R.C.S. 1962, Dam geology: Butterwoths, London, 335 p.2. USBR, 1974, Earth manual (Part 1): U.S. Bureau of Reclamation, Denver, 810 p.3. Fell, R., 2005, Geotechnical engineering of embankment dams: Brokfield, Balkema.4. NAVFAC-DM:7.1, 1982, Soil mechanics design manual (Design of Drainage Blankets and Filters) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition, classification and history for dams |
| 2 | Design principles for rigid dams |
| 3 | Design principles for embankment dams |
| 4 | Foundation: silt and clayey soils |
| 5 | Foundation: sand and gravelly soils |
| 6 | Midterm Examination 1 |
| 7 | Foundation: weathered rock |
| 8 | Foundation: fresh rock |
| 9 | Foundation: layered soils/rocks |
| 10 | Impermeability for foundation soil |
| 11 | Midterm Examination 2 |
| 12 | Excavation and foundation stability |
| 13 | Seepage analysis |
| 14 | Slope stability analysis |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Dr. Hasan TOSUN | **Date:** | 17.04.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **CIVIL ENGINEERING** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 503302512 | **TITLE** | Earth Structures |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 20 |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | | Measurements of soil properties  Geotechnics for dam engineering | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course includes the main requirement for designing the earth structures, gives more detailed information shear strength of soils and stress path concept, and introduces the methods of the slope stability and static deformation analysis for separate loading conditions (end of construction, operation stage, rapid drawdown and earthquake) and mentions the seismic hazard analysis for dam site | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course supplies students on designing of the earth structures and supports dam on the methods for static stability analysis with considering an actual project. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Scientific research and ability for evaluation  Ability for using data  Ability for understanding  Ideas and solutions for complicated situations | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Corps of Engineers, 1970, “Engineering and design stability of earth and rockfill dams” EM 1110-02, Department of the Army Corps of Engineers, Washington.2.Singh, B. and Sharma, H.D., 1976, “Earth and Rockfill Dams” Sarith Rakashan, Meerht, 566 p.3. Sowers, G.F., 1962, Earth and Rockfill Dam Engineering: ASIA Publishing House, London, 283 p.4. USBR, 1987, Design of Small Dams: U.S. Bureau of Reclamation, Denver, 860 p. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definition, classification of earth hydraulic structures |
| 2 | Shear strength of clays |
| 3 | Shear strength of sands |
| 4 | Stress path method for isotropic soil conditions |
| 5 | Stress path method for anisotropic soil conditions |
| 6 | Midterm Examination 1 |
| 7 | Slope stability analysis for end of construction |
| 8 | Slope stability analysis for operation |
| 9 | Seismic hazard analysis for rapid drawdown and earthquake |
| 10 | Design rules |
| 11 | Midterm Examination 2 |
| 12 | Design rules |
| 13 | Case study |
| 14 | Case study |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  | |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  | |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  | |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  | |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  | |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  | |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  | |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  | |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  | |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  | |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  | |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  | |  |  |

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| **Prepared by :** | Dr. Hasan TOSUN | **Date:** | 17.04.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301505 | **TITLE** | Measurement of Soil Properties |

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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 | | | | | 2 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 20 |
| Project | | | | | 1 | | 30 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | This course includes the main requirements of geotechnical studies and site investigation for large engineering structures, and introduces the evaluation techniques for Standart Penetration Test (SPT), Conic Penetration Test (CPT), Vane Test and Pressumeter. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The goal of this course is to give more detail information about site investigation techniques for obtaining more appropriate parameters to designing stage. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Scientific research and ability for evaluation  Ability for using data  Ability for understandThis course includes the main requirements of geotechnical studies and site investigation for large engineering structures, and introduces the evaluation techniques for Standart Penetration Test (SPT), Conic Penetration Test (CPT), Vane Test and Pressumeter.ing  Ideas and solutions for complicated situations | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Holtz R.D. and Kovacs, W.D., (1981), An Introduction to Geotechnical Engineering, Prentice-Hall, Eaglewood Cliffs, NJ.2. Lunne, T., Robertson, P.K and Powell, J.J.M. (1997) “Cone Penetration Testing in Geotechnical Pactice” Blacke Academic and Professional, London, 312p.3. Tosun, H.(1989) “Temel zemini taşıma gücü” DSİ yayınları, Ankara (in Turkish)4. Tosun, H. (1993) “Temel zemini oturma analizi” DSİ yayınları, Ankara (in Turkish) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Prelimanry Site Investigation |
| 2 | Planning for Site Investigation |
| 3 | Advantages of In-situ Tests |
| 4 | In-situ test (Standard Penetration Test) |
| 5 | In-situ test (Conic Penetration Test) |
| 6 | Midterm Examination 1 |
| 7 | In-situ test (Dilatometer Test) |
| 8 | In-situ test (Pressumeter Test) |
| 9 | In-situ test (permeability test) |
| 10 | Bearing capacity for shallow foundation |
| 11 | Midterm Examination 2 |
| 12 | Settlement analysis for shallow foundation |
| 13 | Bearing capacity for deep foundation |
| 14 | Settlement analysis for shallow foundation |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Dr. Hasan TOSUN | **Date:** | 17.04.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301514 | **TITLE** | Environmental hydraulic |

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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 (√)]** | | | | | | |
| + | | + | | | | + | | | | | | |
| **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** | | | | | Wastewater treatment techniques and treatment plant hydraulic design. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learn the design of a typical wastewater treatment plant. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Research , practice, interpreting. | | | | | | | |
| **TEXTBOOK** | | | | | Atıksuların tasfiyesi (Veysel Eroğlu)Atıksuların arıtılması (Ahmet Samsunlu) | | | | | | | |
| **OTHER REFERENCES** | | | | | - | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The basic equation used in the calculation of pressure flow. |
| 2 | The basic equation used in the calculation of open channel flow. |
| 3 | Energy and hydraulic grade line applications. |
| 4 | Water and wastewater treatment techniques. |
| 5 | Water and wastewater treatment techniques. |
| 6 | Midterm Examination 1 |
| 7 | Sizing of precipitation and sedimentation. |
| 8 | Sedimentation tank inlet structures. |
| 9 | Sedimentation tank outlet structures. |
| 10 | Distribution channel types and sizing. |
| 11 | Midterm Examination 2 |
| 12 | Distribution channel types and sizing. |
| 13 | Determination of a typical treatment plant hydraulic profile. |
| 14 | Determination of a typical treatment plant hydraulic profile. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Yrd. Doç. Dr. Hasan TOZLUK | **Date:** | 16/05/2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Construction Project Management |

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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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to Project management. Project management knowledge areas. Project integration management. Project scope management. Project time management. Project cost management. Project quality management. Project human resources management. Project communication management. Project risk management. Project procurement management. Cost and time based project planning. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Provide knowledge on key project management subjects effecting company performance and project success. Provide basic knowledge on project management functions. Optimization on Time management and cost analysis. Provide knowledge on problems related to Linear programming and optimization in Project management (resource allocation time-cost balance) | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students shall increase their ability of evaluating and managing any construction projects according to basic knowledge on project management functions provided by the course | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Students will be informed about project management functions  2. Students will be able to increase their ability of analyzing criteria that may affect the success of the project and company.  3. Students shall increase their ability of examining the economic, social and environmental factors that affect construction firms.  4. Students will be able to increase their ability to manage construction projects. | | | | | | | |
| **TEXTBOOK** | | | | | Albayrak, B., (2009), Proje Yönetimi ve Analizi, Nobel Yayın Dağıtım | | | | | | | |
| **OTHER REFERENCES** | | | | | [1] Akbıyıklı, R., (2012) İnşaat Yönetimi Metraj ve Malşyet Hesapları, Birsen Yayınevi[2] McGeorge, D., Palmer, A., (2002), Construction Management, Blackwell Publishing,[3] Halpin, D.W., (2006), Construction Management, Wiley Publishing,[4] Harris, F., McCaffer, R., Edum-Fotwe, F., (2006), Modern Management, Blackwell Publishing,[5] Winch, G.M., (2010), Managing Construction Management, Wiley-Blackwell Publishing, | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Project Management |
| 2 | Construction Project Life Cycle and Organization |
| 3 | Construction Project management processes |
| 4 | Construction Project Scope Management |
| 5 | Construction Project Time Management |
| 6 | Midterm Examination 1 |
| 7 | Construction Project Cost Management |
| 8 | Construction Project Quality Management |
| 9 | Construction Project Human Resources Management |
| 10 | Construction Project Communication Management |
| 11 | Midterm Examination 2 |
| 12 | Construction Project Risk Management |
| 13 | Construction Project Procurement Management |
| 14 | Construction Investigation of Recent knowldege on Project Management |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assist. Prof. Dr. Hakan KUŞAN | **Date:** | 21.11.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Advanced Foundation Engineering |

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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 | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | | 20 |
| Project | | | | |  | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Site Investigations, In-situ Tests, Design of Shallow Foundations, Deep Foundations, Pile Foundations, Earth Pressures, Retaining Structures | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach advanced theory and practices of foundation engineering, To teach new technologies and applications in foundation engineering | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Provide the information and application of Foundation Engineering at graduate level | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7.. | | | | | | | |
| **TEXTBOOK** | | | | | Bowles, J., (1996) Foundation Analysis and Desgin, McGraw-HillSalgado,(2011), The Engineering of FoundationsDas, B., (2010), Principles of Foundation Engineering CL-Engineering | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Site Investigations |
| 2 | In-Situ Tests |
| 3 | Earth Pressures |
| 4 | Introduction to Foundations |
| 5 | Bearing Capacity of Foundations |
| 6 | Midterm Examination 1 |
| 7 | Shallow Foundations |
| 8 | Settlement of Shallow Foundations |
| 9 | Deep Foundations |
| 10 | Settlement of Shallow Foundations |
| 11 | Midterm Examination 2 |
| 12 | Introduction to Retaining Structures |
| 13 | Retaining Structure Analysis |
| 14 | Construction Methods of Weak Soils |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Ass.Prof. Kamil Bekir Afacan | **Date:** | 05,04,2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Applications of Advanced Mechanics of Fluids |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 5 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Fluid Mechanics, Differential Equations | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Continuum, viscosity and pressure field; mathematical description of fluid motion, flow lines; finite control volume analysis; fluid element kinematics, conservation of mass, the stream function, conservation of linear momentum, Euler equation, Bernouilli equation, non-dimensional form of the Navier-Stokes equations, approximate solutions of the Navier-Stokes equations, potantial flow, turbulence, turbulence models, flow over immersed bodies, pipe and boundary layer flows, open channel flows. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introducing of the physical properties of viscous fluids, mathematical modeling of motion of fluids based on the conservation of mass, momentum and energy for viscous and inviscid fluids, application of the Navier-Stokes equations to the real life fluid mechanics problems using both differential and integral approaches are the objectives of this course. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will be able to employ scientific understandings about the physical properties of fluids, students will be able to define the mathematical description of fluid motions considering conservation of mass, energy and momentum. Students will be able to apply the general governing equations of motions of fluids to the problems related with the motions of both viscous and inviscid fluids. Thus students will be able to understand the general concepts of fluid motions considering the turbulence effects. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to understand the motion of turbulent flows and will be able to determine how those problems can be solved numerically and analytically, which is possible under some assumptions. | | | | | | | |
| **TEXTBOOK** | | | | | Akışkanlar Mekaniğine Giriş, Türbülans ve Bazı Türbülanslı Akımlar, Cahit Çıray, ODTÜ Yayıncılık, 2013. | | | | | | | |
| **OTHER REFERENCES** | | | | | Fundamentals of Fluid Mechanics’, Munson, Young & Okiishi, John Wiley & Sons, Inc., 2010.Mechanics of Fluids’, Potter & Wiggert, Brooks/Cole, 2002.Fluid Mechanics’, Finnemore & Franzini, McGraw-Hill, 2002.Fluid Mechanics’, Çengel & Cimbala, McGraw-Hill, 2010.Fluid Mechanics’, White, McGraw-Hill, New York, 2011.Fluid Mechanics’, Douglas, Gasiorek & Swaffield, Prentice Hall, New York, 2005 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Continuum, viscosity and pressure field |
| 2 | Mathematical description of fluid motion, flow lines, finite control volume analysis. |
| 3 | Fluid element kinematics, conservation of mass, the stream function, conservation of linear momentum, Cauchy stress equation, Navier-Stokes equations, boundary conditions. |
| 4 | Euler equation, Bernouilli equation, fluid element moving along a streamline, alternative forms of Bernouilli equation; static, stagnation, dynamic and total pressure. |
| 5 | Non-dimensional form of the Navier-Stokes equations, vorticity-stream function formulation |
| 6 | Midterm Examination 1 |
| 7 | The velocity potential, elementary plane flow simulations |
| 8 | Turbulence, Reynolds-averaged Navier-Stokes equations. |
| 9 | Modeling of turbulent flows, zero-equation turbulence models, one-equation turbulence models, two-equation turbulence models. |
| 10 | k-epsilon turbulence model, k-omega turbulence model, turbulence stress models, large-eddy simulation model. |
| 11 | Midterm Examination 2 |
| 12 | Pipe and boundary layer flows. |
| 13 | Pipe flows, governing equations, wall shear stress, rough walls. |
| 14 | Open channel flows. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Doç.Dr. Ender Demirel | **Date:** | 04/04/2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | STRUCTURAL OPTIMIZATION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | TURKISH |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 10 |
| Project | | | | | 1 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Solutions of structural optimization problems with traditional and modern optimization methods | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Defining the optimization problem and explaining the basics. To inform the student about linear and non-linear programming and meta-heuristic algorithms. Studying the examples of structural design applications of optimization methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | After completion of the course, student will be able to find the optimal designs of the structures with various methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To understand structural optimization concept, To learn mathematical optimization methods, To learn artificial intelligence methods, Able to apply optimization methods to structural optimization problems. | | | | | | | |
| **TEXTBOOK** | | | | | Engineering Optimization: Theory and Practice (Rao) | | | | | | | |
| **OTHER REFERENCES** | | | | | Optimization Methods for Engineering Design (Parkinson, Balling and Hedengren) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, Basics: Optimization Problem, Objective Function, Single-Objective Optimization, Multi-Objective Optimization, Constraints, Feasible Region, Feasible Solution, Convex Problem, History |
| 2 | Traditional Optimization Methods: Single-Dimensional Unconstrained Optimization, Multi- Dimensional Unconstrained Optimization |
| 3 | Traditional Optimization Methods: Single- Dimensional Constrained Optimization, Multi- Dimensional Constrained Optimization |
| 4 | Linear Programming: Simplex Method, Revised Simplex Method, Duality |
| 5 | Non-Linear Programming I: Methods for Single-Dimensional Problems |
| 6 | Midterm Examination 1 |
| 7 | Non-Linear Programming II: Unconstrained Optimization Methods |
| 8 | Non-Linear Programming III: Constrained Optimization Methods |
| 9 | Geometric Programming, Dynamic Programming |
| 10 | Optimization in Structural Design: Introduction, Conventional Design, Definition of Structural Optimization Problem, Design Variables, Constraints, Objective Function |
| 11 | Midterm Examination 2 |
| 12 | Examples for Structural Optimization Problems, Introduction to Meta-heuristics |
| 13 | Meta-heuristic Algorithms I |
| 14 | Meta-heuristic Algorithms II |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Assist. Prof. Dr. Hakan ÖZBAŞARAN | **Date:** | 27.03.2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **CIVIL ENGINEERING (MSc)** | **SEMESTER** | Fall |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | EXPERIMENTAL METHODS IN CIVIL ENGINEERING |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | | 1 | | 20 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | ---- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Experimental methods in Civil Engineering and the principles of measurement, Properties of measurement systems and tools. Calibration and principles of data recording. Design and construction of models. Methods of load application, loading frames. Nondestructive testing principles. Principles of data recording and data analysis. Reporting of the results | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The objective of this course is to familiarize students with experimental principles and techniques used in civil and structural engineering research and practice; to improve data interpretation / discussion and report writing skills; to encourage the students towards experimental research; to demonstrate reinforced concrete behavior studied earlier | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | This course will contribute to the development of interpretation skills, analysis, obtaining the required parameters and the evaluation in experimental çivil and structural engineering | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will able to design and construct structural models, to measure load, strain, displacement, rotation of a test, to use data acquisition system, and to analyze data gathered during the experiment and write technical reports. | | | | | | | |
| **TEXTBOOK** | | | | | “ Experimental Mechanics of Solids” Cesar A. Sciammarella, Federico M. Sciammarella, 2012, Wiley. USA | | | | | | | |
| **OTHER REFERENCES** | | | | | “ Experimental Methods for Engineers” Jack P. Holman, 2007, McGraw-Hill,USA. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Experimental research, planning and influencing factors, planning and research principles |
| 2 | Scientific research techniques and experimental techniques in applied scientific research and thesis |
| 3 | Structural model analysis principles. Relationship between the prototype and the model, types of models and modeling, scaling |
| 4 | Model analysis approaches used in structures and dimensional approaches |
| 5 | Design and production of models and required items used in production process |
| 6 | Midterm Examination 1 |
| 7 | Load schemes. load-controlled loading and deformation-controlled loading and behavior under loads of concrete or reinforced concrete. |
| 8 | Load application methods. Weight systems. Mechanical systems. Pneumatic systems. Hydraulic systems (pumps). Dynamic load application systems. |
| 9 | Installation frames. Stability issues and mitigation methods. experiment on the safety of life and property. |
| 10 | Load and deformation measurement methods. Spring dynamometers, load rings, weight systems, Straingauge load gauges (load cell) |
| 11 | Midterm Examination 2 |
| 12 | Strain measurements. Application areas and types of strain gauges. Weston bridge. Seçlimi strain gauge, bonding, protection selection. Badges |
| 13 | Generalized Hook's law. Measurements of strain in the body. Rotation and curvature. Calibration |
| 14 | Non-catastrophic experiments. Impact hammer. Off stickers. Ultrasonic measurements. Coring and its locations. Rebar detection. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

**Prepared by :** Yrd.Doç.Dr. Uğur ALBAYRAK **Date:**  03.04.2017

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **CIVIL ENGINEERING (MSc)** | **SEMESTER** | SPRING |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | DESIGN AND CONSTRUCTION OF TALL BUILDINGS |

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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 | | | | | 3 | | 30 |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | | ---- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Overview of design philosophy and selection of the structural systems for tall buildings; criteria and loadings; structural modeling and analysis;  structural and foundation design; fire safety engineering; construction planning and management of tall building projects. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The objective of this course is to familiarize the students with the fundamental behavior and design of tall buildings in comparison with that of low-rise buildings, with emphasis on structural load resisting systems and material systems. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | This course will contribute to the development of interpretation skills, analysis, obtaining the required parameters and the evaluation in experimental çivil and structural engineering in terms of Tall Buildings. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will able to design and construct and can differentiate between different structural systems for buildings; student can calculate the design loads for all buildings and differentiate between different floor systems and using in tall buildings. The student can perform structural modeling and  analysis of tall buildings and identify the construction and project management issues related to tall buildings | | | | | | | |
| **TEXTBOOK** | | | | | Taranath, B.S., Steel, Concrete, & Composite Design of Tall Buildings, 2nd Ed, Mc Graw Hill. USA | | | | | | | |
| **OTHER REFERENCES** | | | | | Chew Yit Lin, M., Construction Technology for Tall Buildings, 2nd Ed., World Scientific | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to tall building structural systems |
| 2 | Gravity load resisting systems:Concrete Buildings |
| 3 | Gravity load resisting systems: Steel and composite buildings |
| 4 | Lateral load resisting systems:Concrete buildings |
| 5 | Lateral load resisting systems:Steel and composite buildings |
| 6 | Midterm Examination 1 |
| 7 | Design Loads for tall buildings |
| 8 | Structural modeling and analysis of tall buildings |
| 9 | High performance materials for tall buildings |
| 10 | Design of structural members: Concrete buildings |
| 11 | Midterm Examination 2 |
| 12 | Design of structural members: Steel and composite buildings |
| 13 | Foundation systems, analysis and design; Fire safety and security of tall buildings |
| 14 | Construction and Project management of tall buildings |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

**Prepared by :** Yrd.Doç.Dr. Uğur ALBAYRAK **Date:**  07.11.2017

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503301536 | **TITLE** | PRINCIPLES OF HIGHWAY PAVEMENT DESIGN |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | --- | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Content of the course is as follows: highway, highway design, highway materials and highway materials experiments. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to provide the student with a clear and through presentation of the theory and application of highways. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Elementary design methods. This course provides effort solving highway design. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to use the basic knowledge of highway design and be familiar with some problems of highways. | | | | | | | |
| **TEXTBOOK** | | | | | UMAR, Faruk, AĞAR, Emine, “Yol Üstyapısı”. 1985. İ.T.Ü. Matbaası. İstanbulWhiteoak, D., The Shell Bitumen Handbook, 1991.Shell Bitüm El Kitabı, İstanbul Büyükşehir Belediyesi, 2004.Asfalt El Kitabı, İSFALT, İstanbul Büyükşehir Belediyesi, 2004.Asfalt ve Uygulamaları, İSFALT, İstanbul Büyükşehir Belediyesi, 2004Asfalt Laboratuvarı El Kitabı, KGM… | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General highway knowledge |
| 2 | Highway loads, layers and design |
| 3 | Geometric cross section |
| 4 | Design standards and highway context |
| 5 | Basic design policies |
| 6 | Scenic values in planning and design |
| 7 | Material sites and disposal sites |
| 8 | Mid-term |
| 9 | Geometrıc desıgn and structure standards |
| 10 | Pavement type and design |
| 11 | Laboratory studies |
| 12 | Laboratory studies |
| 13 | Laboratory studies |
| 14 | Laboratory studies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof. Dr. Murat KARACASU | **Date:** | 12.05.2020 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | SOIL DYNAMICS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 8 | COMPULSORY  ( X ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | | x | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (………) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Vibration of elementary systems, wave propagation in elastic, layered, saturated media. Behavior of dynamically loaded soils. Fundamentals of cyclic soil behavior: stress-strain-pore water pressure behavior, shear moduli and damping, cyclic settlement and concept of volumetric cyclic threshold shear strain. Introduction to the modeling of cyclic soil behavior. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning fundamental concepts about soil dynamics and earthquake, study on behaviour of soil under the dynamic loads and design structures having regard to these phenomenons. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Comprehensive knowledge of soil behavior under dynamic loading | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | LO 1, LO 2, LO 5, LO 6, LO 7. | | | | | | | |
| **TEXTBOOK** | | | | | B.M.Das, Principle of Soil Dynamics,1993 | | | | | | | |
| **OTHER REFERENCES** | | | | | Kramer,S.L. Geotecnical Earthquake Engineering,1996, Ishihara K, Soil Behavior in Geotechnics, 1996 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | SDOF Systems |
| 3 | Two DOF Systems |
| 4 | Basics of Wave Propagation |
| 5 | Introduction to Earthquakes and Response Spectra |
| 6 | Midterm Examination 1 |
| 7 | Fundamentals of cylic soil behavior |
| 8 | Stress-strain-pore water pressure behavior,shear moduli and damping |
| 9 | Introduction to the modeling of cyclic soil behavior |
| 10 | Modeling of cyclic soil behavior |
| 11 | Midterm Examination 2 |
| 12 | Liquefaction |
| 13 | Liquefaction |
| 14 | Project |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Dr. Kamil Bekir Afacan | **Date:** | 16/11/20 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | TRANSPORTATION PLANNING |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Development of transportation, transportation modes, infrastructures of transportation modes, operating characteristics of transportation modes, performance criteria, city transportation modes, transportation and land-use, environmental effects of transportation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main purpose of this course is to provide the student with a clear and through presentation of the theory and application of transportation planning. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is to get students knowledge about definitions of transportation planning. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to use the basic knowledge and some problems of transportation planning. | | | | | | | |
| **TEXTBOOK** | | | | | Morlok, E.K.,” Introduction to Transportation Engineering And Planning”, McGraw-Hill, 1978.YAYLA, Nadir,“Karayolu Mühendisliği”,2002. Birsen Yayınevi Ltd. Şti. İstanbul.Papacostas, C.S.”Fundamentals of Transportation Engineering”,Prentice Hall, 1987 | | | | | | | |
| **OTHER REFERENCES** | | | | | Papacostas,C.S.,Prevedouros,P.D.,”Tranportation Engineering and Planning”,Prentice Hall,2001 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | General modeling knowledge |
| 2 | The need for modeling |
| 3 | Statistical information |
| 4 | General problems in modeling |
| 5 | Trip generation models |
| 6 | Trip distribution models |
| 7 | Modal-split |
| 8 | Mid-term |
| 9 | Traffic assignment models |
| 10 | Questionnaire content |
| 11 | Data analysis |
| 12 | Data analysis |
| 13 | Site studies |
| 14 | Site studies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Prof.Dr. Murat KARACASU | **Date:** | 12.05.2020 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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

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

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

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

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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| **COURSE** | | | |
| **CODE** | 503302531 | **TITLE** | DISCRETE CHOICE MODELLING |

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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 | | X | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In the course, the theory of discrete choice models and their applications in the sub-discipline of transportation engineering, together with data collection and compilation methods, will be explained in detail. For this purpose, utility and regret-based modeling approaches will be explained in detail, alternative and new models in the literature will be introduced. The course content also includes practical topics such as the design of the aforementioned models, the evaluation and interpretation of the models and their results. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To explain the theory of choice models, especially including the practices of transportation engineering, with alternative examples of the relevant disciplines according to the participation in the course from different disciplines.  To give detailed information about the method and purpose of discrete choice models.  To teach topics such as generating utility and regret functions, model designs with generic and alternative-specific coefficients, model estimations, performance tests, and interpretation of model results, including utility and regret modeling approaches.  Regarding data collection and compilation; to explain the subjects such as stated and revealed preference survey designs, possible problems, sampling methods both in general and in the sub-discipline of transportation engineering. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | In transportation planning studies, which is a study area of the Transportation Engineering sub-discipline of Civil Engineering Department, the travel behavior of individuals should be modeled. For this purpose, modeling the choice characteristics of individuals is a necessity for transportation planning in terms of decision-making processes for current and future investments by interpreting the results of this model. For this purpose, discrete choice modelling course is designed to meet this need. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Understanding the theory of choice models.  To have information about the choice behaviors required in transportation planning in practice, to evaluate the model results to be used in the planning processes of investments.  Gaining knowledge about data collection and data compilation.  Comprehension of utility and regret-based modeling theory.  Creating, analyzing and interpreting model designs.  Ability to use different modeling approaches separately and in synthesis. | | | | | | | |
| **TEXTBOOK** | | | | | De Dios Ortúzar, J., Willumsen, L.G. (2011). Modelling Transport. John Wiley & Sons.Chorus, C.G. (2012). Random Regret-based Discrete Choice Modeling: A Tutorial. Springer. | | | | | | | |
| **OTHER REFERENCES** | | | | | Ben-Akiva, M., Lerman, S. (1985). Discrete Choice Analysis, The MIT Press.Horowitz, J.L., Koppelman, F.S., Lerman, S. (1986). A Self-Instructing Course in Disaggregate Mode Choice Modeling, Paper No. IA-11-0006, U.S. Department of Transportation, Washington, D.C.Train, K. (2002) Discrete Choice Methods with Simulation, Cambridge University Press.Hensher, D.A., Rose, J.M., Greene, W.H. (2005). Applied Choice Analysis: A Primer, Cambridge University Press.Koppelman, F.S., Bhat, C.R. (2006). A Self-Instructing Course in Mode Choice Modeling: Multinomial and Nested Logit Models, U.S. Department of Transportation, Washington, D.C.Akalın, K.B. (2021). Utilization of Random Regret Minimization and Random Utility Maximization Methods for Trip Generation and Attraction Modeling. Dissertation Thesis. Eskisehir Osmangazi University. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to choice models, the place and importance of choice models in transportation planning |
| 2 | Structure of data used in choice models, sampling methods |
| 3 | Data collection methods: Stated and revealted preference surveys. Compiling the data to be used in the model, disaggregated and aggregated data structure |
| 4 | Random utility theory and utility-based choice models |
| 5 | Theory and estimation methods of binary logit and multinomial logit modelling approaches |
| 6 | Theory and estimation methods of ordered logit and nested logit modelling approaches |
| 7 | Generic and alternative-specific parameter estimations. Interpretation of estimated results |
| 8 | Mid-term examination |
| 9 | Random regret theory and regret-based choice models |
| 10 | Theory and estimation methods of basic and classical regret minimization modelling approaches |
| 11 | Theory and estimation methods of generalized, scaled and pure regret minimization modelling approaches |
| 12 | Hybrid utility and regret modelling approach, estimation method and interpretation |
| 13 | Transportation mode choice and value of time analysis. Scenario analysis and evaluation |
| 14 | Discrete choice modelling applications in transportation and different disciplines |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE CIVIL ENGINEERING MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | In civil engineering, ability of reaching out new information with scientific research; ability of evaluation, interpretation and application of the new information |  |  |  |
| **LO 2** | Comprehensive knowledge of recent applications of technics and procedures in civil engineering |  |  |  |
| **LO 3** | Describing and finding unknown, limited or missing data; ability of using data related to other disciplines |  |  |  |
| **LO 4** | Awareness of new and innovative applications in civil engineering, ability of evaluation and learning them when needed |  |  |  |
| **LO 5** | Ability of describing and formulizing related problems in civil engineering, developing new methods and applying them in order to solve these problems |  |  |  |
| **LO 6** | Ability of developing new and/or original ideas and procedures; designing and planning alternative/innovative methods for complicated systems |  |  |  |
| **LO 7** | Ability of designing and practicing theoretical, empirical and model based research; ability of understanding and solving the complicated problems in the process |  |  |  |
| **LO 8** | To be able to work efficient in and inter disciplinary, lead in these groups and develop solutions and ideas in complicated situations; ability of working individually and taking responsibility |  |  |  |
| **LO 9** | Ability of using at least one foreign language at a sufficient level and communication in verbal and writing |  |  |  |
| **LO 10** | Ability of conveying the processes and the results of a research systematically and clearly in nationwide and international meetings |  |  |  |
| **LO 11** | Knowledge of application of project management and professional career in terms of society, environment, health, safety and law in civil engineering applications and awareness of the limitations of them |  |  |  |
| **LO 12** | Awareness of being ethical in gathering data, interpretation and publishing them in any engineering events |  |  |  |

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| **Prepared by :** | Res. Asst. Dr. Kadir Berkhan AKALIN | **Date:** | 09/11/2022 |

**Signature**: