**SOIL SCIENCE AND PLANT NUTRITION 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](#C13) | 7.5 | 3+0 | 3 | **C** | Turkish |
| 506802501 | [PREPARATION OF FERTILIZATION PROGRAMS DEPENDING ON SOIL AND PLANT ANALYSIS](#C2) | 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 |  | C/E | Language |
| 506802503 | [FERTILITY ANALYSES OF SOIL](#C1) | 7.5 | 3+0 | 3 | **C** | Turkish |
|  | Elective Course-3 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0 | 3 | E | Turkish |
| 506802001 | Seminar | 7.5 | 0+1 | - | **C** | Turkish |
|  | Total of II. Semester  | 30 |  | 12 |  |  |
|  | TOTAL OF FIRST YEAR | 60 |  | 21 |  |  |

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| **Second Year** |
| **III. Semester** |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 506801702 | MSc THESIS STUDY | 25 | 0+1 | - | **C** | Turkish |
| 506801703 | 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 |
| 506801702 | MSc THESIS STUDY | 25 | 0+1 | - | **C** | Turkish |
| 506801703 | 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 |  | C/E | Language |
| 506802505 | [FERTIGATION TECHNIQUES](#C3) | 7.5 | 3+0 | 3 | E | Turkish |
| 506802502 | [FERTILIZER IN ORGANIC AGRICULTURE](#C7) | 7.5 | 3+0 | 3 | E | Turkish |
| 506801502 | [MINERAL NUTRITIONAL DISORDERS OF PLANTS](#C6) | 7.5 | 3+0 | 3 | E | Turkish |
| 506801503 | [PHYTOREMEDIATION](#C8) | 7.5 | 3+0 | 3 | E | Turkish |
| 506802504 | [PLANT GROWTH TECHNIQUES IN SOILLES MEDIA](#C9)   | 7.5 | 3+0 | 3 | E | Turkish |
| 506801504 | [SOIL PROPERTIES AFFECTING YIELD](#C12) | 7.5 | 3+0 | 3 | E | Turkish |
| 506802506 | [SOIL, PLANT, WATER RELATIONS](#C11) | 7.5 | 3+0 | 3 | E | Turkish |
| 506802507 | [The Techniques of Trial Planning and Evaluation](#C14) | 7.5 | 3+0 | 3 | E | Turkish |
| 506801505 | [WATER HARVESTING TECHNIQUES](#C10) | 7.5 | 3+0 | 3 | E | Turkish |
| 506801501 | [WATERSHED MANAGEMENT](#C5) | 7.5 | 3+0 | 3 | E | Turkish |

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  FERTILITY ANALYSES OF SOIL |

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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 (√)]** |
|   | 0 |      |
| **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** |  The affecting factors of soil fertility, physical, chemical soil analysis, interpretation of soil analysis results and evaluation of the soil fertility.  |
| **COURSE OBJECTIVES** |  Learning the basic principles and concepts of fertility analysis of soil. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about soil analysis and soil fertility. |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1) learn basic theoretical knowledge about soil analysis, 2) analyze soil physical properties 3) analyze soil chemical properties 4) interpret the soil analysis results used in determining fertility of soil. |
| **TEXTBOOK** |  1) Müftüoğlu N. M., Türkmen C ve Çıkılı Y., (2012).Toprak ve Bitkide Verimlilik Analizleri, Kriter Yayınevi. 2)Karaçal, İ.2008. Toprak Verimliliği. Nobel Yayınları, Ankara.  |
| **OTHER REFERENCES** |  1) J.R.Brown, (1987). Soil Testing: Sampling, Correlation, Calibration, and Interpretation. 2)Toprak analizleri (2012). Prof.Dr. Burhan Kacar. Nobel Yayınları. |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Basic principles of soil analysis |
| 2 |  The affecting factors of soil fertility  |
| 3 |  Determination of soil fertility with soil analyses |
| 4 |  Sampling and preparation of soil, Soil texture analysis |
| 5 |  pH and salt analysis in soil  |
| 6 | Midterm Examination 1 |
| 7 |  Determination of CaCO3 in soil |
| 8 |  Determination organic matter in soil |
| 9 |  Determination of total N in soil |
| 10 |  Determination of available P in soil |
| 11 | Midterm Examination 2 |
| 12 |  Determination of available K in soil |
| 13 |  Determination of available Fe, Zn, Mn, Cu concentration in soil  |
| 14 |  Interpretation of results of soil analysis and evaluation of the soil fertility  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE** **MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[ ]**  | **[x]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Hatice DAĞHAN **Date:** 10/04/2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Preparation of Fertilization Programs Depending on Soil and Plant 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 ) | TR |
| **CREDIT DISTRIBUTION** |
| **Basic Science** | **Basic Engineering** | **Knowledge in the discipline****[if it contains considerable design content, mark with (√)]** |
|   | 0 |      |
| **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** |  To assessment of the data of soil and plant analysis results and prepare of fertilizer programs.  |
| **COURSE OBJECTIVES** |  To teach students data mining evaluation and establishing convenient fertilization programs. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To know the basic principals of fertilization |
| **LEARNING OUTCOMES OF THE COURSE** |  1. To evaluate of soil analysis data2. To become able to establish fertilization program.3. To chose of suitable fertilizer4. To categorize of fertilizer speciality |
| **TEXTBOOK** |  Güçdemir İ.H. (2006). Türkiye Gübre ve Gübreleme Rehberi. Tarım ve Köy İşleri Bakanlığı Yayınları, No 231. |
| **OTHER REFERENCES** |  -Marschner, H. 1995. Mineral Nutrition of Higher Plants. Academic Press. - Kacar B. ve Katkat V. (1999). Gübreler ve Gübreleme Tekniği. |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Fertilization and its importance  |
| 2 |  Basic information on establishing fertilization program  |
| 3 |  The contents and properties of fertilizers |
| 4 |  The contents and properties of fertilizers |
| 5 |  Assessment of soil analysis data |
| 6 | Midterm Examination 1 |
| 7 |  Assessment of plant analysis data |
| 8 |  Correlative assessment of data in analysis results |
| 9 |  Points to consider in establishing fertilization programmes  |
| 10 |  Points to consider in establishing fertilization programmes |
| 11 | Midterm Examination 2 |
| 12 |  The determination of required plant nutrients regarding to analysis data |
| 13 |  A case study for determination of analysis data |
| 14 |  A case study for establishing fertilization program |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Dr. Nurdilek GÜLMEZOĞLU **Date:**

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Fertigation Techniques |

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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 (√)]** |
|   | 0 |      |
| **ASSESSMENT CRITERIA** |
| **SEMESTER ACTIVITIES** | **Evaluation Type** | **Number** | **Contribution** **( % )** |
| Midterm |   | 25 |
| Quiz |   |    |
| Homework |   | 25 |
| Project |   |    |
| Report |   |    |
| Seminar |   |    |
| Other (………) |   |    |
| **Final Examination** | 50 |
| **PREREQUISITE(S)** |  none |
| **SHORT COURSE CONTENT** |  To gain knowledge of fertigation techniques |
| **COURSE OBJECTIVES** |  Learning the basic principles and concepts of fertigation techniques  |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about fertigation techniques |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1) Learning the definition and coverage of fertigation techniques 2) Learning injection methos in fertigation. 3. Learning the nutrients and fertilizers used in fertigation 4. Realize the fertigation applications |
| **TEXTBOOK** |  1) Bitki Besleme ve Gübreleme (2007): Aydın GÜNEŞ, Mehmet ALPASLAN, Ali İNAL. Ankara Üniversitesi, Ziraat Fakültesi,Yayın No:15512) Sulama Sistemlerinin Tasarımı (2013): Prof.Dr. Osman Yıldırım, A.Ü. Ziraat Fakültesi, Yayın No: 1594 |
| **OTHER REFERENCES** |  1) Fertigation: Fundamentals and Applications (1982) Editor: P. C. Bandyopadhyay 2) Water and Fertigation Management in Micro Irrigation (2013) Megh R. Goyal (Editor) 3) Crop Water Requirements (1977), FAO Irrigation and Drainage Paper 24, Rome, Doorenbos, J. And Pruitt W.O. 4) Yield Response to Water (1979), FAO Irrigation and Drainage Paper 33, Rome, Doorenbos, J. And Kassam, A.H. |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition of fertigation, advantages and disadvantages |
| 2 |  Irrigation methods and requirement of irrigation water  |
| 3 |  Irrigation scheduling |
| 4 |  Nutrient requirements of the plants |
| 5 |  Nutrients and fertilizers used in fertigation |
| 6 | Midterm Examination 1 |
| 7 |  Antagonistic and synergistic effects of fertilizers |
| 8 |  Calculation of chemicals used in fertigation |
| 9 |  Injection methods used in fertigation |
| 10 |  Problems and solutions existing in fertigation  |
| 11 | Midterm Examination 2 |
| 12 |  Water quality and salinity management in fertigation |
| 13 |  Fertigation applications for greenhouse, field and horticultural crops |
| 14 |        |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[ ]**  | **[x]**  | **[ ]**  |

**Prepared by:** Yrd. Doç. Dr. Ertuğrul KARAŞ **Date:** 14.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  EFFECT OF SOIL PROPERTIES ON FERTILIZER CONSUMPTION  |

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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 (√)]** |
|   | 0 |      |
| **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** |  The recognition of soil as a source of plant nutrition , Uptake of plant nutrition, Functions of mineral nutrients. |
| **COURSE OBJECTIVES** |  Understand the principles of mineral nutrition of cultivated plants. The defined benefit and how the need for additional fertilizer nutrient consumption led to disclosure. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  Added to the mineral elements in the soil to ensure that the beneficial effects of plant growth to understand |
| **LEARNING OUTCOMES OF THE COURSE** |  1. To assessment of effect of applied plant nutrients on plant yield2. To compare of relationship between soil properties and plant nutrition3. To determine of efficient fertilizer4. To identify of sources in soil of plant nutritions |
| **TEXTBOOK** |  Kacar B. ve Katkat V. (1999). Gübreler ve Gübreleme Tekniği |
| **OTHER REFERENCES** |  -Güzel, N., Gülüt, K.Y., Büyük, G. 2008. Toprak Verimliliği ve Gübreler. Ç.Ü. Ziraat Fak. Yay.no: 246, Ders Kitapları no: A-80. -Marschner, H. 1995. Mineral Nutrition of Higher Plants. Academic Press |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Soil as a plant nutrient |
| 2 |  Moving of plant nutrient to root medium |
| 3 |  Plant nutrition uptake of plants |
| 4 |  Functions of mineral nutrients |
| 5 |  Nitrogen sources of plants |
| 6 | Midterm Examination 1 |
| 7 |  Phosphorus sources of plants |
| 8 |  Potassium sources of plants |
| 9 |  Calcium sources of plants |
| 10 |  Magnesium sources of plants |
| 11 | Midterm Examination 2 |
| 12 |  Sulfur sources of plants |
| 13 |  Iron and zinc sources of plants |
| 14 |  Boron and Manganese sources of plants |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Dr. Nurdilek GÜLMEZOĞLU **Date:** 10.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Watershed 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 (√)]** |
|   | 0 |      |
| **ASSESSMENT CRITERIA** |
| **SEMESTER ACTIVITIES** | **Evaluation Type** | **Number** | **Contribution** **( % )** |
| Midterm |   | 25 |
| Quiz |   |    |
| Homework |   | 25 |
| Project |   |    |
| Report |   |    |
| Seminar |   |    |
| Other (………) |   |    |
| **Final Examination** | 50 |
| **PREREQUISITE(S)** |  NONE |
| **SHORT COURSE CONTENT** |  To gain knowledge of watershed management |
| **COURSE OBJECTIVES** |  Learning the basic principles and concepts of watershed scale planning  |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about watershed management |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1)Learning the definition and coverage of watershed management 2)Analysing rainfall distribution in the watersheds. 3.Learning soil erosion and sedimentation. 4.The imporatence in natural resources management of the principles of watershed planning |
| **TEXTBOOK** |  1) Özhan, S., 2004, Havza Amenajmanı Kitabı. 2) Ward, R., 1999, Principles of Hydrology. 3) Chow, Wen, Applied Hydrology.4) Akalan, İ. 1974. Toprak ve Su Muhafaza. Ankara Üniversitesi, Ziraat Fakültesi Ders Kitabı Yayın No.177 |
| **OTHER REFERENCES** |  1) Brouth ,E. , Peterson, A., Kline-Robach, R., Smith, K, Wolfson , L., 2000. Developing a Watershed Management Plan for Water Quality, An Introductory Guide. 2) Editor: Diana Hoffer, 2002. Watershed Analysis and Management Guide for States and Communities |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition of watershed management, Natural resources and actual environmental problems  |
| 2 |  Watershed characteristics |
| 3 |  Watershed processes, Hydrologic cycle |
| 4 |  Measurement of Precipitation, mean areal precipitation computation methods |
| 5 |  Evaporation, interception, transpiration, evapotranspirasyon and water budget |
| 6 | Midterm Examination 1 |
| 7 |  İnfiltration, soil water storage |
| 8 |  Soil water |
| 9 |  Surface runoff, Subsurface runoff, base flow |
| 10 |  Hydrograph, Unit hydrograph |
| 11 | Midterm Examination 2 |
| 12 |  Measuring stream flows, hydrological observations at streams and rivers |
| 13 |  Soil erosion and sedimentation |
| 14 |  Planning in watershed management,  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[ ]**  | **[x]**  | **[ ]**  |

**Prepared by:** Yrd.Doç.Dr. Ertuğrul KARAŞ **Date:** 14.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  MINERAL NUTRITIONAL DISORDERS OF PLANTS |

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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 (√)]** |
|   | 0 |      |
| **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** |  To gain definition and classification of mineral plant nutrients, function of macro and micro plant nutrients, uptake of plant nutrition, deficiency and toxicity symptoms of mineral elements knowledge |
| **COURSE OBJECTIVES** |  The aim of this course is to learn basic knowledge about identification of mineral nutrition disorders (deficiency and toxicity) symptoms and solving nutritional disorders.  |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about mineral nutrition disorders of plants |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1) learn basic theoretical knowledge about mineral plant nutrients, 2) identify deficiency symptoms of mineral plant nutrients 3) identify toxicity symptoms of mineral plant nutrients 4) explain the relationships between nutrient disorders and plant growth 5) offer solution methods to scope with nutritional disorder in plant |
| **TEXTBOOK** |  1) Marschner, H. 1995. Mineral Nutrition of Higher Crops. Academic Press, London. 2) Kacar, B. ve Katkat, V. 2009. Bitki Besleme. Nobel Yayın 3) Güneş, A., Alpaslan, M. ve İnal, A. 2004. Bitki Besleme ve Gübreleme. A.Ü. Ziraat Fakültesi yayın No: 1539, Ders Kitabı: 492 |
| **OTHER REFERENCES** |  1) Mengel, K., Kirkby, A.E., 2001. Principles of Plant Nutrition.5th Ed.Kluwer Academic Pub. Dordrecht. 2) Bergmann, W., 1998. Nutritional Disorders of Plants.Gustav Fischer Verlag Jena.Stuttgart |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition and classification of mineral nutrients |
| 2 |  The form and transport mechanism of mineral nutrients in soil |
| 3 |  Uptake and transport mechanism of mineral nutrients by plants |
| 4 |  Function of nitrogen in plants  |
| 5 |  Function of phosphorus and potassium in plants  |
| 6 | Midterm Examination 1 |
| 7 |  Function of calcium, magnesium and sulfur in plants  |
| 8 |  Function of zinc and iron in plants |
| 9 |  Function of copper, manganese and boron in plants |
| 10 |  Function of other micro nutrients in plants |
| 11 | Midterm Examination 2 |
| 12 |  Diagnosis of deficiency and toxicity of mineral nutrients |
| 13 |  Diagnosis of deficiency and toxicity of mineral nutrients with plant analysis |
| 14 |  Diagnosis of deficiency and toxicity of mineral nutrients with soil analysis |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Hatice DAĞHAN **Date:** 10/04/2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Fertilizer in Organic Agriculture |

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| **LEVEL** | **HOUR/WEEK** | **Credit** | **ECTS** | **TYPE** | **LANGUAGE** |
| **Theory** | **Practice** | **Laboratory** |
|  **MSc** | 3  | 0  | 0  | 3  | 7,5 | COMPULSORY(   ) | ELECTIVE( X ) | TR |
| **CREDIT DISTRIBUTION** |
| **Basic Science** | **Basic Engineering** | **Knowledge in the discipline****[if it contains considerable design content, mark with (√)]** |
|   | 0 |      |
| **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** |  To recognise of the use of organic fertilizers and organic residues and the assessment according to organic agriculture principles. |
| **COURSE OBJECTIVES** |  To know the use of organic fertilizers and organic residues in organic agriculture. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To know the sustainability of soil fertility in organic agriculture |
| **LEARNING OUTCOMES OF THE COURSE** |  1. To know the basic principles of plant nutrition on organic agriculture 2. To know organic agriculture 3. The soil fertility applications in organic agriculture 4. To apprehend fertilization in organic agriculture |
| **TEXTBOOK** |  -Kacar B. (2014). Temel Gübreleme Bilgisi. Nobel Yayınları. |
| **OTHER REFERENCES** |  -Marschner, H. 1995. Mineral Nutrition of Higher Plants. Academic Press.- Kacar B. ve Katkat V. (1999). Gübreler ve Gübreleme Tekniği. |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Short history of soil fertility, factors of affecting of soil fertility  |
| 2 |  The importance of plant nutriton in organic agriculture. |
| 3 |  Basic principals of plant nutrition |
| 4 |  Primary plant nutrients |
| 5 |  Secondary plant nutrients.  |
| 6 | Midterm Examination 1 |
| 7 |  Soil Fertility  |
| 8 |  Soil Fertility in Organic Agriculture  |
| 9 |  Farmyard manure  |
| 10 |  Poultry manure  |
| 11 | Midterm Examination 2 |
| 12 |  Green manuring  |
| 13 |  Compost  |
| 14 |  Other organic residues  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Dr. Nurdilek GÜLMEZOĞLU **Date:** 10.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  PHYTOREMEDIATION |

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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 (√)]** |
|   | 0 |      |
| **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** |  Definition of soilless agriculture, classification, basic knowledge to constitute a general point of view in the subjects of the methods used in the soilless agriculture and running principles of those methods. |
| **COURSE OBJECTIVES** |  The aim of this course is using plants to remediate environment contaminated with organic, inorganic and gaseous pollutants.  |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about phytoremediation |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to;1) learn definition of environment and environmental pollution, 2) known factors of environmental pollution and remediation methods of environment 3) learn definition and content of phytoremediation 4) classify phytoremediation techniques 5) explain the properties of plants suitable for phytoremediation methods 6) offer solutions the possible problems to be met in phytoremediation |
| **TEXTBOOK** |  1) Terry, N. And Banuelos, G., (2000). Phytoremediation of contaminated soil and water. CRC Press LLC. ISBN-10: 1566704502. 2) Phytoremediation of Toxic Metals: Using Plants to Clean Up the Environment.Ilya Raskin (Editor), Burt D. Ensley (Editor).Publisher: Wiley-Interscience (November 24, 1999) ISBN-10: 0471192546 .  |
| **OTHER REFERENCES** |  Prasad MNV, Sajwan K.S. and Ravi Naidu (eds) (2006) Trace elements in the environment:Biogeochemistry, Biotechnology and Bioremediation. CRC Press. Boca Raton. Taylor and Francis Group. 726 pp.  |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition of environment and environmental pollution, sources of Pollution and reclamation methods  |
| 2 |  Definition and content of Phytoremediotion  |
| 3 |  Advantages and disadvantages of Phytoremediotion |
| 4 |  Limitation factors of Phytoremediotion technology |
| 5 |  Classification of phytoremediation  |
| 6 | Midterm Examination 1 |
| 7 |  Ideal plant for Phytoremediotion and their properties, Hyperaccumulate plants  |
| 8 |  The importance of plant biotechnology for Phytoremediotion technology  |
| 9 |  Phytoextraction, Phytostablization, Rhizofiltration |
| 10 |  Phytovolatilization, Phytodegradation |
| 11 | Midterm Examination 2 |
| 12 |  Phytoremediotion market  |
| 13 |  Environmental application of Phytoremediation |
| 14 |  General evaluation  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[ ]**  | **[x]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Hatice DAĞHAN **Date:** 10/04/2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  PLANT GROWTH TECHNIQUES IN SOILLES MEDIA      |

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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 (√)]** |
|   | 0 |      |
| **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** |  Definition of soilless agriculture, classification, basic knowledge to constitute a general point of view in the subjects of the methods used in the soilless agriculture and running principles of those methods. |
| **COURSE OBJECTIVES** |  The aim of this course is to give knowledge to students about the current situation of soilless agriculture in Turkey and the World, methods used in the soilless agriculture, basic knowledge in the issues of running principles of those methods with subsequent constitution of general point of view. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about soilless culture and environment.  |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1) learn soilless culture techniques of environmental problems, 2) Knowing application areas of soilless agriculture 3) identify and apply growth mediums to be used in the soilless medium 4) offer solutions the possible problems to be met in soilless culture. |
| **TEXTBOOK** |  J. Benton and Jones Jr., (2005). Hydroponics: A practical Guide fort the Soilless Grower. 2nd Edition, CRC Presss, New York Washington, D.C. |
| **OTHER REFERENCES** |  1) Prof. Dr.Ayten Sevgican.Örtü altı Sebzeciliği (Topraksız Tarım) E.Ü.Zir.Fak.Bah.Bit.Böl. 2) Topraksız Tarım ppt sunu. Hazırlayan Tar-Get (Tarım Teknolojileri Araştırma-Geliştirme ve Uygulama Hizmetleri) 3) Marschner, H. 1995. Mineral Nutrition of Higher Crops. Academic Press, London      |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition of fertilization and historical progress  |
| 2 |  Advantages and disadvantages of soilless agriculture |
| 3 |  Classification of soilless agriculture techniques |
| 4 |  Cultures between the agriculture with and without soil (Hay culture, Ring Culture) |
| 5 |  Solid Cultures (Bag-packeg and pot cultures, rock wool culture)medias (Solid, inorganics and organics medias) and sterilization of these medias  |
| 6 | Midterm Examination 1 |
| 7 |  Hydroponic Cultures (Standing Aerated hdroponic culture, Ebb-and-Flow hdroponic culture, Drip irrigation system, Aeroponics, Nutrient Film Technique (NFT)) |
| 8 |  Plants nutrition requirements (Macro an micro nutrients), Nutrient disorders, diseases and insect control |
| 9 |  Main principles for preparing nutrient solutions (Required nutrient solution properties, chemical matters ans water properties)  |
| 10 |  Cultural applications in the plants grown by the technique of soilless agriculture  |
| 11 | Midterm Examination 2 |
| 12 |  The present situation of soilless agriculture in the world and Turkey, problems and suggestions for the solution |
| 13 |  Hydroponics effect on economic and social conditions  |
| 14 |  General assessment of soilless agriculture applications  |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Hatice DAĞHAN **Date:** 10/04/2015 **Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Water Harvesting Techniques |

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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 (√)]** |
|   | 0 |      |
| **ASSESSMENT CRITERIA** |
| **SEMESTER ACTIVITIES** | **Evaluation Type** | **Number** | **Contribution** **( % )** |
| Midterm |   | 25 |
| Quiz |   |    |
| Homework |   | 50 |
| Project |   |    |
| Report |   |    |
| Seminar |   |    |
| Other (………) |   |    |
| **Final Examination** | 25 |
| **PREREQUISITE(S)** |  none |
| **SHORT COURSE CONTENT** |  To gain knowledge of water harvesting techniques |
| **COURSE OBJECTIVES** |  Learning the basic principles and concepts of water harvesting techniques planning  |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about water harvesting techniques |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1) Learning the definition and coverage of water harvesting techniques 2) Learning macro, micro, rooftop and courtyard water harvesting techniques, 3.Learning the storing and conservation of the water 4.Understand the planning principles of water harvesting |
| **TEXTBOOK** |  1) FAO 32 Water Harvesting Techniques, FAO-Rome 2) Water Harvesting, ICARDA Theib OWEİS and Ahmed Hachum, 2006 |
| **OTHER REFERENCES** |  1. Critchley, W. Siegert, K.and Chapman, C.1991. A Manual for the Design and Construction of Water Harvesting Schemes for Plant Production. Food And Agrıculture Organızatıon Of The United Natıons – Rome.  |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Definition, importance and basic principles of the water harvesting |
| 2 |  Relationship of soil, water and water harvesting  |
| 3 |  Relationship of rainfall and runoff  |
| 4 |  Determination of the rate of rainfall-runoff and land use  |
| 5 |  Classification of the water harvesting techniques |
| 6 | Midterm Examination 1 |
| 7 |  Rooftop and Courtyard Water harvesting  |
| 8 |  Micro-Catchment Water harvesting      |
| 9 |  macro-Catchment Water harvesting |
| 10 |  Floodwater harvesting |
| 11 | Midterm Examination 2 |
| 12 |  Storing and conservation of water |
| 13 |  The plants that will be used in production |
| 14 |  Simple measurement techniques that will be used in water harvesting projects |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[ ]**  | **[x]**  | **[ ]**  |

**Prepared by:** Yrd.Doç.Dr. Ertuğrul KARAŞ **Date:** 14.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  Soil, Plant, Water Relations |

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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 (√)]** |
|   | 0 |      |
| **ASSESSMENT CRITERIA** |
| **SEMESTER ACTIVITIES** | **Evaluation Type** | **Number** | **Contribution** **( % )** |
| Midterm |   | 25 |
| Quiz |   |    |
| Homework |   | 50 |
| Project |   |    |
| Report |   |    |
| Seminar |   |    |
| Other (………) |   |    |
| **Final Examination** | 25 |
| **PREREQUISITE(S)** |  none |
| **SHORT COURSE CONTENT** |  To gain knowledge of soil plant water relationship  |
| **COURSE OBJECTIVES** |  Learning the basic principles and concepts of soil-plant-water relations |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To gain knowledge and experience, practices about soil-plant-water relations in terms of irrigation |
| **LEARNING OUTCOMES OF THE COURSE** |  Upon successful completion of this course, the students will be able to; 1)learning soil-plant-water relations 2) Learning of the expression way of the soil moisture 3. Interperate the soils according to their infiltration rates 4.Evaluate the irrigation scheduling of the plants based on their soil plant and water relations.  |
| **TEXTBOOK** |  1) Toprak-su ilişkileri (1982) Nuri Munsuz, A.Ü. Ziraat Fakültesi, Yayın No: 7982) Sulama (2012). Prof.Dr. Yetkin Güngör, Prof. Dr. Zeki Erözel, Prof. Dr. Osman Yıldırım, A.Ü. Ziraat Fakültesi, Yayın No: 1592. 3) Sulama Sistemlerinin Tasarımı (2013). Prof.Dr. Osman Yıldırım, A.Ü. Ziraat Fakültesi, Yayın No: 1594 |
| **OTHER REFERENCES** |  1) Crop Water Requirements (1977), FAO Irrigation and Drainage Paper 24, Rome, Doorenbos, J. and Pruitt W.O. 2) Yield Response to Water (1979), FAO Irrigation and Drainage Paper 33, Rome, Doorenbos, J. and Kassam, A.H. |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  Volume and mass relationships of soil constituents |
| 2 |  Soil water characteristics |
| 3 |  Soil water energy |
| 4 |  Soil water potential  |
| 5 |  Explaining of the soil water |
| 6 | Midterm Examination 1 |
| 7 |  Measuring of the soil water |
| 8 |  Movement of the soil water |
| 9 |  Soil moisture balance |
| 10 |  Measuring infiltration rate of the water in the soil |
| 11 | Midterm Examination 2 |
| 12 |  Plant water consumption (Evapotranspiration) |
| 13 |  Crop coefficient |
| 14 |  Irrigation scheduling |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Yrd.Doç.Dr.Ertuğrul KARAŞ **Date:** 14.04.2015

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** |  **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  SOIL PROPERTIES AFFECTING YIELD |

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| **LEVEL** | **HOUR/WEEK** | **Credit** | **ECTS** | **TYPE** | **LANGUAGE** |
| **Theory** | **Practice** | **Laboratory** |
|  **MSc** | 3  | 0  | 0  | 3  | 7,5 | COMPULSORY(   ) | ELECTIVE( X ) | TR |
| **CREDIT DISTRIBUTION** |
| **Basic Science** | **Basic Engineering** | **Knowledge in the discipline****[if it contains considerable design content, mark with (√)]** |
|   | 0 |      |
| **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** |  In order to increase in soil fertility belonging to the applications of information to be gained. |
| **COURSE OBJECTIVES** |  Sustainable soil fertility determinants of the teaching and practices to gain information. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  To learn the methods of determining soil fertility, soil contributes to calculate the amount of fertilizer applied. |
| **LEARNING OUTCOMES OF THE COURSE** |  1. To learn the basic methods used to determine the status of soil fertility. 2. Understand the principles of soil fertility and soil plant relations.3. The assignment of the soil physical properties.4. The development of the soil chemical and biological properties |
| **TEXTBOOK** |  -Karaçal, İ. 2008. Toprak Verimliliği. Nobel Yayın no: 1335. |
| **OTHER REFERENCES** |  -Güzel, N., Gülüt, K.Y., Büyük, G. 2008. Toprak Verimliliği ve Gübreler. Ç.Ü. Ziraat Fak. Yay.no: 246, Ders Kitapları no: A-80. -Marschner, H. 1995. Mineral Nutrition of Higher Plants. Academic Press |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  History of soil fertility, factors of affecting of soil fertility  |
| 2 |  Soil water |
| 3 |  Soil texture, soil air |
| 4 |  Soil temperature |
| 5 |  Soil reaction |
| 6 | Midterm Examination 1 |
| 7 |  Soil organic matter |
| 8 |  Soil biological properties  |
| 9 |  Soil-plant-water relationships |
| 10 |  Soil colloidal properties |
| 11 | Midterm Examination 2 |
| 12 |  Exchange of anion and cation in soil |
| 13 |  Soil salinity and alkalinity  |
| 14 |  Nutrient elements and methods of determination of soil fertility |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE       MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO 1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[ ]**  | **[ ]**  | **[x]**  |
| **LO 10** | The ability of interdisciplinary teamwork and to follow the national and international literature | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 11** | Taking responsibility being initiative and having creativity skills  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO 12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |

**Prepared by:** Assoc. Prof. Dr. Nurdilek GÜLMEZOĞLU **Date:**

**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. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 2** | Being able to have researcher qualification with occupational sense of responsibility.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 3** | Becoming skillful at analyzing and reporting the data obtained in scientific researches. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO 4** | Gaining awareness on ethical principles at basic research methods. | **[x]**  | **[ ]**  | **[ ]**  |
| **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** | **SOIL SCIENCE AND PLANT NUTRITION (MSc)** | **SEMESTER** |   |

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| **COURSE** |
| **CODE** |        | **TITLE** |  The Techniques of Trial Planning and Evaluation |

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| **LEVEL** | **HOUR/WEEK** | **Credit** | **ECTS** | **TYPE** | **LANGUAGE** |
| **Theory** | **Practice** | **Laboratory** |
|  **MSc** | 3  | 0  | 0  | 3  | 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 |   |    |
| Project |   |    |
| Report |   |    |
| Seminar |   |    |
| Other (     ) |   |    |
| **Final Examination** | 60 |
| **PREREQUISITE(S)** |        |
| **SHORT COURSE CONTENT** |  This course; trial methods to be used in solving the problems that need to be investigated theoretically and practically in laboratory, controlled and field conditions and the ways to be followed in the application of these methods, basic principles of trials, trial types, simple statistics, significance tests, plot shape and dimensions, pot and field preparation, trial planning, It includes the implementation of the trial plan in the trial area, preparation of the seed material, setting and preparation of the trial equipment, planting, cultural practices, records and labeling, observations and conducting the trials. |
| **COURSE OBJECTIVES** |  In this course; It is aimed to improve the knowledge and skills of the students trial methods to be used in the solution of various problems in theoretical and practical terms in laboratory, greenhouse and field conditions, the ways to be followed in the application of these methods, basic principles of trials, trial types, simple statistics, significance tests, parcel shape and dimensions, field preparation, trial planning, trial field in the implementation of the trial plan, preparation of the seed material, setting and preparation of the trial equipment, planting, cultural practices, recording and labeling, observations. |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** |  The course contributes to the basic knowledge students will need while planning experiments about their profession and interpreting the results of the trials. |
| **LEARNING OUTCOMES OF THE COURSE** |  1) Evaluating the difference between averages2) Understanding of hypothesis controls3) To be able to analyze the sources of variation4) Understanding simple statistics6) Learning about the preparation of trial materials, potting and field preparation and planting, cultural practices, recording and labeling, observations and conducting trials7) Trial planning, implementation of trial plan to the trial area8) Application of trial and plot shape and dimensions in controlled and uncontrolled conditions9) Learning about trial patterns and their properties, basic principles of trial technique and trial error and trial types |
| **TEXTBOOK** |  lparslan, M., Güneş, A., İnal, A. 2005. Trial Technics. Ankara University, Faculty of Agriculture, Textbook No:1543  |
| **OTHER REFERENCES** |  Açıkgöz, N. 1988. Research and Trial Methods in Agriculture. Ege University Faculty of Agriculture Publications, No: 478Seltman, H. J. (2018). Experimental design and analysis . Carnegie Mellon University.  |

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| **COURSE SCHEDULE (Weekly)** |
| **WEEK** | **TOPICS** |
| 1 |  History and trial types of agricultural research trials |
| 2 |  Basic principles of trial technique and trial error |
| 3 |  Trial and plot shape and dimensions in controlled and uncontrolled conditions |
| 4 |  Planning the trial, implementing the trial plan at the trial site, preparation of trial materials, field preparation and planting, cultural practices, recording and labeling, observations and trials |
| 5 |  Trial patterns and their features |
| 6 | Midterm Examination 1 |
| 7 |  Gaining data from trial patterns and the data entry to the computer |
| 8 |  Basic concepts and simple statistics |
| 9 |  Variance analysis of single factor experiments and the applications with SPSS, Minitab and Jmp programs |
| 10 |  Variance analysis of multiple factor experiments and the applications with SPSS, Minitab and Jmp programs |
| 11 | Midterm Examination 2 |
| 12 |  Trials conducted in different years and locations and analysis with SPSS, Minitab and Jmp programs |
| 13 |  Sources of variance and hypothesis checks |
| 14 |  Significiancy test methods and comparison of differences between averages |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE SOIL SCIENCE AND PLANT NUTRITION MSc PROGRAM LEARNING OUTCOMES** | **CONTRIBUTION LEVEL** |
| **NO** | **LEARNING OUTCOMES (MSc)**  | **3**High | **2**Mid | **1**Low |
| **LO1** | Students learn essential and actual conceptual knowledge in the areas of soil science and plant nutrition and combine and develop this piece of knowledge with personal ingenuity | **[ ]**  | **[x]**  | **[ ]**  |
| **LO2** | Students gain ability to attain, understand, use, and produce knowledge in issues of soil science and plant nutrition. | **[ ]**  | **[x]**  | **[ ]**  |
| **LO3** | Students improve skills in use of information technologies in public and occupational services. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO4** | Students will be able to conduct activities in individual and multidisciplinary areas of soil science and plant nutrition.  | **[x]**  | **[ ]**  | **[ ]**  |
| **LO5** | Students build up mentality of occupational and ethical responsibility in agricultural engineering | **[x]**  | **[ ]**  | **[ ]**  |
| **LO6** | Students take decision on recognizing, deciding, and solving problems in soil science and plant nutrition.  | **[ ]**  | **[x]**  | **[ ]**  |
| **LO7** | Students will have knowledge on the topics of recognition, planning, conservation, and sustainability of soil and other natural resources | **[ ]**  | **[x]**  | **[ ]**  |
| **LO8** | Students perform routine analyses of soil, plant, and water and use the results towards soil fertility, fertilization, mapping, soil and water conservation, and soil reclamation. | **[x]**  | **[ ]**  | **[ ]**  |
| **LO9** | To gain the ability to study in laboratories and in the field related to the branch and evaluates the data by using appropriate statistical method. | **[x]**  | **[ ]**  | **[ ]**  |
| **L10** | The ability of interdisciplinary teamwork and to follow the national and international literature |  |  |  |
| **L11** | Taking responsibility being initiative and having creativity skills  |  |  |  |
| **L12** | Using his/her knowledge for the benefit of science and society | **[x]**  | **[ ]**  | **[ ]**  |
| **Prepared by :**  |  Assoc. Prof. Imren KUTLU | **Date:** |  17.11.2020 |

**Signature**: