**AGRICULTUREL BIOTECHNOLOGY 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](#EN21) | 7.5 | 3+0 | 3 | **C** | Turkish |
| 506601515 | [MOLECULAR LABORATORY METHODS](#EN28) | 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 |
| 506602507 | [MOLECULAR MARKERS AND ANALYSIS METHODS](#EN1) | 7.5 | 2+2 | 3 | **C** | Turkish |
|  | Elective Course-3 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0 | 3 | E | Turkish |
| 506602001 | 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 |
| 506601702 | MSc THESIS STUDY | | 25 | | 0+1 | - | **C** | Turkish |
| 506601703 | 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 | |
| 506601702 | | MSc THESIS STUDY | 25 | 0+1 | | - | **C** | Turkish | |
| 506601703 | | 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 |
| 506601503 | [ADVANCED MOLECULAR GENETICS](#EN10) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602506 | [AGRICULTURAL BIOTECHNOLOGY AND ENVIRONMENT INTERACTION](#EN16) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601509 | [BASIC BIOTECHNOLOGY](#EN18) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602501 | [BIOTECHNOLOGICAL TRENDS IN PLANT STRESS PHYSIOLOGY](#EN5) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601506 | [BIOTECHNOLOGY APPLICATIONS IN CROP PRODUCTION](#EN6) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602514 | [FUNCTIONAL GENOMICS](#EN30) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601508 | [FORENSIC ENTOMOLOGY](#EN11) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602502 | [GENE ENGINEERING AND ITS APPLICATIONS IN PLANT BREEDING](#EN3) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602504 | [GENETIC MAPPING AND MOLECULAR BREEDING](#EN8) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602503 | [GMO DETECT AND ANALYSIS TECHNIQUES](#EN7) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601514 | [HEREDITARY DEFECTS OF ANİMALS](#EN25) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602505 | [INSECT BIOTECHNOLOGY APPLICATIONS IN AGRICULTURE](#EN15) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602509 | [INTEGRATIVE MOLECULAR ECOLOGY](#EN22) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601505 | [METHODS USED IN PLANT MOLECULAR BIOLOGY](#EN4) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602513 | [MOLECULAR DETECTION OF BEE DISEASES](#EN29) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601513 | [MOLECULAR MARKER TECHNIQUES](#EN23) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601501 | [MOLECULAR MARKERS AND THEIR USAGE IN PLANT BREEDING](#EN12) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601512 | [MOLECULAR PLANT PHYSIOLOGY AND METABOLISM](#EN24) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601502 | [PROTEIN TRAFICCKING](#EN13) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601510 | [SOIL BIOTECHNOLOGY](#EN19) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602508 | [STRESS PROTEINS](#EN14) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601504 | [TRANSGENIC APPLICATIONS IN AGRICULTURAL PRODUCTION](#EN17) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601507 | [TRANSGENIC INSECTS](#EN20) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602512 | [Agricultural Bioinformatics](#EN26) | 7.5 | 3+0 | 3 | E | Turkish |
| 506601516 | [Lignocellulosic Biotechnology](#EN27) | 7.5 | 3+0 | 3 | E | Turkish |
| 506602511 | [GMO Analysis Techniques](#EN29) | 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** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602507 | **TITLE** | MOLECULAR MARKERS AND ANALYSIS METHODS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Genetic polymorphism, biochemical markers and molecular markers,  protein markers and analysis techniques, restriction enzymes and ligation,  gel electrophoresis techniques (agarose and PAGE), RFLP, PCR and Real Time PCR, DNA and RNA markers. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The goal is to teach molecular markers which are widely used in phylogenetic analysis, gene mapping, breedin, hereditary disorders, etc. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence in molecular markers used in agricultural production. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Comprehend learn polymorphism and importance of it  2.Learn biochemical markers and molecular markers  3.Understand Restriction Digestion, PCR  4.Perform gel electrophoresis techniques (agarose and PAGE)  5.Recognize and use molecular markers | | | | | | | |
| **TEXTBOOK** | | | | | Brooker R., Genetics Analysis and Principles, McGraw-Hill Science, 4th Edition, 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | | Özcan, S., Gürel, E, Babaoglu, M.(eds.), Bitki Biyoteknolojisi I ve II, S.Ü. Vakfı Yayınları, 2001. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, genetic polymorphism |
| 2 | Biochemical and Molecular Markers |
| 3 | Protein Markers and their analysis techniques |
| 4 | Restriction enzymes and ligation |
| 5 | RFLP |
| 6 | Midterm Examination 1 |
| 7 | Gel Electrophoresis techniques (agarose and PAGE) |
| 8 | PCR and Real Time PCR |
| 9 | RAPD, VNTR |
| 10 | AFLP |
| 11 | Midterm Examination 2 |
| 12 | SSR |
| 13 | SNP EST, STS |
| 14 | RNA markers |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr. Muhammet KAYA | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | MOLECULAR LABORATORY METHODS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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** | | | | | Macro and micro organic molecules in the cell, isolation of organic molecules, disruption (homogenization) techniques, separation, purification and analysis methods (DNA, RNA, protein, enzyme). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that students learn the basic extraction, separation and purification techniques used in molecular biology and to acquire the skills data evaluation of enzymatic analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn extraction techniques of macro-molecules and analysis methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Understand the biological properties of the cells at the molecular level.  2. Consider that studies of proteins and nucleic acids and which steps includes thats.  3. Understand the strengths and weaknesses of different experimental approaches used in molecular biology.  4. Know many advanced techniques in molecular biology. | | | | | | | |
| **TEXTBOOK** | | | | | Temizkan, G., Arda, N., Moleküler Biyolojide Kullanılan Yöntemler, Nobel Tıp Kitabevleri Ltd. Şti. Istanbul, 2004. | | | | | | | |
| **OTHER REFERENCES** | | | | | Copeland, R.A., Methods for Protein Analaysis: A Practical Guide to Laboratory Protocols. London. Chapman&Hall,1993. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Physical and chemical homogenization methods |
| 2 | Isolation of DNA |
| 3 | Analysis of the DNA spectral and electrophoretic methods |
| 4 | Replicationed of DNA via Polymerase Chain Reaction (PCR) |
| 5 | Isolation of proteins |
| 6 | Midterm Examination 1 |
| 7 | Determination of protein concentration |
| 8 | Concentration of protein extracts |
| 9 | Electrophoretic analysis of proteins |
| 10 | Staining of protein gel |
| 11 | Midterm Examination 2 |
| 12 | Transfer to the membrane and immunological methods |
| 13 | Principles of enzymatic analysis |
| 14 | Defining and measuring of enzyme activity |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül ERGİN | **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** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602502 | **TITLE** | GENE ENGINEERING AND ITS APPLICATIONS IN PLANT BREEDING |

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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 | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Structure and function of genes, control mechanisms of protein synthesis, and antisens RNA technique, isolation of genes, gene manipulations, gene transfer methods. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to make the students learn molecular genetic engineering which are used in agricultural productions. The goal is to teach gene transfer techniques and genetically modified plant productions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | At the end of the course, students will be use the genetic engineering applications in plant breeding. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Recognise the plant genomic organisation and differentiate the gene families, special gene locations and single copy genes  2.Apply genetic engineering techniques used for plant breeding  3.Produce solutions to problems faced in plant breeding  4.Solve the problems about distribution and conservation of the plant genetic resources | | | | | | | |
| **TEXTBOOK** | | | | | Leland H., Leroy H., Goldberg, M., Reynolds, A.E., Silver, L., Genetics: From Genes to Genomes, McGraw-Hill Science, 4th Edition, 2010. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Brooker R., Genetics Analysis and Principles, McGraw-Hill Science, 4th Edition, 2011.2.Özcan, S. ve Gürel, E, Babaoglu, M.(eds.), Bitki Biyoteknolojisi I ve II, S.Ü. Vakfı Yayınları, 2001. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Genetic engineering in breeding programs |
| 2 | Cells, chromosomes, DNA and RNA structure |
| 3 | Structure and function of genes |
| 4 | Protein synthesis and amino acids structure |
| 5 | Control mechanisms of protein synthesis and antisens RNA technique |
| 6 | Midterm Examination 1 |
| 7 | The structure of gene transfer |
| 8 | Isolation of genes, gene manipulations |
| 9 | Biological methods in gene transfer |
| 10 | Direct gene transfer techniques (microinjection, particle bombardment and electroporation) |
| 11 | Midterm Examination 2 |
| 12 | Bacteria mediated gene transfer |
| 13 | Genetic engineering in the development of resistant varieties |
| 14 | Genetic engineering and environmental relations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601505 | **TITLE** | METHODS USED IN PLANT MOLECULAR BIOLOGY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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** | | | | | Macro and micro organic molecules in the cell, isolation of organic molecules, disruption (homogenization) techniques, separation, purification and analysis methods (DNA, RNA, protein, enzyme). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that students learn the basic extraction, separation and purification techniques used in plant molecular biology and to acquire the skills data evaluation of enzymatic analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn extraction techniques of macro-molecules from plant tissues and analysis methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Understand the biological properties of the cells at the molecular level.  2. Consider that studies of proteins and nucleic acids and which steps includes thats.  3. Understand the strengths and weaknesses of different experimental approaches used in molecular biology.  4. Know many advanced techniques in molecular biology. | | | | | | | |
| **TEXTBOOK** | | | | | Temizkan, G., Arda, N., Moleküler Biyolojide Kullanılan Yöntemler, Nobel Tıp Kitabevleri Ltd. Şti. Istanbul, 2004. | | | | | | | |
| **OTHER REFERENCES** | | | | | Copeland, R.A., Methods for Protein Analaysis: A Practical Guide to Laboratory Protocols. London. Chapman&Hall,1993. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Physical and chemical homogenization methods |
| 2 | Isolation of DNA |
| 3 | Analysis of the DNA spectral and electrophoretic methods |
| 4 | Replicationed of DNA via Polymerase Chain Reaction (PCR) |
| 5 | Isolation of proteins |
| 6 | Midterm Examination 1 |
| 7 | Determination of protein concentration |
| 8 | Concentration of protein extracts |
| 9 | Electrophoretic analysis of proteins |
| 10 | Staining of protein gel |
| 11 | Midterm Examination 2 |
| 12 | Transfer to the membrane and immunological methods |
| 13 | Principles of enzymatic analysis |
| 14 | Defining and measuring of enzyme activity |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül ERGİN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602501 | **TITLE** | BIOTECHNOLOGICAL TRENDS IN PLANT STRESS PHYSIOLOGY |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Concepts and sense of stress, biotic and abiotic stress factors, stress resistant plant production strategies, transgenic plants resistant to biotic and abiotic stresses. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Molecular and biotechnological approaches to the development of tolerance to stress conditions in plants. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding of what limits plant distribution. Applying of biotechnological methods that is used in plant stress physiology. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Learn plant stress concept and classifies the plant stress factors in advanced level  2.Learn the molecular methods which are used in development of adaptation and tolerance in plants to biotic and abiotic stress.  3.Learn the biotechnological methods which are used in development of adaptation and tolerance in plants to biotic and abiotic stress.  4.Choose the best tecniques at plant breeding for biotic and abiotic stress resistance and high yield quality. | | | | | | | |
| **TEXTBOOK** | | | | | Madhava Rao, K.V., Raghavendra, A.S., Janardhan Reddy, K. (eds.), Physiology and Molecular Biology of Stress Tolerance in Plants, Springer, Netherlands,345p., 2006. | | | | | | | |
| **OTHER REFERENCES** | | | | | Inze, D. (ed.), Oxidative Stress in Plants, Taylor&Francis, 321p., 2002. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Descriptions and concepts of stress and stress factors |
| 2 | Biotic stress resistant plant production strategies |
| 3 | Biotic stress resistant plant production strategies |
| 4 | Biotic stress resistant plant production strategies |
| 5 | Abiotic stress resistant plant production strategies |
| 6 | Midterm Examination 1 |
| 7 | Abiotic stress resistant plant production strategies |
| 8 | Abiotic stress resistant plant production strategies |
| 9 | Transgenic plants resistant to biotic stresses |
| 10 | Transgenic plants resistant to biotic stresses |
| 11 | Midterm Examination 2 |
| 12 | Transgenic plants resistant to abiotic stresses |
| 13 | Transgenic plants resistant to abiotic stresses |
| 14 | Discussion of recent studies about biotechnological methods are used in stress physiology |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601506 | **TITLE** | BIOTECHNOLOGY APPLICATIONS IN CROP PRODUCTION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Biotechnological applications to increase product quality and post-harvest period. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To bring clarity of current issues such as the last spots in biotechnological applications and usage in crop production biotechnological areas and to understand the potential benefits and harms are among the main objectives of the course. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Course includes significant scientific methods and technical information. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Know plant genome structure.  2. Understand the applications of molecular markers in plants.  3. Know gene expression analysis.  4. Evaluate the genetic transformation studies. | | | | | | | |
| **TEXTBOOK** | | | | | Nigel H., Plant Biotechnology: Current and Future Applications of Genetically Modified Crops [Kindle Edition] ,Wiley, 1. edition, p 316, 2006. | | | | | | | |
| **OTHER REFERENCES** | | | | | Gözükırmızı N., Ari Ş., Bitkisel Üretimde Biyoteknoloji Uygulamaları, Tarım ve Köy, Tarım ve Köy İşleri Bakanlığı Dergisi, cilt.107, ss.25-26, 1996 . | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Plant genome structure, |
| 2 | Plant breeding and its methods from past to present |
| 3 | Molecular markers and application fields on plants |
| 4 | Genetic mapping and genetic mapping studies in plants |
| 5 | Genetic mapping and genetic mapping studies in plants |
| 6 | Midterm Examination 1 |
| 7 | QTL mapping and QTL mapping in plants |
| 8 | Construction of genomic and cDNA libraries and the creation of this libraries for plants, |
| 9 | The methods for gene expression analysis, |
| 10 | Gene expression and genetic transformation studies in order to obtain resistant plants against various biotic and abiotic stress, |
| 11 | Midterm Examination 2 |
| 12 | Gene expression and genetic transformation studies in order to obtain resistant plants against various biotic and abiotic stress, |
| 13 | Genetic studies in order to improve crop quality and post-harvest period, |
| 14 | Genetic studies in order to improve crop quality and post-harvest period, |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül ERGİN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | GMO DETECT AND ANALYSIS TECHNIQUES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | GM plant and techniques, GMO detect methods based on DNA and proteins, DNA purifications and quality, PCR and Real time (RT) PCR techniques, GMO detect and quantification methods, Standarts on GMO analysis. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | IIt is aimed that students obtain knowledge about detection and quantifications analysis of GMOs. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence in detection and analysis of GMOs. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Comprehend the molecular genetics technics  2.Understand RT-PCR and GMO analysis  3.Perform GMO analysis methods  4.Evaluate the result of GMO analysis | | | | | | | |
| **TEXTBOOK** | | | | | Querci, M., Jermini, M., den Eede, G.V., Gıda örneklerinde genetiği değiştirilmiş organizma analizleri: Kurs el kitabı, Çeviren; Yılmaz, R., Eyidogan, F., Öz, M.T., Yücel, M, ve Öktem, H.A., 238 s., European Comission JRC IHCP, İtalya, 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | | Dorak, M.T., Real-Time PCR, Taylor & Francis Group, New York, 2006. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Genetically modified organisms and their techniques |
| 2 | GMO detect methods based on DNA and proteins |
| 3 | DNA purifications and quality |
| 4 | PCR and Real time (RT) PCR techniques |
| 5 | RT-PCR analysis and contaminations |
| 6 | Midterm Examination 1 |
| 7 | GMO detect methods |
| 8 | GMO detect methods |
| 9 | GMO quantification methods |
| 10 | GMO quantification methods |
| 11 | Midterm Examination 2 |
| 12 | GMO quantification methods |
| 13 | Standarts on GMO analysis |
| 14 | Evaluation of analysis results |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Muhammet KAYA | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602504 | **TITLE** | GENETIC MAPPING AND MOLECULAR BREEDING |

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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 | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Genetic mapping and methods are used in molecular breeding. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to make the students learn molecular genetic markers which are used in agricultural productions. The goal is to teach DNA molecular markers and linkage mapping which are widely used in phylogenetic analysis, gene mapping, breedin, hereditary disorders, etc. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To get knowledge about genetic mapping and molecular breeding and transfers them into practice. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Understand polymorphism and importance of it.  2.Know that biochemical markers and molecular markers.  3.Evaluate that usage of linkage mapping.  4.Realize that genetic engineering, marker assisted selections and quantitative trait locus. | | | | | | | |
| **TEXTBOOK** | | | | | Brooker R., Genetics Analysis and Principles, McGraw-Hill Science, 4th Edition, 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Leland H., Leroy H., Goldberg, M., Reynolds, A.E., Silver, L., Genetics: From Genes to Genomes, McGraw-Hill Science, 4th Edition, 2010.2.Özcan, S., Gürel, E, Babaoglu, M. (eds.), Bitki Biyoteknolojisi I ve II, S.Ü. Vakfı Yayınları, 2001.3.William S. Klug, Michael R. Cummings. Genetik Kavramlar,Palme Yayınevi. Çeviren: C Öner, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | Genetic polymorphism |
| 3 | Biochemical and protein markers |
| 4 | Molecular markers |
| 5 | Linkage maps |
| 6 | Midterm Examination 1 |
| 7 | Genetic basis of quantitative Locus |
| 8 | Populations used to create genetic map |
| 9 | Mapping and characterization of Quantitative Trait Locus (QTL) |
| 10 | Marker Assisted Selection (MAS) |
| 11 | Midterm Examination 2 |
| 12 | Genetic engineering |
| 13 | Gene isolation and gene transfer |
| 14 | Genetic resources of important genes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül ERGİN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601503 | **TITLE** | ADVANCED MOLECULAR GENETICS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | X | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Nucleic acids as genetic material, DNA structure, kinetics of DNA denaturation and renaturations, replications of pro-and eukaryotes,  DNA function, gene description, detailed structure of genes, transcription, genetic code, protein synthesis, processing of eukaryotic RNA, mutations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that students obtain knowledge about molecular genetics applications in livestock and plant production. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn molecular structure of DNA and they will use of it in the professional life. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Learn nucleic acids and DNA structure.  2.Perform the extraction of DNA.  3.Understand DNA replications, transcriptions and translations.  4.Comprehend DNA mutations. | | | | | | | |
| **TEXTBOOK** | | | | | Klug, S.G., Cummings, M.R., Genetik Kavramlar, 8.Baskıdan Çeviri, (Çeviri Editörü:C.Öner), Palme Yayınevi, 2009. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Brooker R., Genetics Analysis and Principles, McGraw-Hill Science, 4th Edition, 2011.2.Leland H., Leroy H., Goldberg, M., Reynolds, A.E., Silver, L., Genetics: From Genes to Genomes, McGraw-Hill Science, 4th Edition, 2010. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Heredity material |
| 2 | DNA structure |
| 3 | Chromosome |
| 4 | Replications of pro-and eukaryotes |
| 5 | Transcription |
| 6 | Midterm Examination 1 |
| 7 | RNA splicing |
| 8 | Translation |
| 9 | Cytoplasmic heredity material |
| 10 | Gene, operon, ORF, mi and siRNAs |
| 11 | Midterm Examination 2 |
| 12 | Regulation of transcription |
| 13 | Mutations |
| 14 | DNA repairing |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Muhammet KAYA | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601508 | **TITLE** | FORENSIC ENTOMOLOGY |

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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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | History of forensic entomology, Identifying flies that are important in forensic entomology, Identification of beetle families using DNA The life cycles of flies and beetles, Sampling at the crime scene, Calculating the post mortem interval, Ecology of forensically important flies, Ecology of selected forensically important beetles. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The purpose of the course is detected to criminal cases and contribute to the training of many researchers working on this subject. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Adds the ability to work independently and can bring innovation in the sector. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To recognize importance of forensic entomology flies  2-To analyze Coleopters and their food using DNA  3-To synthesis Forensic Entomology on Diptera  4-To evaluation obtained data | | | | | | | |
| **TEXTBOOK** | | | | | Gennard, D.E., Forensic Entomology: An Introduction, (Wiley, Chichester), 2007. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The use of insects in forensic entomology cause |
| 2 | The use of insects in forensic entomology cause |
| 3 | The relationship between corpse and Arthropod |
| 4 | The relationship between corpse and Arthropod |
| 5 | Insects used in forensic entomology |
| 6 | Midterm Examination 1 |
| 7 | In forensic entomology insect molecular diagnostics |
| 8 | In forensic entomology insect molecular diagnostics |
| 9 | In forensic entomology insect molecular diagnostics |
| 10 | Insect dissection |
| 11 | Midterm Examination 2 |
| 12 | Vertebrata tissue extract from insect tissue |
| 13 | DNA extraction from extracted tissues |
| 14 | PCR, Set up sequences and match |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Coşkun GÜÇLÜ | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601501 | **TITLE** | MOLECULAR MARKERS AND THEIR USAGE IN PLANT BREEDING |

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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 | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | |  |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Technical approaches used in marker applications. Phylogenetic analysis, genetic mapping, The marker-based selection, cloning based mapping. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The purpose of this course is to provide basic information about "Plant Breeding" and "Molecular Markers" by combining these subject. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Upon successful completion of this course, students learn important biotechnological techniques used to accelerate breeding studies. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Explain aims and strategies on molecular marker tools at breeding of plants for desired characters  2.Solve the problems about distribution and conservation of the plant genetic resources  3.Choose the best tecniques for plant breeding  4.Distinguish between plant breeding populations | | | | | | | |
| **TEXTBOOK** | | | | | Newbury, H.J. (ed), Plant Molecular Breeding, Blackwell Publishing, CRC Press, Birmingham, UK, 2003. | | | | | | | |
| **OTHER REFERENCES** | | | | | Varshney, R.K., Tuberosa, R. (eds), Genomics-Assisted Crop Improvement, Volume 1, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Molecular Markers: Definition, types, importance of molecular markers in breeding studies of molecular markers importance |
| 2 | Technical approaches used in marker applications: Nucleic acid isolation, Polymerase Chain Reaction (PCR) |
| 3 | Technical approaches used in marker applications: PAGE, capillary electrophoresis, sequence analysis |
| 4 | AFLP (Amplified Fragment Leght Polymorphism) principle and methods of applications |
| 5 | SSR (Simple Sequence Repeats, Microsatellite) principles and methods, applications |
| 6 | Midterm Examination 1 |
| 7 | SNP (Single Nucleotide Polymorphism) principles and methods of applications |
| 8 | SSR and SNP detection methods |
| 9 | Plant Breeding: Definition, breeding methods, their agricultural importance, objectives |
| 10 | Usage of molecular markers in plant breeding: Identification of genetic resources and conservation |
| 11 | Midterm Examination 2 |
| 12 | Phylogenetic analysis, genetic mapping |
| 13 | The marker-based selection (MAS Marker-Assisted Selection) |
| 14 | Cloning based mapping (Map-Based Cloning) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601502 | **TITLE** | PROTEIN TRAFICCKING |

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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 | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 25 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Protein synthesis, protein folding, protein transportation, protein degradation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To study various selected aspects of protein structure and function including protein synthesis, folding, targeting and trafficking and protein degradation within the cell. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students gain competence in the understanding of protein pathways after protein synthesis. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Distinguish the structural and functional relationship of proteins at molecular level.  2. Students will be able to explain protein translation in eukaryotic and prokaryotic cells.  3. Grasp the mechanisms which target proteins to a number of compartments.  4. To build up knowledge about the different protein degradation mechanisms. | | | | | | | |
| **TEXTBOOK** | | | | | Walsh, G., Headon, D.R.,Protein Biotechnology, Wiley, 382p, 1994. | | | | | | | |
| **OTHER REFERENCES** | | | | | Dalbey, R.E., von Heijne, G., Protein Targeting, Transport & Translocation,Elsevier, 424p, 2002. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Protein synthesis in prokaryotes |
| 2 | Protein synthesis in eukaryotes |
| 3 | Protein folding: Chaperon systems |
| 4 | Synthesis and localization of lyzosomal and membrane proteins |
| 5 | Protein modifications and quality control in endoplasmic reticulum |
| 6 | Midterm Examination 1 |
| 7 | Vesicular transport mechanism |
| 8 | Targeting of mitochondrial proteins |
| 9 | Targeting of chloroplast proteins |
| 10 | Nuclear import and export of proteins |
| 11 | Midterm Examination 2 |
| 12 | Targeting of peroxisomal proteins |
| 13 | Ubiquitin-mediated degradation: ubiquitination |
| 14 | Degradation of ubiquitinated proteins, proteasomes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
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| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
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| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602508 | **TITLE** | STRESS PROTEINS |

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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 | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Stress proteins, Chaperones, Stress protein families (HSP 90, HSP 70, HSP 60 and Ubiquitin) and functions. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that identification of the proteins synthesized in the organism, and their function during stress. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain competence in the understanding of plants' defence mechanisms developed during stress. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Know that developed defence mechanisms against to stress.  2. Realize that stress proteins and stress protein families.  3. Evaluate the physiological functions of stress proteins.  4. Understand the characteristics of stress response. | | | | | | | |
| **TEXTBOOK** | | | | | Schlesinger, M.J., Santoro, M.G., Garaci, E., Stress Proteins Induction and Function, Springer-Verlag, Berlin-Heidelberg, 1990. | | | | | | | |
| **OTHER REFERENCES** | | | | | Kalderwood, S.K. (ed.)., Cell Stress Proteins, Vol:7, SpringerScience+Business Media, LLC, New York, USA, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The concept of stress |
| 2 | Developed defence mechanisms against stress |
| 3 | General properties of proteins |
| 4 | General properties of proteins |
| 5 | Stress proteins |
| 6 | Midterm Examination 1 |
| 7 | Stress protein families and their functions |
| 8 | Physiological function of stress proteins |
| 9 | Characteristics of the stress response |
| 10 | HSP’s and their functions |
| 11 | Midterm Examination 2 |
| 12 | sHSP’s and their functions |
| 13 | Dehidrins |
| 14 | Shaperons |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül Ergin | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602505 | **TITLE** | INSECT BIOTECHNOLOGY APPLICATIONS IN AGRICULTURE |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Insect biotechnology and using new technology for human goal. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course is to teach genetic engineering and biotechnology applications of insects and insect damage in agriculture. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Adds the ability to work independently and can bring innovation in the sector. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1-To recognize insect molecular biology  2-To synthesize the basic techniques of insect biotechnology  3-To application insect biotechnology in industry  4-To evaluation results | | | | | | | |
| **TEXTBOOK** | | | | | Vilcinskas, A. (Ed), Insect Biotechnology, Series: Biologically-Inspired Systems, Vol. 2 Vilcinskas, Andreas, 268 p., 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Insect biotechnology, molecular markers |
| 2 | Insect biotechnology, molecular markers |
| 3 | Insect biotechnology, molecular markers |
| 4 | Insect antimicrobial peptides |
| 5 | Insect antimicrobial peptides |
| 6 | Midterm Examination 1 |
| 7 | Usage of RNA interference in insect control |
| 8 | Insect transgenesis and sterile insect release |
| 9 | Get inspired technology insects |
| 10 | Insect odor biosensors |
| 11 | Midterm Examination 2 |
| 12 | Production of recombinant proteins in insect cells |
| 13 | Production of recombinant proteins in insect cells |
| 14 | Production of recombinant proteins in insect cells |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Coşkun GÜÇLÜ | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602506 | **TITLE** | AGRICULTURAL BIOTECHNOLOGY AND ENVIRONMENT INTERACTION |

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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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | To eliminate main factors that cause environmental pollution by using biotechnological methods. Microbial ecology and biosensors. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main objective of this course is to ensure that students have knowledge about biotechnological applications that are used in removing of environmental pollution. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn microbial metabolism and its kinetics and so they will able to offer biotechnology-derived solutions to environmental problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Learn common chemical contaminants have to be removed in different environmental conditions.  2. Explain the bioremediation and phytoremediation.  3. Learn the basic principles of the cleaning reaction.  4. Learn the environmental cleaning with genetically modified organisms. | | | | | | | |
| **TEXTBOOK** | | | | | Scragg, A.,Environmental Biotechnology. Oxford University Press, Oxford, New York, 2005. | | | | | | | |
| **OTHER REFERENCES** | | | | | William J. Thieman ve Michael A. Palladino., Introduction to Biotechnology, Pearson Education Inc, USA, 2013. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic biotechnologydescriptions, |
| 2 | Biotechnological applications in environmental pollution, |
| 3 | Removal of heavy metals from waste, |
| 4 | Removal of nitrogen and phosphorus, |
| 5 | Removal of biological sulphate, |
| 6 | Midterm Examination 1 |
| 7 | Evaluation of waste by biotechnology, |
| 8 | Biogas production, |
| 9 | Microbial insecticides, |
| 10 | Biodegradation of pesticides, |
| 11 | Midterm Examination 2 |
| 12 | Biological fertilizer, |
| 13 | Phytoremediation,mycoremediation |
| 14 | Microbial ecology, microbiyal corosion and biosensors |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assoc.Prof.Dr.Hatice DAĞHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601504 | **TITLE** | TRANSGENIC APPLICATIONS IN AGRICULTURAL PRODUCTION |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 2 | |  | 2 | | | 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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Tissue and cell culture, molecular structure of genes and gene expressions, gene isolations and ligations, techniques of gene transfere, antisense RNA,  transgenic animals, transgenic organism and biosafety. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to make the students learn transgenic organism which are used in agricultural productions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence in cell and tissue culture, gene transfer techniques, transgenic organisms and biosafety. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Learn tissue and cell culture  2. Understand techniques of gene transfere  3.Learn transgenic animals  4. Comprehend antisense RNA methods  5. Evaluate transgenic organism and biosafety | | | | | | | |
| **TEXTBOOK** | | | | | Özcan, S., Gürel, E, Babaoglu, M. (eds.), Bitki Biyoteknolojisi I ve II, S.Ü. Vakfı Yayınları, 2001. | | | | | | | |
| **OTHER REFERENCES** | | | | | Querci, M., Jermini, M., den Eede, G.V., Gıda örneklerinde genetiği değiştirilmiş organizma analizleri: Kurs el kitabı, Çeviren; Yılmaz, R., Eyidogan, F., Öz, M.T., Yücel, M, ve Öktem, H.A., 238 s., European Comission JRC IHCP, İtalya, 2011. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Tissue and cell culture, Molecular structure of genes and gene expressions |
| 2 | Gene isolations, cloning and ligations |
| 3 | Vectors |
| 4 | Promoters |
| 5 | Techniques of gene transfer |
| 6 | Midterm Examination 1 |
| 7 | Directly gene transfer |
| 8 | Microinjection |
| 9 | Gene transfer to protoplast |
| 10 | Bacteria mediated gene transfer |
| 11 | Midterm Examination 2 |
| 12 | Gene transfer with Agrobacterium |
| 13 | Antisense RNA |
| 14 | Transgenic organism and bio safety |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr. Muhammet KAYA | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601509 | **TITLE** | BASIC BIOTECHNOLOGY |

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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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basic biotechnological methods, microorganisms and enzymes used in biotechnology. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The objective of this course is to teach the basic biotechnological methods and the intended use of these methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain proficiency in basic biotechnological methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Knowledge some basic procedures used in biotechnology  2. Learn biological purification methods  3. Knowledge fermentation technology and their application areas  4. Comprehend the biological conversion reactions. | | | | | | | |
| **TEXTBOOK** | | | | | Stewart, C. N., Plant Biotechnology and Genetics,Willey Publishing, 2012. | | | | | | | |
| **OTHER REFERENCES** | | | | | William J. Thieman ve Michael A. Palladino., Introduction to Biotechnology, Pearson Education Inc, USA, 2013. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic methods in biotechnology |
| 2 | Fermentation technology |
| 3 | Fermentation technology |
| 4 | Production of metabolites |
| 5 | Production of metabolites |
| 6 | Midterm Examination 1 |
| 7 | The microorganisms used in biotechnological manufacturing and their production techniques |
| 8 | The microorganisms used in biotechnological manufacturing and their production techniques |
| 9 | Bioconversion reactions |
| 10 | Bioconversion reactions |
| 11 | Midterm Examination 2 |
| 12 | Enzyme biotechnology |
| 13 | Enzyme biotechnology |
| 14 | The importance of biotechnology in terms of human and the environment |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assos.Prof.Dr.Hatice DAĞHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601510 | **TITLE** | SOIL BIOTECHNOLOGY |

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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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Soil micro fauna, biotransformation and it’s applications, biodegradation and it’s applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To explain that how to use of conventional technologies and most recently used biotechnological methods in improving agricultural land without harming the environment and soil. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain proficiency in soil biotechnology. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Knowledge studies in soil biotechnology.  2. Knowledge the role of microorganisms in gaining the resistance particular against pests in crops.  3. Learn biotechnological methods used in the treatment of agricultural land.  4. Learn removing of soil pollution by using biotechnological methods. | | | | | | | |
| **TEXTBOOK** | | | | | Agothos, N., Reineke ,W., Biotechnology for the enviroment:Soil remediation.(Focus on biotechnology), Springer 1th edition, 2003. | | | | | | | |
| **OTHER REFERENCES** | | | | | Lynch,J.M., Soil Biotechnology.Microbiological factors in crop productivity,Blackwell Science Inc., 1983. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Microbial saprophytes |
| 2 | Spermosf and rhizosphere |
| 3 | Plant root infection |
| 4 | The growth regulators and fitotoxins generated by microorganisms |
| 5 | Effects of soil applications |
| 6 | Midterm Examination 1 |
| 7 | The microorganismal practices and methods in agricultural systems |
| 8 | Biotransformation, Biodegradation |
| 9 | Definition and principles of biological amendment |
| 10 | Biological amendment of heavy metal pollution in the soil |
| 11 | Midterm Examination 2 |
| 12 | Biological amendment of pesticide pollution in the soil |
| 13 | Biological amendment of hydrocarbon pollution in the soil |
| 14 | Biological amendment of nuclear waste pollution in the soil |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assoc.Prof.Dr.Hatice DAĞHAN | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506601507 | **TITLE** | TRANSGENIC INSECTS |

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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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Transgenic insect technology and using new technology for pest control. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Usage purpose of transgenic insects and the methods used to prepare transgenic insects constitutes of this course goals and objectives. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Adds the ability to work independently and can bring innovation in the sector | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1-To learn methods of gene transfer of insects  2-To recognize application areas of transgenic insect  3-To analyze new approach of insect pest methods  4-To evaluation results | | | | | | | |
| **TEXTBOOK** | | | | | Gilbert, L.I., Insect Molecular Biology and Biochemistry, First. Edition. University of North Carolina Chapel Hill, Academic Press. ISBN-13: 978-0123847478, 2012. | | | | | | | |
| **OTHER REFERENCES** | | | | | Feyereisen, R., Gill, S., Insect Biochemistry and Molecular Biology, ISSN: 0965-1748. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The history of gene transfer in insect and gene transfer methods in insects |
| 2 | Gene targeting |
| 3 | Transgenic selection |
| 4 | Transposable element vectors |
| 5 | Viral vectors |
| 6 | Midterm Examination 1 |
| 7 | Symbionts vectors |
| 8 | Transgenic useful-harmful and vector insects |
| 9 | Paratransgenesis |
| 10 | Vertical and horizontal gene transfer |
| 11 | Midterm Examination 2 |
| 12 | Social issues |
| 13 | Risk analysis |
| 14 | Legal regulations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Coşkun GÜÇLÜ | **Date:** | 15/05/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | 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** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Integrative Molecular Ecology |

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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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The importance of molecular systematic and molecular markers in molecular ecology, introductionmolecular ecology, enetic analysis of single and multiple population, Phylogeography, behavioral ecology in molecular approach, conservation genetics | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Upon successful completion of this course, students will be able to explain molecular ecology and populatio ecology | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1-Molecular ecology and introduction  2- Population ecology learning  3- Analitics approach about population ecology  4- Ecological effect of genetic | | | | | | | |
| **TEXTBOOK** | | | | | Molecular Ecology | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Avise, J. C., Helfman, G. S., Saunders, N. C. and Hales, L. S. 1986. Mitochondrial DNA differentiation in North Atlantic eels: population genetic consequences of an unsual life history pattern. Proceedings of the National Academy of Sciences USA 4354 p | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction molecular ecology |
| 2 | Introduction molecular ecology |
| 3 | Introduction molecular ecology |
| 4 | Importance of molecular markers in ecology |
| 5 | Importance of molecular markers in ecology |
| 6 | Midterm Examination 1 |
| 7 | Species borders and theories |
| 8 | Genetic analysis of single population |
| 9 | Geneticanalysis of singlepopulation |
| 10 | Genetic analysis of multipli population |
| 11 | Midterm Examination 2 |
| 12 | Phylogeography |
| 13 | Behavioral ecology in molecular approach |
| 14 | Conservation genetics |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assoc. Prof.Dr.Coşkun GÜÇLÜ | **Date:** | 04.11.2016 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Hereditary Defects of Animals |

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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** | | | | | Mendelian genetics, DNA and mutations  Inherited diseases in animals  Methods of identifying hereditary defects | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed to teach the molecular bases of hereditary diseases in farm animals and molecular methods used in the identification of hereditary defects. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It is important to understand the molecular mechanisms of important hereditary diseases that cause fertility and economic loss in farm animals, and to eradicate disease from the herd. Given the importance of molecular diagnostic techniques in the gene level of diseases, economic losses can be reduced while hereditary diseases are diagnosed cheaply and practically. Gaining competence in terms of animal breeding, having eradication of genetic diseases and hereditary disease-free flocks | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students who successfully complete this course will have the following qualifications:  1. Be informed about important inherited defects in farm animals  2. Identification of hereditary diseases in farm animals by molecular genetic methods | | | | | | | |
| **TEXTBOOK** | | | | | Introduction to Veterinary Genetics, Frank W. Nicholas, 2009, Wiley-BlackwelThe Genetics of Cattle,Dorian Garrick, Anatoly Ruvinsky, 1999. | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Mendelian genetics, |
| 2 | DNA-protein relationship |
| 3 | Mutations |
| 4 | Inherited diseases in cattle |
| 5 | Inherited diseases in equine |
| 6 | Midterm Examination 1 |
| 7 | Inherited diseases in chicken |
| 8 | Inherited diseases in sheep |
| 9 | PCR and RT-PCR technqiues |
| 10 | Methods of identifying hereditary defects |
| 11 | Midterm Examination 2 |
| 12 | Methods of identifying hereditary defects |
| 13 | Methods of identifying hereditary defects |
| 14 | Eradication of hereditiary disease. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Dr. Öğr. Üy. Muhammet Kaya | **Date:** | 28.03.2018 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Molecular Plant Physiology and Metabolism |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Critical knowledge of phyto-hormone biosynthesis and mechanism of action will be highlighted. Students will be oriented into developing a molecular understanding of the principles of photosynthesis and photo-morphogenesis, molecular basis of nutrient uptake and utilization with emphasis on plant stress physiology. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. To make students understand the biological processes central to plant life and the normal functioning of plant body, 2. Explain the molecular mechanisms of physiological processes 3. Give students a solid basis for plant biotechnology.4. To illustrates knowledge of stress adaptations in biological systems. 5. To deliver molecular understanding of primary and secondary metabolic process. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence on the molecular aspects of the physiological and metabolic processes in plants. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand the plant structure and comprehend the physiological functions of different plant tissues and organs and the interactions among them 2.Comprehend all essential metabolic processes and transport phenomena regarding water, energy and matter in plants.3.Explain how plant hormones and environmental factors such as light affect the growth and development of plants. 4.Understand the plant injuries caused by abiotic stress factors and the adaptation and tolerance mechanisms that plants have evolved. | | | | | | | |
| **TEXTBOOK** | | | | | 1.Plant Physiology. Authors: Taiz L. and Zeiger, E. (2006), 2. Plant Physiology. Authors: Salisbury, F.B., Ross, C.W. (1992) 3.Cell and Molecular Biology. Authors:Karp, G. (2008). | | | | | | | |
| **OTHER REFERENCES** | | | | | Molecular Cell Biology. Authors: Lodish, H. Berk, A.,Kaiser, C.A., Krieger, M., Scott, M.P., Bretscher, A., Ploegh, H., Matsudaira, P. (2008). | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Part I Molecular Plant Physiology:Overview of plant organelles, cells and tissues |
| 2 | Soil-plant-water relations: water absorption, transport and loss, molecular and biochemical aspects of stomatal regulation |
| 3 | Soil-plant-water relations: water absorption, transport and loss, molecular and biochemical aspects of stomatal regulation |
| 4 | Photo-Morphogenesis: Circadian Rhythms, Phytochromes,Cryptochromes, Photoperiodism, Phototropism |
| 5 | Photo-Morphogenesis: Circadian Rhythms, Phytochromes,Cryptochromes, Photoperiodism, Phototropism |
| 6 | Midterm Examination 1 |
| 7 | Phytohormones: functions, metabolism and signal transduction |
| 8 | Phytohormones: functions, metabolism and signal transduction |
| 9 | Molecular mechanisms of abiotic stress in plants: drought, salinity and flooding |
| 10 | Molecular mechanisms of abiotic stress in plants: temperature, mineral deficiencies and toxicities and oxidative stress |
| 11 | Midterm Examination 2 |
| 12 | Part II Metabolism and Regulation - An overview, metabolic diversity, catabolism and anabolism, Light reactions of photosynthesis, Carbon reactions of photosynthesis |
| 13 | Photorespiration, C3, C4 and CAM metabolisms, Carbohydrate metabolism and cellular respiration, Lipid, amino acid and protein metabolism |
| 14 | Secondary Metabolism: Categories of Secondary Compounds Phenolics, Terpenoids and Alkaloids Amino Acid Metabolism (synthesis) and Urea Cycle (degradation & recyclization): |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 27.03.2018 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | MOLECULAR MARKER TECHNIQUES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | X | | | | | | |
| **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** | | | | | Genetic polymorphism, biochemical markers and molecular markers,  analysis techniques, restriction enzymes and ligation,  gel electrophoresis techniques (agarose and PAGE), RFLP, PCR and Real Time PCR, DNA and RNA markers. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The goal is to teach molecular markers which are widely used in phylogenetic analysis, gene mapping, breedin, hereditary disorders, etc. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence in molecular markers used in agricultural production. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Comprehend learn polymorphism and importance of it  2.Learn biochemical markers and molecular markers  3.Understand Restriction Digestion, PCR  4.Perform gel electrophoresis techniques (agarose and PAGE)  5.Recognize and use molecular markers | | | | | | | |
| **TEXTBOOK** | | | | | Brooker R., Genetics Analysis and Principles, McGraw-Hill Science, 4th Edition, 2011. | | | | | | | |
| **OTHER REFERENCES** | | | | | Özcan, S., Gürel, E, Babaoglu, M.(eds.), Bitki Biyoteknolojisi I ve II, S.Ü. Vakfı Yayınları, 2001. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction, genetic polymorphism |
| 2 | Biochemical Molecular Markers |
| 3 | Molecular Markers |
| 4 | Restriction enzymes and ligation |
| 5 | RFLP |
| 6 | Midterm Examination 1 |
| 7 | Gel Electrophoresis techniques (agarose and PAGE) |
| 8 | PCR and Real Time PCR |
| 9 | RAPD, PCR-RFLP |
| 10 | AFLP |
| 11 | Midterm Examination 2 |
| 12 | SSR |
| 13 | SNP EST, STS |
| 14 | RNA markers |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr. Muhammet KAYA | **Date:** | 27/03/2018 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | BIOTECHNOLOGICAL TRENDS IN PLANT STRESS PHYSIOLOGY |

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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 | | | | |  | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | | 30 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Concepts and sense of stress, biotic and abiotic stress factors, stress resistant plant production strategies, transgenic plants resistant to biotic and abiotic stresses. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Molecular and biotechnological approaches to the development of tolerance to stress conditions in plants. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understanding of what limits plant distribution. Applying of biotechnological methods that is used in plant stress physiology. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1.Learn plant stress concept and classifies the plant stress factors in advanced level  2.Learn the molecular methods which are used in development of adaptation and tolerance in plants to biotic and abiotic stress.  3.Learn the biotechnological methods which are used in development of adaptation and tolerance in plants to biotic and abiotic stress.  4.Choose the best tecniques at plant breeding for biotic and abiotic stress resistance and high yield quality. | | | | | | | |
| **TEXTBOOK** | | | | | Madhava Rao, K.V., Raghavendra, A.S., Janardhan Reddy, K. (eds.), Physiology and Molecular Biology of Stress Tolerance in Plants, Springer, Netherlands,345p., 2006. | | | | | | | |
| **OTHER REFERENCES** | | | | | Inze, D. (ed.), Oxidative Stress in Plants, Taylor&Francis, 321p., 2002. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Descriptions and concepts of stress and stress factors |
| 2 | Biotic stress resistant plant production strategies |
| 3 | Biotic stress resistant plant production strategies |
| 4 | Biotic stress resistant plant production strategies |
| 5 | Abiotic stress resistant plant production strategies |
| 6 | Abiotic stress resistant plant production strategies |
| 7 | Mid-Term Examination |
| 8 | Abiotic stress resistant plant production strategies |
| 9 | Transgenic plants resistant to biotic stresses |
| 10 | Transgenic plants resistant to biotic stresses |
| 11 | Transgenic plants resistant to abiotic stresses |
| 12 | Transgenic plants resistant to abiotic stresses |
| 13 | Discussion of recent studies about biotechnological methods are used in stress physiology |
| 14 | Discussion of recent studies about biotechnological methods are used in stress physiology |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Prof.Dr.Ece TURHAN | **Date:** | 07/11/2019 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | GMO Analysis 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 (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | GM plant and techniques,  GMO detect methods based on DNA and proteins,  DNA purifications and quality,  PCR and Real time (RT) PCR techniques,  RT-PCR analysis and contaminations,  GMO detect methods,  GMO quantification methods,  Standarts on GMO analysis | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that students obtain knowledge about analysis of genetically modified organisms detection and quantifications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It is aimed that students obtain knowledge about analysis of GMOs detection, quantification and biosafety | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will learn PCR and GMO analysis techniques. Students will learn PCR techniques and how to apply RT-PCR techniques, make and evaluate GD plant analysis. | | | | | | | |
| **TEXTBOOK** | | | | | M. Querci, M. Jermini, G. V. Eede., GDO Analizleri Kurs El Kitabı, Çeviren; R. Yılmaz, F. Eyidogan, M.T. Öz, M. Yücel ve H.A. Öktem. | | | | | | | |
| **OTHER REFERENCES** | | | | | M.T. Dorak. Real-Time PCR | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | GM plant and techniques |
| 2 | GMO detect methods based on DNA and proteins |
| 3 | DNA purifications and quality |
| 4 | PCR and Real time (RT) PCR techniques |
| 5 | RT-PCR analysis and contaminations |
| 6 | GMO detect methods |
| 7 | Mid-Term Examination |
| 8 | GMO detect methods |
| 9 | GMO quantification methods |
| 10 | GMO quantification methods |
| 11 | GMO quantification methods |
| 12 | GMO quantification methods |
| 13 | Standarts on GMO analysis |
| 14 | Evaluations of analysis results |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist. Prof. Dr. Muhammet KAYA | **Date:** | 07/11/2019 |

**Signature**:

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | MOLECULAR LABORATORY METHODS |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | | X | | | | | | |
| **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** | | | | | Macro and micro organic molecules in the cell, isolation of organic molecules, disruption (homogenization) techniques, separation, purification and analysis methods (DNA, RNA, protein, enzyme). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed that students learn the basic extraction, separation and purification techniques used in molecular biology and to acquire the skills data evaluation of enzymatic analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn extraction techniques of macro-molecules and analysis methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Upon successful completion of this course, students will be able to:  1. Understand the biological properties of the cells at the molecular level.  2. Consider that studies of proteins and nucleic acids and which steps includes thats.  3. Understand the strengths and weaknesses of different experimental approaches used in molecular biology.  4. Know many advanced techniques in molecular biology. | | | | | | | |
| **TEXTBOOK** | | | | | Temizkan, G., Arda, N., Moleküler Biyolojide Kullanılan Yöntemler, Nobel Tıp Kitabevleri Ltd. Şti. Istanbul, 2004. | | | | | | | |
| **OTHER REFERENCES** | | | | | Copeland, R.A., Methods for Protein Analaysis: A Practical Guide to Laboratory Protocols. London. Chapman&Hall,1993. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Physical and chemical homogenization methods |
| 2 | Physical and chemical homogenization methods |
| 3 | Isolation of DNA |
| 4 | Analysis of the DNA spectral and electrophoretic methods |
| 5 | Replicationed of DNA via Polymerase Chain Reaction (PCR) |
| 6 | Isolation of proteins |
| 7 | Determination of protein concentration |
| 8 | Concentration of protein extracts |
| 9 | Electrophoretic analysis of proteins |
| 10 | Transfer to the membrane and immunological methods |
| 11 | 2D Gel Electrophoresis |
| 12 | Principles of enzymatic analysis |
| 13 | Defining and measuring of enzyme activity |
| 14 | DNA Blotting Methods |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist.Prof.Dr.Sergül ERGİN | **Date:** | 01.04.2019 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Lignocellulosic Biotechnology |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
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| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | As bioproducts obtained from lignocellulosic biomass gain importance in our era, the technologies that make use of biomass and its wastes will constitute the content of this course. The definition of lignocelluosic biomass, its types, contents, its use in renewable energy fields such as biofuels, industrial uses and emerging bioproducts, applications of biomass in agricultural biotechnology will be among the subjects of the course. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach lignocellulosic biotechnology used in the use of products obtained using lignocellulosic biomass. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To teach lignocellulosic biomass biotechnologies that students can use in their graduate studies and professional life. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students who successfully complete this course:  1. Learn about the structure and types of lignocellulosic biomass.  2. Learn and comprehends the applications of lignocellusic biotechnology.  3. Evaluate the applications of lignocellulosic biotechnology and apply them when necessary.  4. Become competent in the types and potential and industrial uses of bioproducts obtained from different biomass. | | | | | | | |
| **TEXTBOOK** | | | | | Biotechnology of Lignocellulose. Hongzhan Chen, 2014. ISBN 978-94-007-6897-0 | | | | | | | |
| **OTHER REFERENCES** | | | | | Introduction to Chemicals from Biomass. Clark JH, Deswarte F, John Wiley and Sons, 2008 Print ISBN:9781118714485 |Online ISBN:9781118714478 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to lignocellulosic biotechnology |
| 2 | Lignocellulosic biomass basic concepts |
| 3 | Lignocellulosic biomass structure |
| 4 | Lignocellulosic biomass types |
| 5 | Principles of lignocellulosic biotechnology |
| 6 | Midterm Examination 1 |
| 7 | Lignocellulosic biomass |
| 8 | Production of renewable energy from biomass |
| 9 | Biofuel production technologies |
| 10 | Microbial conversion of biomass |
| 11 | Midterm Examination 2 |
| 12 | Applications of lignocellulosic biotechnology in ecological agriculture |
| 13 | Applications of lignocellulosic biotechnology in chemical industry |
| 14 | Applications of lignocellulosic biotechnology in other fields |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Associate Professor Utku AVCI | **Date:** | 15.06.2021 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Agricultural Bioinformatics |

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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 | | | | | 2 | | 60 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fundamentals of DNA sequencing and informations about the use of bioinformatics for agricultural purposes will be given.The use of basic bioinformatics tools and gene banks will be taught. Analysis of chromatogram files will be carried out and generating process of consensus sequences will be shown. After alignment of DNA sequencing data is taught, phylogenetic analysis will be performed. Primer design and quality controls will be performed from selected gene region for both of conventional and real-time PCR studies. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. To teach of DNA sequencing technologies to the students 2. To understand the importance of bioinformatics for agricultural purposes 3. To ensure the use of basic bioinformatics tools and gene bank 4. Teaching of working with chromatogram files 5.Teaching of how to align DNA sequencing data 6. To be able to perform phylogenetic analysis 7. To explore the designing of primers used for conventional and real-time PCR studies. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Gain competence on the use of agricultural bioinformatics. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understands DNA sequencing technologies.  2. Explores the use of basic bioinformatics tools and gene bank.  3. Understands working and analyzing with chromotogram files.  4. Understands the alignment of DNA sequencing data.  5. Understands the phylogenetic analysis process.  6. Understands primer design for conventional and real-time PCR studies. | | | | | | | |
| **TEXTBOOK** | | | | | 1.Essential Bioinformatics. Authors: Xiong, J. (2006), 2. Basics of Bioinformatics. Authors: Jiang, R., Zhang, X., Zhang, M.Q. (2013). | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Bioinformatics Primer (An Introductory Handbook for Bioinformatics Practitioners). Authors: Bio-Bio-1 Team. (2011). 2. Genomik Analiz için Biyoinformatik Yöntemler. Authors: Şakiroğlu, M. (2020).3.https://www.ncbi.nlm.nih.gov/ 4. https://www.expasy.org/5. https://www.genome.jp/kegg/6. https://www.ebi.ac.uk/Tools/msa/clustalo/7. https://eu.idtdna.com/calc/analyzer8. http://primer3plus.ut.ee/cgi-bin/primer3plus/primer3plus.cgi9.http://bioinformatics.org/sms2/ | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamentals of DNA sequencing and principles of technologies used to day |
| 2 | Sanger sequencing technology |
| 3 | Bioinformatics and its Agricultural use |
| 4 | Basic bioinformatics tools and their uses |
| 5 | Gene banks and their uses |
| 6 | Midterm Examination 1 |
| 7 | Quality control and trimming of chromotogram files |
| 8 | Merging of chromotogram files and obtaining consensus sequences |
| 9 | Blasting consensus sequence to genome databases and interpreting results |
| 10 | Allignment of DNA sequencing data |
| 11 | Midterm Examination 2 |
| 12 | Phylogenetic analysis: Pairwise identity and dendograms |
| 13 | Primer design and quality controls for conventional PCR |
| 14 | Primer design and quality controls for Real-time PCR |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Asst. Prof. Dr. Serkan ÖNDER | **Date:** | 16.11.2020 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602514 | **TITLE** | Functional Genomics |

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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 | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | | 1 | | 20 |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | -Organization and structure of genome  - Gene expression and analysis methods with different technologies  - Recent developments and analyzes in genomics and proteomics  - Use of bioinformatics databases | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to understand the organization and structure of the genome, gene expression and analysis methods with different technologies, the latest developments in the field of genome and proteome, and the use of bioinformatics databases in analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students understand the scope of functional genomics studies and the basic principles of gene mapping and DNA sequence analysis technologies. Learns how to use genomic data in molecular biology and biotechnology (identification of genetic defects and/or advantages). | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | - Understanding genome organization and structure  - DNA and RNA structure and isolation methods  - Identifying gene expression analyzes with different technologies  - Synthesizing basic knowledge about the mechanism of RNA interference, epigenetics and genome editing  - Following the latest developments in genome projects of different organisms  -To be able to use bioinformatics databases in genome and proteome analysis.  -To be able to explain the organization and structure of the plant genome. | | | | | | | |
| **TEXTBOOK** | | | | | •Terence A Brown,Genomes, 3nd edition, Garland Science, 2007. ISBN 9780815341383•Temizkan G., Arda, N. Temel ve İleri Moleküler Biyoloji Yöntemleri Genomik ve Proteomik Analizler Nobel Tıp Kitabevleri, 2018. ISBN 9786053353621 | | | | | | | |
| **OTHER REFERENCES** | | | | | •Klug, S. W., Cummings, R. M., Spencer, A. C. Genetik Kavramlar, Palme Yayıncılık, Ankara, 2009.•Functional Plant Genomics, Morot-Gaudry, J-F, Lea, P., Briat, J-F, CRC Press, Taylor & Francis, 2019.•Bob B. Buchanan, Wilhelm Gruissem, Russell L. Jones, Biochemistry and Molecular Biology of Plants 2nd Edition, 2015. ISBN-10: 9780470714218 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Genom organization I |
| 2 | Genom organization II |
| 3 | Structure and properties of DNA, genomic DNA isolation methods |
| 4 | Structure and properties of RNA, genomic DNA isolation methods |
| 5 | Gene Expression and Analysis: Microarray |
| 6 | Gene Expression and Analysis: Real Time PCR |
| 7 | Gene Expression and Analysis: RNA sequencing |
| 8 | Mid-Term |
| 9 | Revers Genetics :miRNA |
| 10 | siRNA |
| 11 | Epigenetics |
| 12 | Genom organization |
| 13 | Detecting protein functions from genom sequences |
| 14 | Bioinformatics in genomics and proteomics |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
| **LO 6** | To develop and implement new methods to identify and solve problems in the field of Agricultural Biotechnology. |  |  |  |
| **LO 7** | Be aware of new and developing applications in the field of Agricultural Biotechnology needed to study and learn them. |  |  |  |
| **LO 8** | To take account of social, scientific and ethical values; during the collection, interpretation and dissemination of the data stages and in all professional activities. |  |  |  |
| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Dr. Öğr. Üyesi Çiğdem AYDOĞAN | **Date:** | 03/11/2022 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **AGRICULTURAL BIOTECHNOLOGY (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 506602513 | **TITLE** | Molecular Detection of Bee Diseases |

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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 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The content of the proposed lecture is primarily the importance of bees, bee diseases and the molecular methods and methods used in the detection of diseases. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Within the scope of this lesson, it is aimed to provide students with necessary information about the importance of bees, introduction of bee species and bee breeds, information about beekeeping activities in our country, explanation of disease factors in bees and molecular detection of some common diseases. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Thanks to lecture, students learn about the importance of bees in terms of the sustainability of biodiversity and plant production. They learn bee species and breeds. They will have an idea about beekeeping activities in our country and in the world and the economic importance of bees, disease factors in bees and diagnosis of diseases.  They will also learn how to detect diseases that affect and harm bees all over the world by molecular methods. They can use the information they get from here during their graduate education or in the projects or research they will prepare in the future. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | In this lesson, students;  1- The importance of bees for pollination and plant production,  2- Bee species, breeds, beekeeping activities and bee products,  3- Bee diseases and pests,  4- Findings and diagnosis of disease factors,  5- They will learn to detect some bee diseases by molecular methods. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Hachiro Shimanuki and David A. Knox, 2000. Diagnosis of Honey Bee Diseases. United States Department of Agriculture Agricultural Research Service Agriculture Handbook Number 6902- Molecular. detection. of. parasitic. protozoa. l . M. MORGAN\* and R. C. A. THOMPSON World Health Organisation, 1998. | | | | | | | |
| **OTHER REFERENCES** | | | | | Eva Forsgrens, 2009. Molecular Diagnosis and Characterization of Honey Bee Pathogens. Faculty of Natural Resources and Agricultural Sciences Department of Ecology Uppsala | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The importance of bees in ecosystem and plant production, Bee species and breeds |
| 2 | Beekeeping and its history, Morphology and biology of bees |
| 3 | Arı kolonisi ve koloni bakımı |
| 4 | Beekeeping activities in Turkey and the World |
| 5 | Social immunity and pathogen transmission |
| 6 | Honey bee adult and brood diseases |
| 7 | Bacterial diseases (Melissococcus plutonius, Paenibacillus larvae) |
| 8 | Mid-term exam |
| 9 | Parasitic diseases |
| 10 | Viruses (Deformed wing virus) |
| 11 | Microsporidia-Nosema (Nosema apis, Nosema ceranae, Nosema bombi) |
| 12 | Nucleic acid detection, DNA and RNA extraction, Polymerase chain reaction, Real-time PCR |
| 13 | Repetitive PCR, Pulsed Field Gel Electrophoresis, DNA sequencing |
| 14 | Literature review and discussion on the molecular detection of diseases |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE AGRICULTURAL BIOTECHNOLOGY MSc PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Sufficiently use of a foreign language, oral and written communication. |  |  |  |
| **LO 2** | To offer the time course and results of the studies systematically and clearly as written or oral in national and international workspace or not. |  |  |  |
| **LO 3** | To lead in multidisciplinary teams, to develop solution approach in complex cases, to work independently and to take responsibility. |  |  |  |
| **LO 4** | To design and practice the researches theoretical, experimental and based on modelling; to solve and scrutiny complex problems encountered in this process. |  |  |  |
| **LO 5** | To utilize of information and communication technologies in the field of Agricultural Biotechnology and use sufficiently. |  |  |  |
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| **LO 9** | To development new and/or original ideas and methods; to design complex systems or processes and to development innovative /alternative solutions in their designs. |  |  |  |
| **LO 10** | To know social, environmental, health, safety, legal aspects, project management and their business life applications of Agricultural Engineering and to realize the limitations of them on/in engineering applications. |  |  |  |
| **LO 11** | To have knowledge about current techniques and methods used in Agricultural Engineering with to make comparisons about their constraints. |  |  |  |

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| **Prepared by :** | Assist. Prof. Bahar ARGUN KARSLI | **Date:** | 07.11.2022 |

**Signature**: