**PHYSICS 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](#EN80) | 7.5 | 3+0+0 | 3 | **C** | Turkish |
| 501301529 | [MATH APPLICATIONS IN PHYSICS](#EN1) | 7.5 | 3+0+0 | 3 | **C** | Turkish |
| 501301530 | [MODERN QUANTUM MECHANICS](#EN81) | 7.5 | 3+0+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | Total of I. Semester | 30 |  | 12 |  |  |
| **II. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
|  | Elective Course-2 | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | Elective Course-3 | 7.5 | 3+0+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302001 | Seminar | 7.5 | 0+1+0 | - | **C** | Turkish |
|  | Total of II. Semester | 30 |  | 9 |  |  |
|  | TOTAL OF FIRST YEAR | 60 |  | 21 |  |  |

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| **Second Year** | | | | | | | | |
| **III. Semester** | | | | | | | | | |
| Code | Course Title | | ECTS | | T+P | Credit | C/E | Language |
| 501301702 | MSc THESIS STUDY | | 25 | | 0+1+0 | - | **C** | Turkish |
| 501301703 | SPECIALIZATION FIELD COURSE | | 5 | | 3+0+0 | - | **C** | Turkish |
|  | | Total of III. Semester | 30 |  | |  |  |  | |
| **IV. Semester** | | | | | | | | | |
| Code | | Course Title | ECTS | T+P | | Credit | C/E | Language | |
| 501301702 | | MSc THESIS STUDY | 25 | 0+1+0 | | - | **C** | Turkish | |
| 501301703 | | SPECIALIZATION FIELD COURSE | 5 | 3+0+0 | | - | **C** | Turkish | |
|  | | Total of IV. Semester | 30 |  | |  |  |  | |
|  | | TOTAL OF SECOND YEAR | 60 |  | |  |  |  | |

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| **Elective Courses** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501301515 | [ACOUSTICS I](#EN21) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302525 | [ACOUSTICS II](#EN22) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301518 | [ADVANCED ELECTROMAGNETIC THEORY I](#EN52) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302518 | [ADVANCED ELECTROMAGNETIC THEORY II](#EN51) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301528 | [CELLULAR BIOPHYSICS I](#EN66) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302521 | [CELLULAR BIOPHYSICS II](#EN67) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301526 | [COLD PLASMAS I](#EN70) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302523 | [COLD PLASMAS II](#EN71) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301505 | [ELECTRONIC METHODS IN PHYSICS-I](#EN2) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302504 | [ELECTRONIC METHODS IN PHYSICS-II](#EN7) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301509 | [FIBER OPTIC WAVEGUIDES I](#EN31) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302508 | [FIBER OPTIC WAVEGUIDES II](#EN32) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302533 | [GLASS SCİENCE AND TECHNOLOGY](#EN87) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302505 | [GROUP THEORY AND APPLICATIONS](#EN35) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301525 | [INDUSTRIAL PLASMA APPLICATIONS I](#EN53) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302519 | [INDUSTRIAL PLASMA APPLICATIONS II](#EN54) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301506 | [INFRARED SPECTROSCOPY AND APPLICATIONS](#EN36) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301512 | [INSTRUMENTAL ANALYSIS I](#EN29) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302528 | [INSTRUMENTAL ANALYSIS II](#EN30) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301508 | [LASERS AND LASER SPECTROSCOPY I](#EN3) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302507 | [LASERS AND LASER SPECTROSCOPY II](#EN8) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301531 | [Materials Science](#EN92) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301511 | [MATHEMATICAL PHYSICS I](#EN39) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302511 | [MATHEMATICAL PHYSICS II](#EN40) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302534 | [NANOSTRUCTURES](#EN84) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302520 | [Nuclear Reaction Model Codes Education](#EN93) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302516 | [Nuclear Reaction Theory for Astrophysics](#EN94) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301516 | [NUMERICAL METHODS IN PHYSICS I](#EN5) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302530 | [NUMERICAL METHODS IN PHYSICS II](#EN13) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301501 | [OPTOELECTRONICS I](#EN50) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301517 | [PARTICLE PHYSICS I](#EN58) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302510 | [PARTICLE PHYSICS II](#EN59) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301520 | [PHOTONICS I](#EN33) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302531 | [PHOTONICS II](#EN34) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301514 | [QUANTUM MECHANICS I](#EN4) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302513 | [QUANTUM MECHANICS II](#EN9) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301521 | [RADIATION MEASURMENT METHODS](#EN65) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302515 | [SEMICONDUCTOR ELECTRONIC DEVICES I](#EN11) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302514 | [SEMICONDUCTOR ELECTRONIC DEVICES II](#EN10) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301523 | [SOLAR CELLS I](#EN56) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302524 | [SOLAR CELLS II](#EN55) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302532 | [SPECTROSCOPIC METHODS IN PHYSICS](#EN72) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301524 | [STRUCTURE ANALYSIS TECHNIQUES IN SOLID MATERIALS I](#EN6) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302522 | [STRUCTURE ANALYSIS TECHNIQUES IN SOLID MATERIALS II](#EN12) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301504 | [THE QUANTUM THEORY OF SOLIDS I](#EN73) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302503 | [THE QUANTUM THEORY OF SOLIDS II](#EN74) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301527 | [THIN FILM PHYSICS I](#EN75) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302526 | [THIN FILM PHYSICS II](#EN76) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501301502 | [ULTRASOUND I](#EN77) | 7.5 | 3+0+0 | 3 | E | Turkish |
| 501302501 | [ULTRASOUND II](#EN78) | 7.5 | 3+0+0 | 3 | E | Turkish |

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Math Applications in Physics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | none | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Linear algebra and vector analysis;Complex analysis;Curve fitting and Interpolation;Variational calculus;Integral transforms;Special functions in physics. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain the necessary math knowledge required in scientific research works. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To remove the difficulties arising in interdisciplinary research works. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.To learn how to apply math in physical events  2.To verify experimental data by math methods  3.To make interdisciplinary exchange of knowledge easily  4.To follow modern knowledge easily | | | | | | | |
| **TEXTBOOK** | | | | | Arfken G.B.&Weber H.J.(1995),Mathematical Methods for Physicists,New York:Academic Press | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Kreyszig E.(1995),Advanced Engineering Mathematics,John Wiley&Sons2.Hildebrand F.b.(1965),Methods of Applied mathematics,Prentice -Hall | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Linear Algebra |
| 2 | Vector Differential Calculus |
| 3 | Vector Integral Calculus |
| 4 | Complex Analysis |
| 5 | Complex Integral Theorems |
| 6 | Midterm Examination 1 |
| 7 | Residue Theorem and Applications |
| 8 | Curve fitting and Interpolation |
| 9 | Variational Calculus |
| 10 | Variational Calculus |
| 11 | Midterm Examination 2 |
| 12 | Integral Transforms |
| 13 | Special Functions in Physics |
| 14 | Special functions in Physics |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301505 | **TITLE** | Electronic methods in physics-I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Semiconductor materials, diodes, transistors and opamp applications, pressure, flow, sound and heat sensors and their general applications in physics. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main object of the course is to provide a basic understanding of Analog Electronics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Understand Analog Electronics.  2.Analog Electronic applications.  3.Associate the gained knowledge, analyze and interpret data.  4.Correlate and apply gained knowledge directly with technology and industry. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Peter H. Beards(1987), Analog and digital electronics.2. Jacob Millman ; Christos C. Halkias(1987), Integrated electronics : analog and digital circuits and systems | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Semiconductor materials |
| 2 | Diodes |
| 3 | Transistors |
| 4 | Operational amplifiers (OPAMP) |
| 5 | Operational amplifiers (OPAMP) |
| 6 | Midterm Examination 1 |
| 7 | Operational amplifier applications |
| 8 | Operational amplifier applications |
| 9 | Pressure and flow sensors |
| 10 | Sound sensor |
| 11 | Midterm Examination 2 |
| 12 | Heat sensor |
| 13 | General applications in physics sensors |
| 14 | General applications in physics sensors |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd.Doç.Dr. İsmail Özkan | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301508 | **TITLE** | LASER AND LASER SPECTROSCOPY I |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **TEXTBOOK** | | | | | 1. Laser spectroscopy, Wafgang Demtrüder, Springer, 1990.2. Modern spectroscopy J. Micheal Hollas, John Willey and Sans, 1996.3. Principles of Laser, Orazio Svelto, Plenum Press, 1989. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Laser spectroscopy, Wafgang Demtrüder, Springer, 1990.2. Modern spectroscopy J. Micheal Hollas, John Willey and Sans, 1996.3. Principles of Laser, Orazio Svelto, Plenum Press, 1989. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Quantum Mechanics and Laser Spectroscopy |
| 2 | Effect of Electro Magnetic Radiation with Atom and Molecule |
| 3 | General Characteristic of Experimental Method |
| 4 | Molecular Symmetry |
| 5 | Elements of Symmetry |
| 6 | Midterm Examination 1 |
| 7 | Spectroscopy of Radiation |
| 8 | Laser Raman spectroscopy of Rotation |
| 9 | Laser spectroscopy of Vibration |
| 10 | Laser spectroscopy of Electronic |
| 11 | Midterm Examination 2 |
| 12 | Laser spectroscopy of Electronic |
| 13 | Atomic Spectroscopy |
| 14 | Molecular Application of Gaussian 03 and CAChe programmes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | DOÇ.DR.EROL TAŞAL | **Date:** | | 1/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301514 | **TITLE** | QUANTUM MECHANICS I |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data.  Learning objectives: | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data.  Learning objectives: | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data.  Learning objectives: | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data.  Learning objectives: | | | | | | | |
| **TEXTBOOK** | | | | | 1. Kuantum Mekaniği, Erol Taşal, (In Press).2. Introductory Quantum Mechanics, Richard L. Liboff, Addison-Wesley, 1989.3. Problems in Quantum Mechanics with solution, G.L. Sequires, Cambridge University press, 1995.4. Exercise Quantum Mechanics, Harry Mavromatis, Kluwer Academic Publishers, 1992 | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kuantum Mekaniği, Erol Taşal, (In Press).2. Introductory Quantum Mechanics, Richard L. Liboff, Addison-Wesley, 1989.3. Problems in Quantum Mechanics with solution, G.L. Sequires, Cambridge University press, 1995.4. Exercise Quantum Mechanics, Harry Mavromatis, Kluwer Academic Publishers, 1992 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Quantum Mechanics |
| 2 | Wave Mechanics |
| 3 | Schrödinger’s Equations |
| 4 | Fourier Techniques |
| 5 | Expectation Values |
| 6 | Midterm Examination 1 |
| 7 | Review of Classical Mechanics |
| 8 | Measurement + Written Exam |
| 9 | Photon Polarization  1 |
| 10 | Photon Polarization |
| 11 | Midterm Examination 2 |
| 12 | The Uncertainty Principle |
| 13 | Wave Function |
| 14 | The Simple Harmonic Oscillator  15. Presented of Application |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | DOÇ.DR.EROL TAŞAL | **Date:** | | 1/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301516 | **TITLE** | Numerical Methods in Physics I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Türkçe |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Mathematical background; errors in numerical solution;Nonlinear Equations; bisection method, Reula Falsi method, Newton's method, Secant method, Linear Equations; Gauss elimination method, Gauss-Jordan elimination method, LU decomposition method, Jacobi iterative method, Gauss-Seidal iterative method, Curve fitting and interpolation, Numerical differentitiation; Finite difference approximation of the derivative, Finite difference formulas using Taylor series expansion, Numerical integration;Rectangle and midpoint methods, Trapezoidal method, simpson's 1/3 and 3/8 methods, Gauss Quadrature, Romberg integration improper integrals. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | improvement of numerical computing tecnique | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | apply knowledge of natural sciences (Mathematics, Physics, Chemistry) | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.To learn how to apply math in physical events  2.To verify experimental data by math methods  3.To make interdisciplinary exchange of knowledge easily  4.To follow modern knowledge easily | | | | | | | |
| **TEXTBOOK** | | | | | Gilat, A., Subramaniam, V., (2008). Numerical Methods for Engineers and Scientists. | | | | | | | |
| **OTHER REFERENCES** | | | | | Gerald C. F.,Wheatley P. O., (1999). Applied Numerical Analysis. Karagöz İ., (2001). Sayısal Analiz ve Mühendislik Uygulamaları. Tapramaz, R. (2002). Sayısal Çözümleme. Mathews, J. H. (1992). Numerical Methods for mathematics, science and Engineering. Burden, R. L., Faires, J. D., (2011). Numerical Analysis. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Mathematical background; errors in numerical solution; |
| 2 | Nonlinear Equations; bisection method, Reula Falsi method, |
| 3 | Newton's method, Secant method, |
| 4 | Linear Equations; Gauss elimination method, |
| 5 | LU decomposition method, Jacobi iterative method, |
| 6 | Midterm Examination 1 |
| 7 | Gauss-Seidal iterative method, |
| 8 | Curve fitting and interpolation, |
| 9 | Numerical differentitiation; Finite difference approximation of the derivative, |
| 10 | Numerical integration;Rectangle and midpoint methods, |
| 11 | Midterm Examination 2 |
| 12 | Trapezoidal method, simpson's 1/3 and 3/8 methods, |
| 13 | Gauss Quadrature, |
| 14 | Romberg integration, improper integrals. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Ömer ÖZBAŞ | **Date:** | | 4/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301524 | **TITLE** | Structure Analysis Techniques in Solid Materials I |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of clays and zeolites in solid materials, two and three dimensional cells in crystal structure, crystal symmetries, crystal axis, Miller indexes, x-ray diffraction in zeolites, heat analysis processes in zeolites (DTA,DSC, TGA, DTA) | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to teach structure analysis techniques in solid materials | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It enables students to learn the methods to determine the structure of the solid material. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn the classification of solid material in the clay and zeolite.  2 cells in the crystal structure in two and three dimensions, crystal symmetry, crystallographic axes and Miller learns indices.  3.Zeolit in x-ray examinations learn.  4. Thermal analysis processes in zeolites (DTA, DSC, TGA, DTG) learn.. | | | | | | | |
| **TEXTBOOK** | | | | | Gregg, S.J. and Sing, K.S.W. (1982). Adsorption, Surface Area and Porosity, Academic Press, London | | | | | | | |
| **OTHER REFERENCES** | | | | | Dorfner, K. (1972) Scaife, B.K.P. (1998). Ion Exchangers Properties and Applications, Ann Arbor Science Publ. USA.Arcasoy, A. (1983). Seramik Teknolojisi, Marmara Üniv., Güzel Sanatlar Fak. Yay., İstanbulSuziki, M. (1990). Adsorrption Engineering, Elsevier, Tokyo. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Classification of clays and zeolites in solid materials |
| 2 | Classification of clays and zeolites in solid materials (Continue) |
| 3 | Two and three dimensional cells in crystal structure |
| 4 | Crystal symmetries |
| 5 | Crystal symmetries (Continue) |
| 6 | Midterm Examination 1 |
| 7 | Crystal axis |
| 8 | Miller indexes |
| 9 | Miller indexes (Continue) |
| 10 | X-ray diffraction in zeolites |
| 11 | Midterm Examination 2 |
| 12 | X-ray diffraction in zeolites (Continue) |
| 13 | Heat analysis processes in zeolites (DTA,DSC, TGA, DTA) |
| 14 | Heat analysis processes in zeolites (DTA,DSC, TGA, DTA) (Continue) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Tevfik ÜNALDI | **Date:** | | 29.05,2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302504 | **TITLE** | Electronic methods in physics-II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | |  |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to circuit simulation programs, Electronic Circuits with circuit simulated programs analysis (Electronic work bench) | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main object of the course is to provide a basic understanding of Circuit Design. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Understand Circuit Design.  2.Circuit Design applications.  3.Associate the gained knowledge, analyze and interpret data.  4.Correlate and apply gained knowledge directly with technology and industry. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Peter H. Beards(1987), Analog and digital electronics.2. Jacob Millman ; Christos C. Halkias(1987), Integrated electronincs : analog and digital circuits and systems | | | | | | | |

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| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to circuit simulation programs |
| 2 | Introduction to circuit simulation programs |
| 3 | Introduction to circuit simulation programs |
| 4 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 5 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 6 | Midterm Examination 1 |
| 7 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 8 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 9 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 10 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 11 | Midterm Examination 2 |
| 12 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 13 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 14 | Electronic Circuits with circuit simulated programs analysis (Electronic work bench) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd.Doç.Dr. İsmail Özkan | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302507 | **TITLE** | LASERS AND LASER SPECTROSCOPY II |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | The main aim of the course is Teaching of atom-molecule and laser electronics, Learning of atom-molecule and laser electronics with cache computer programme, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data, Interdisciplinary knowledge association and application | | | | | | | |
| **TEXTBOOK** | | | | | 1. Laser spectroscopy, Wafgang Demtrüder, Springer, 1990.2. Modern spectroscopy J. Micheal Hollas, John Willey and Sans, 1996.3. Principles of Laser, Orazio Svelto, Plenum Press, 1989. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Laser spectroscopy, Wafgang Demtrüder, Springer, 1990.2. Modern spectroscopy J. Micheal Hollas, John Willey and Sans, 1996.3. Principles of Laser, Orazio Svelto, Plenum Press, 1989. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | IPhotoelectron Spectroscopy |
| 2 | Auger Electron and X-Ray Fluorescence Spectroscopy |
| 3 | General Discussion of Lasers and Laser Sources |
| 4 | Hyper Raman Spectroscopy |
| 5 | Coherent Anti-Stakes Raman Scattering Spectroscopy |
| 6 | Midterm Examination 1 |
| 7 | Laser Electron Rezonans Spectroscopy |
| 8 | Laser Electron Rezonans |
| 9 | Single Vibranic Level Fluorescence Spectroscopy |
| 10 | Single Vibranic Level Fluorescence Spectroscopy |
| 11 | Midterm Examination 2 |
| 12 | Fluorescence Excitation Spectroscopy |
| 13 | Fluorescence Laser Spectroscopy |
| 14 | 12. Fluorescence Laser Spectroscopy  13. Laser Spectroscopy and Microscopy with Surface Analyzes  14. Laser Spectroscopy and Microscopy with Surface Analyzes  15. Molecular Application of Gaussian 03 and CAChe programmes  16. Molecular Application of Gaussian 03 and CAChe programmes |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | DOÇ.DR.EROL TAŞAL | **Date:** | | 1/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302 | **TITLE** | QUANTUM MECHANICS II |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | TThe main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | TThe main aim of the course is Teaching of Quantum Mechanics, Learning of Quantum Mechanics, Apply knowledge of natural sciences (mathematics, physics, chemistry), Justify and analyze natural phenomena, Identify, formulate, and solve field related problems, Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **TEXTBOOK** | | | | | 1. Kuantum Mekaniği, Erol Taşal, (In Press).2. Introductory Quantum Mechanics, Richard L. Liboff, Addison-Wesley, 1989.3. Problems in Quantum Mechanics with solution, G.L. Sequires, Cambridge University press, 1995.4. Exercise Quantum Mechanics, Harry Mavromatis, Kluwer Academic Publishers, 1992 | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Kuantum Mekaniği, Erol Taşal, (In Press).2. Introductory Quantum Mechanics, Richard L. Liboff, Addison-Wesley, 1989.3. Problems in Quantum Mechanics with solution, G.L. Sequires, Cambridge University press, 1995.4. Exercise Quantum Mechanics, Harry Mavromatis, Kluwer Academic Publishers, 1992 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Angular Momentum |
| 2 | Central Forces, The Hydrogenic Atom |
| 3 | The Three-Dimensional Oscillator |
| 4 | The Free Particle |
| 5 | Matrix Representations |
| 6 | Midterm Examination 1 |
| 7 | Spin Angular Momentum |
| 8 | Transformations of Representations |
| 9 | Approximation Methods |
| 10 | Interaction with a Strong Electromagnetic Field |
| 11 | Midterm Examination 2 |
| 12 | Interaction with a Strong Electromagnetic Field |
| 13 | Scattering Theory |
| 14 | Identical Particles  13. Perturbation Theory  14. Perturbation Theory  15. Presented of Application  16. Presented of Application |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | DOÇ.DR.EROL TAŞAL | **Date:** | | 1/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302514 | **TITLE** | Semiconductor Electronic Devices II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | pn junctions, Static current-voltage characteristics of pn junction diodes, Electrical breakdown in pn junctions, Zener diode, Dynamic behavior of pn junction diodes, Tunnel diode, Schottky barrier diode, Ohmic contacts, Heterojunctions, Semiconductor Optoelectronic devices, Bipolar junction transistors, Junction and metal-semiconductor field effect transistors, MOS transistors | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To realize the importance and position of semiconductor devices in technology. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. To teach the role of semiconductor devices in technological applications.  2. To provide a better understanding of semiconductor devices in electronic and material sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Knows the basic concepts and structures of semiconductors devices.  2. Knows the physical properties of semiconductor devices.  3. Knows the technological semiconductor devices.  4. Realize the role of semiconductor devices in everyday life and technology. | | | | | | | |
| **TEXTBOOK** | | | | | M. S. Tyagi, Introduction to semiconductor materials and devices | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. M. S. Tyagi, Introduction to semiconductor materials and devices 2. M. Shur, Physics of semiconductor devices 3. R. Boylestad, L. Nashelsky, Electronic devices and circuit theory 4. J. Singh, Semiconductor optoelectronics | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | pn junctions |
| 2 | pn junctions |
| 3 | Static current-voltage characteristics of pn junction diodes |
| 4 | Electrical breakdown in pn junctions and Zener diode |
| 5 | Dynamic behavior of pn junction diodes |
| 6 | Midterm Examination 1 |
| 7 | Tunnel diode and Schottky barrier diode |
| 8 | Ohmic contacts |
| 9 | Heterojunctions |
| 10 | Semiconductor Optoelectronic devices |
| 11 | Midterm Examination 2 |
| 12 | Bipolar junction transistors |
| 13 | Junction and metal-semiconductor field effect transistors |
| 14 | MOS transistors |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof Dr Ferhunde ATAY | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302515 | **TITLE** | Semiconductor Electronic Devices I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Band formation in solids, Solids and band structures, Semiconductors, Intrinsic and extrinsic semiconductors, Electrical conductivity and mobility, Fermi level, Conduction mechanisms, Semiconductors under electric field, Semiconductor under temperature, Semiconductors under magnetic field, Optical properties of semiconductors. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To realize the basics of semiconductors physics and the role of semiconductors in technology | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. To teach the role of semiconductors in technological applications.  2. To provide a better understanding of semiconductors in electronic and material sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Knows the basic concepts and structures of semiconductors materials.  2.Knows the physical properties of semiconductor materials.  3.Realize the role of semiconductur physics in technology.  4.Realize the role of semiconductor materials in everyday life and technology. | | | | | | | |
| **TEXTBOOK** | | | | | John P. McKelvey, Solid State and Semiconductor Physics | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. John P. McKelvey, Solid State and Semiconductor Physics 2. Jacques I. Pankove, Optical Processes in semiconductors 3. S. Wang, Fundamentals of Semiconductor Theory and Device Physics 4. Prof. Dr. Kaşif ONARAN, Malzeme Bilimi | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Band formation in solids |
| 2 | Solids and band structures |
| 3 | Semiconductors |
| 4 | Intrinsic and extrinsic semiconductors |
| 5 | Electrical properties |
| 6 | Midterm Examination 1 |
| 7 | Electrical conductivity and mobility |
| 8 | Fermi level and Conduction mechanisms |
| 9 | Semiconductors under electric field |
| 10 | Semiconductor under temperature |
| 11 | Midterm Examination 2 |
| 12 | Semiconductors under magnetic field |
| 13 | Optical properties of semiconductors |
| 14 | Optical properties of semiconductors |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof Dr Ferhunde ATAY | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302522 | **TITLE** | Structure Analysis Techn. in Solid Materials II |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 10 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Zeolites, ion exchange, ion exchange methods, BET, Langmuir and Freundlich theories in gas adsorption, determination of surface area in zeolites from gas adsorption theories, calculation of atom numbers in unit cell, investigation of ion exchange percentages and selectivities. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to teach structure analysis techniques in solid materials | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It enables students to learn the methods to determine the structure of the solid material. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn ion exchange and ion exchange methods.  2. Learn the gas adsorption theory.  3. Learn the determination of the surface area of the theory of gas adsorption in zeolite movement.  4. Calculation of the number of atoms in the unit cell, learn how to calculate the ion exchange percent and selectivity. | | | | | | | |
| **TEXTBOOK** | | | | | Gregg, S.J. and Sing, K.S.W. (1982). Adsorption, Surface Area and Porosity, Academic Press, London | | | | | | | |
| **OTHER REFERENCES** | | | | | Dorfner, K. (1972) Scaife, B.K.P. (1998). Ion Exchangers Properties and Applications, Ann Arbor Science Publ. USA.Arcasoy, A. (1983). Seramik Teknolojisi, Marmara Üniv., Güzel Sanatlar Fak. Yay., İstanbulSuziki, M. (1990). Adsorrption Engineering, Elsevier, Tokyo. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Zeolites |
| 2 | Zeolites (Continue) |
| 3 | Ion exchange and ion exchange methods |
| 4 | Ion exchange and ion exchange methods (Continue) |
| 5 | BET, Langmuir and Freundlich theories in gas adsorption |
| 6 | Midterm Examination 1 |
| 7 | BET, Langmuir and Freundlich theories in gas adsorption (Continue) |
| 8 | Determination of surface area in zeolites from gas adsorption theories |
| 9 | Determination of surface area in zeolites from gas adsorption theories (Continue) |
| 10 | Calculation of atom numbers in unit cell |
| 11 | Midterm Examination 2 |
| 12 | Calculation of atom numbers in unit cell (Continue) |
| 13 | Investigation of ion exchange percentages and selectivities |
| 14 | Investigation of ion exchange percentages and selectivities (Continue) |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Tevfik Ünaldı | **Date:** | | 29.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302530 | **TITLE** | Numerical Methods in Physics II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Türkçe |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 2 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Mathematical background for ordinary differential equations; Ordinary differential equation:İnitial-value problems: Euler's method, Modified Euler's method, midpoint method, Runge-Kutta (second, third and fourth-order) methods, Multistep methods: Adams-Bashforth method, Adams-Moulton mehtod, ordinary differential equation systems, Ordinary differential equation: Boundary-value problems: Shooting method, Finite difference method, Error and stability in numerical solution of boundary problems, Partial differential equations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | improvement of numerical computing tecnique | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | apply knowledge of natural sciences (Mathematics, Physics, Chemistry) | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.To learn how to apply math in physical events  2.To verify experimental data by math methods  3.To make interdisciplinary exchange of knowledge easily  4.To follow modern knowledge easily | | | | | | | |
| **TEXTBOOK** | | | | | Gilat, A., Subramaniam, V., (2008). Numerical Methods for Engineers and Scientists. | | | | | | | |
| **OTHER REFERENCES** | | | | | Karagöz, İ. (2001). Sayısal analiz ve Mühendislik Uygulamaları. Gerald, C. F., Wheatley, P. O., (1999). Applied Numerical Analysis. Mathews, J. H. (1992). Numerical Methods for mathematics, science and Engineering. Burden, R. L., Faires, J. D., (2011). Numerical Analysis. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Mathematical background for ordinary differential equations; |
| 2 | Ordinary differential equation:İnitial-value problems: Euler's method, |
| 3 | Modified Euler's method, midpoint method, |
| 4 | Runge-Kutta (second, third and fourth-order) methods, |
| 5 | Runge-Kutta (second, third and fourth-order) methods, |
| 6 | Midterm Examination 1 |
| 7 | Multistep methods: Adams-Bashforth method, |
| 8 | Adams-Moulton mehtod, |
| 9 | ordinary differential equation systems, |
| 10 | Ordinary differential equation: Boundary-value problems: Shooting method, |
| 11 | Midterm Examination 2 |
| 12 | Finite difference method, |
| 13 | Error and stability in numerical solution of boundary problems, |
| 14 | Partial differential equations. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Yrd. Doç. Dr. Ömer ÖZBAŞ | **Date:** | | 4/6/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301515 | **TITLE** | Acoustics I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | |  |  | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fundamentals of vibration, transvers motion- the vibrating string, vibrations of bars, the two dimensional wave equation, vibrations of membranes and plates, the acoustics wave equation and simple solutions, transmission phenomena. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to teach the fundamental principles underlying the generation, transmission, and reception of acoustic waves. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To familiarize the student with the fundamental concepts and terminology of Acoustics and with the simpler analytical methods that are available for attacking acoustic problems | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Learn general properties of acoustic waves.  2.Learn using of acoustic waves.  3.To familiarize the student with the fundamental concepts and terminology of acoustics and with the simpler analytical methods that are available for attacking acoustic problems.  4.Learn the fundamental principles underlying the generation, transmission, and reception of acoustic waves. | | | | | | | |
| **TEXTBOOK** | | | | | Fundamentals of Acoustics (Lawrence E. KINSLER) | | | | | | | |
| **OTHER REFERENCES** | | | | | Pierce A.D. (1991). Acoustics, New York: Acoustical Society of America, | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamentals of Vibration, |
| 2 | Transvers Motion |
| 3 | Vibrations of Bars |
| 4 | The Two Dimensional Wave Equation |
| 5 | Student Study Report Discussion |
| 6 | Midterm Examination 1 |
| 7 | Vibrations of Membranes and Plates |
| 8 | The Acoustics Wave Equation and Simple Solutions |
| 9 | Transmission Phenomena |
| 10 | Interference of Sound Waves on The Surface of The Sea |
| 11 | Midterm Examination 2 |
| 12 | The Sonar Equation |
| 13 | Active Sonar |
| 14 | Passive Sonar |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Gökhan SAVAROĞLU | **Date:** | | 30.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302609 | **TITLE** | Acoustics II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Absorption and Attenuation of sound Waves in Fluids, Radiation and Reception of Acoustic Waves, Noise, Signal Detection, Hearing and Speech, Environmental Acoustics | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the fundamental principles underlying the generation, transmission, and reception of acoustic waves | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To familiarize the student with the fundamental concepts and terminology of Acoustics and with the simpler analytical methods that are available for attacking acoustic problems | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Learn transmission absorption and attenuation of acoustic waves in fluid.  2. Learn information about noise.  3. Learn how to occur hearing and speech.  4. Learn information about environmental acoustics. | | | | | | | |
| **TEXTBOOK** | | | | | Fundamentals of Acoustics (Lawrence E. KINSLER) | | | | | | | |
| **OTHER REFERENCES** | | | | | Pierce A.D. (1991). Acoustics, New York: Acoustical Society of America | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Attenuation of sound Waves in Fluids |
| 2 | Absorption of sound Waves in Fluids |
| 3 | Radiation of Acoustic Waves |
| 4 | Reception of Acoustic Waves |
| 5 | Student study report discussion |
| 6 | Midterm Examination 1 |
| 7 | Noise |
| 8 | Noise Measurement |
| 9 | Sound Isolation and Measurement |
| 10 | Highway Noise and Measurement |
| 11 | Midterm Examination 2 |
| 12 | Room Acoustics |
| 13 | Hearing and Speech |
| 14 | Environmental Acoustics |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Gökhan SAVAROĞLU | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 5013015112 | **TITLE** | Enstrümental Analysis I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Türkçe |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Properties of Electromagnetic Radition, Electromagnetic radition-Matter interaction, Introduction to molecular spectroscopy, UV and visible molecular absorption spectrophotometry,Spektroskopik Elipsometre, Atomic Force Microscopy | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to give to students branches of Spectroscopy, and is to investigate the experimental capability of students, and is to explain the structure the matters. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Fundamental knowledge for optoelectronic technology, learning on solid materials and optical processes, have knowledge on light –matter interactions | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Apply knowledge of natural sciences (Mathematics, Physics, Chemistry)  Identify and solve field related problems  Design experiments as well as to analyze and interpret data  Interdisciplinary knowledge association  Direct correlation of gained knowledge with technology and industry  Gain a knowledge of contemporary issues | | | | | | | |
| **TEXTBOOK** | | | | | Enstrumental Analiz Yöntemleri, Prof.Dr. Atilla Yıldız, Prof.Dr. Ömer Genç, Prof. Dr. Sema Bektaş, Hacettepe Üniversitesi Yayınları A-64, 1997, AnkaraEnstrumental Analiz İlkeleri, Skoog Holler Nieman, Çeviri Editörleri: Prof.Dr. Esma Kılıç, Prof. Dr. Fitnat Köseoğlu, Prof. Dr. Hamza Yılmaz, Bilim Yayıncılık, 1998 | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Properties of Electromagnetic Radition |
| 2 | Electromagnetic radition-Matter interaction |
| 3 | Electromagnetic radition-Matter interaction |
| 4 | UV and visible molecular absorption spectrophotometry |
| 5 | UV and visible molecular absorption spectrophotometry |
| 6 | Midterm Examination 1 |
| 7 | X-rays methods |
| 8 | X-rays methods |
| 9 | Atomic Force Microscopy |
| 10 | Atomic Force Microscopy |
| 11 | Midterm Examination 2 |
| 12 | Spektroskopik Elipsometer |
| 13 | Spektroskopik Elipsometer |
| 14 | Spektroskopik Elipsometer |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Sema KURTARAN | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 5013015112 | **TITLE** | Enstrümental Analysis II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 |  | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Türkçe |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Properties of Electromagnetic Radition, Electromagnetic radition-Matter interaction, Luminescence Spectroscopy | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to give to students branches of Spectroscopy, and is to investigate the experimental capability of students, and is to explain the structure the matters | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Fundamental knowledge for optoelectronic technology, learning on solid materials and optical processes, have knowledge on light –matter interactions | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Apply knowledge of natural sciences (Mathematics, Physics, Chemistry)  Identify and solve field related problems  Design experiments as well as to analyze and interpret data  Interdisciplinary knowledge association  Direct correlation of gained knowledge with technology and industry  Gain a knowledge of contemporary issues | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Properties of Electromagnetic Radition |
| 2 | Properties of Electromagnetic Radition |
| 3 | Electromagnetic radition-Matter interaction |
| 4 | Electromagnetic radition-Matter interaction |
| 5 | Electromagnetic radition-Matter interaction |
| 6 | Midterm Examination 1 |
| 7 | Luminescence Spectroscopy |
| 8 | Luminescence Spectroscopy |
| 9 | Luminescence Spectroscopy |
| 10 | Luminescence Spectroscopy |
| 11 | Midterm Examination 2 |
| 12 | Thin solid films application of Luminescence Spectroscopy |
| 13 | Thin solid films application of Luminescence Spectroscopy |
| 14 | Thin solid films application of Luminescence Spectroscopy |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Sema KURTARAN | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301509 | **TITLE** | Fiber Optic Waveguides I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Introduction to optical fibres, rewiev of electromagnetic theory, basic waveguides equations, wave and ray optics, the dielectric slab waveguide, the step index fiber, the graded index fiber. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduce the basic concepts and information related to optical waveguides, apply the basic mathematical relations to optical transmission. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Explaining natural phenomena, to study different profession groups since is interdisciplinary field. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. An awareness of necessity the optical communications.  2. To learn media that inside guide the light.  3. To learn how to move electromagnetic wave in different media.  4. Gain the ability to follow the developing optical communication technology. | | | | | | | |
| **TEXTBOOK** | | | | | Keiser, G., Optical Fiber Communications. McGraw-Hill, 2000. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Cherin, A.H., An Introduction to Optical Fibers. McGraw-Hill, 1983.2) Buck J. A., Fundamentals of Optical Fibers. John Wiley & Sons, 1995. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to optical fibers, classification of optical fibers, optical fibers in communication systems, historical improvement of optical fibers, advantages of optical fiber communications. |
| 2 | Field concept, Maxwell equations, wave equation, solution of scalar wave equations. |
| 3 | Wave parameters, dispersive media, group velocity, transverse electromagnetic waves, poynting vector. |
| 4 | Boundary conditions in dielectric media, reflection and refraction at a plane dielectric interface,  total internal reflection, evanescent fields. |
| 5 | Basic waveguides equations, wave optics, waveguide equations in cylindrical coordinates. |
| 6 | Midterm Examination 1 |
| 7 | Ray optics, eikonal and ray equations, ray equations in cylindrical coordinates, propagating modes of the symmetric slab waveguide. |
| 8 | Even TE modes, odd TE modes, characteristic equation, mode cutoff conditions, TM modes, ray optics explanation of modes in a dielectric slab waveguide, multimode group delay in a dielectric slab waveguide. |
| 9 | Basic equation and physical constraints in step index fiber, the fields in the core and cladding of the step index fiber, boundary conditions and characteristic equation for step index fiber, the properties of the modes in a step index fiber. |
| 10 | Mode cutoff conditions, single mode optical fiber, delay distortion in a single mode fiber, weakly guiding fibers, simplified characteristic equation, linearly polarized (LP) modes. |
| 11 | Midterm Examination 2 |
| 12 | Total number of modes, principal mode number, power distribution in a step index fiber,  delay distortion in a step index multimode fiber. |
| 13 | The graded index fiber, WKB analysis in a graded index fiber, propagation constants in a graded index fiber, leaky modes in a graded index fiber, total number of modes in a graded index fiber, power law profiles. |
| 14 | Near and far field power distribution in a graded index fiber, delay distortion in a multimode graded index fiber, ray optics analysis of the graded index fiber. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Dr. Ali ÇETİN | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302508 | **TITLE** | Fiber Optic Waveguides II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fabrication of optical fibers, fiber measurement, packaging of optical fibers, source coupling, splices and connectors, fiber systems examples. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduce the basic concepts and information related to fiber optics applications, apply the basic mathematical information to optical transmission. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Explaining natural phenomena, to study different profession groups since is interdisciplinary field. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. An awareness of the importance of optical fiber in communications.  2. To learn how the production of fiber optic cable.  3. To learn measuring and splicing of fiber optic cables.  4. Gain the ability to follow the developing optical communication technology. | | | | | | | |
| **TEXTBOOK** | | | | | Keiser, G., Optical Fiber Communications. McGraw-Hill, 2000. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Cherin, A.H., An Introduction to Optical Fibers. McGraw-Hill, 1983.2) Buck J. A., Fundamentals of Optical Fibers. John Wiley & Sons, 1995. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Material considerations, loss and bandwidth limiting mechanism. |
| 2 | Mechanical and thermal characteristics. |
| 3 | Preform fabrication techniques, fiber drawing, fabrication of multicomponent glass fibers. |
| 4 | Transmission loss measurements, scattering and absorption loss measurements. |
| 5 | Nondestructive loss measurements, delay distortion, bandwidth measurements. |
| 6 | Midterm Examination 1 |
| 7 | Time domain measurements, frequency domain measurements, measurement of refractive index profiles. |
| 8 | Packaging of optical fibers, mechanical considerations. |
| 9 | Fiber transmission consideration, fiber cable design, examples of cable designs. |
| 10 | Source coupling into an optical fiber, intrinsic and extrinsic splice loss parameters. |
| 11 | Midterm Examination 2 |
| 12 | Single and multifiber splices, single and multifiber connectors. |
| 13 | Measurement of splice loss, system design consideration, fiber properties, source and dedector characteristics, modulation formats. |
| 14 | Intracity fiber optics trunk digital telecommunication system, analog fiber optic system example. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Dr. Ali ÇETİN | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301520 | **TITLE** | Photonics I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Ray optics, wave optics, beam optics, Fourier optics, electromagnetic optics, polarization and crystal optics, guided wave optics, fiber optics. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduce the basic concepts and information related to photonics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Explaining natural phenomena, to study different profession groups since is interdisciplinary field. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. An awareness of the necessity of light from the physics viewpoint.  2. An awareness of the necessity of using the light in science. light from the physics viewpoint.  3. Understand the interaction of light with medium.  4. Explain and apply the basic principles of photonics. | | | | | | | |
| **TEXTBOOK** | | | | | Saleh, B.A.E., Teich M. C., Fundamentals of Photonics, John Wiley and Sons, New Jersey, 2007. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Kasap, S.O., Optoelectronics and Photonics: Principles and Practices, Prentice Hall, Upper Saddle River, N.J., 2001.2) Yariv, A., Yeh, P., Photonics, Oxford University Press, New York, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Postulates of ray optics, simple optical components, graded index optics, matrix optics. |
| 2 | Postulates of wave optics, monochromatic waves. |
| 3 | Relation between wave optics and ray optics, simple optical components, interference, polychromatic and pulsed light. |
| 4 | Gaussian beam, transmission through optical components, Hermite-Gaussian beams, Laguerre-Gaussian and Bessel beams. |
| 5 | Propagation of light in free space, optical Fourier transform, diffraction of light, image formation, holograph. |
| 6 | Midterm Examination 1 |
| 7 | Electromagnetic theory of light, electromagnetic waves in dielectric media, monochromatic electromagnetic waves, elementary electromagnetic waves. |
| 8 | Absorption and dispersion, pulse propagation in dispersive media, optics of magnetic materials and metamaterials. |
| 9 | Polarization of light, reflection and refraction, optics of anisotropic media. |
| 10 | Optical activity and magneto-optics, optics of liquid crystals, polarization devices. |
| 11 | Midterm Examination 2 |
| 12 | Planar mirror waveguides, planar dielectric waveguides, two dimensional waveguides. |
| 13 | Optical coupling in waveguides, sub-wavelength metal waveguides (plasmonics). |
| 14 | uided rays, guided waves, loss and dispersion. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Dr. Ali ÇETİN | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302531 | **TITLE** | Photonics II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Photonic Crystals, resonator optics, satistical optics, lasers, electo optics. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Apply the basic mathematical information used optical transmission. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Explaining natural phenomena, to study different profession groups since is interdisciplinary field. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Gain the ability to use photonics and their physical basics.  2. Gain the ability to apply the photonics to technology.  3. Gain the ability to follow a rapidly developing photonic technologies.  4. Identify and solve the problems encountered from material to production of photonic devices. | | | | | | | |
| **TEXTBOOK** | | | | | Saleh, B.A.E., Teich M. C., Fundamentals of Photonics, John Wiley and Sons, New Jersey, 2007. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1) Kasap, S.O., Optoelectronics and Photonics: Principles and Practices, Prentice Hall, Upper Saddle River, N.J., 2001.2) Yariv, A., Yeh, P., Photonics, Oxford University Press, New York, 2007. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Postulates of ray optics, simple optical components, graded index optics, matrix optics. |
| 2 | Postulates of wave optics, monochromatic waves. |
| 3 | Relation between wave optics and ray optics, simple optical components, interference, polychromatic and pulsed light. |
| 4 | Gaussian beam, transmission through optical components, Hermite-Gaussian beams, Laguerre-Gaussian and Bessel beams. |
| 5 | Propagation of light in free space, optical Fourier transform, diffraction of light, image formation, holograph. |
| 6 | Midterm Examination 1 |
| 7 | Electromagnetic theory of light, electromagnetic waves in dielectric media, monochromatic electromagnetic waves, elementary electromagnetic waves. |
| 8 | Absorption and dispersion, pulse propagation in dispersive media, optics of magnetic materials and metamaterials. |
| 9 | Polarization of light, reflection and refraction, optics of anisotropic media. |
| 10 | Optical activity and magneto-optics, optics of liquid crystals, polarization devices. |
| 11 | Midterm Examination 2 |
| 12 | Planar mirror waveguides, planar dielectric waveguides, two dimensional waveguides. |
| 13 | Optical coupling in waveguides, sub-wavelength metal waveguides (plasmonics). |
| 14 | uided rays, guided waves, loss and dispersion. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assist. Prof. Dr. Ali ÇETİN | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302505 | **TITLE** | GROUP THEORY AND APPLICATIONS |

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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 | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | none | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Symmetry Elements and Symmetry Operations, Groups and their Basic Properties, Matrices, Representations of Groups, Reducible and Irreducible Representations, Some Important Reducible Representations, Group Theory and Vibrational Spectroscopy | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The application of group theory to determine the molecular wave functions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Courses and chemical solutions to group theory is concerned with the application of techniques of physical problems. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Examination of the symmetry of the molecular structure,  2. Symmetry properties and applications  3. Investigation of symmetry and spectroscopic properties,  4. Identification of molecular symmetry with the computer program | | | | | | | |
| **TEXTBOOK** | | | | | Molecular Symmetry and Group Theory; Alan VINCENT | | | | | | | |
| **OTHER REFERENCES** | | | | | Group Theory and Chemistry; David M. BISHOP; Introductory Group Theory for Chemists; George DAVIDSON | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Symmetry elemans, Symmetry operations |
| 2 | Point Goups, some properties of the groups |
| 3 | Identification of Molecular point groups |
| 4 | Non-degenerate representations |
| 5 | Matrix representation |
| 6 | Midterm Examination 1 |
| 7 | Matrix representation derived from base vectors |
| 8 | Function Space |
| 9 | Equal and reducible representations |
| 10 | Degenerate representations |
| 11 | Midterm Examination 2 |
| 12 | Chemical bonding applications |
| 13 | Molecular vibrations |
| 14 | Applications to molecular vibrations |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Güneş Süheyla KÜRKÇÜOĞLU | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301506 | **TITLE** | INFRARED SPECTROSCOPY AND APPLICATIONS |

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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 | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | none | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Electromagnetic Radiation, Vibrations of Molecules, Normal Modes of Vibration, Intensity of Infrared Bands, Instrumentation, Sampling, Spectrum Interpretation, Applications | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning the theoretical concepts in the IR spectroscpy field and ready to apply these in the applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Structural analysis is important in terms of operation. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Designing experiments to investigate the physics of the problem,  2. Experimentation and data collection,  3. Analyzing the results  4. Interpretation skills to win | | | | | | | |
| **TEXTBOOK** | | | | | Modern Infrared Spectroscopy, D. J. ANDO, John Wiley and Sons | | | | | | | |
| **OTHER REFERENCES** | | | | | Organik kimyada spektroskopik Yöntemler, Ender ERDİK, A.Ü., Instrumental Analiz Yöntemleri, T Gündüz, A.Ü. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Electromagnetic Radiation |
| 2 | Vibrations of Molecules |
| 3 | Normal Modes of Vibration |
| 4 | Intensity of Infrared Bands |
| 5 | Group determination of frequency |
| 6 | Midterm Examination 1 |
| 7 | Effects of changing to Group Frequency |
| 8 | Sample Techniques and used resolutions in the IR Specytroscopy |
| 9 | Enstrumentation |
| 10 | Applications |
| 11 | Midterm Examination 2 |
| 12 | interpretation of the spectrum |
| 13 | Applications of the IR spectrum |
| 14 | Applications |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Güneş Süheyla KÜRKÇÜOĞLU | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301511 | **TITLE** | Mathematical Physics I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Rotation of the coordinate axes, Gradient, Divergence, Curl, Vector integration, Gauss’s law, Stokes’s law, Potential Theory, Poisson’s equation, Orthogonal coordinate systems, Special coordinate systems, Tensor Analysis, Pseudotensors, Dual tensors, Determinants; Matrices, Orthogonal, Hermition, Unitary matrices, Generators of continuous groups, Orbital angular momentum, Angular momentum coupling, Lorentz covariance of Maxwell’s equations, Discrete groups. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce a mathematical background required in the expressions, formulations, and understanding of the fundamental physical terms. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn how to use advanced calculus and advanced differential methods for understanding the physical structure of macro and micro universe. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to: Learn how to use mathematical methods in Physics.arn how to use mathematical methods in Phys Learn how to use mathematical methods in Physics.  1.Learn how to use mathematical methods in Physics.  2.apply knowledge of natural sciences (Mathematics, Physics).  3.justify and analyze natural phenomena.  4.identify, formulate, and solve field related problems.  5.interdisciplinary knowledge association and application.  6.get an understanding of professional and ethical responsibility.  7.get a recognition of the need for, and an ability to engage in life-long learning.  8.gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | Arfken, G. B. & Weber, H. J. (1995). Mathematical Methods for Physicists. New York: Academic Press. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Hassani, S. (1999). Mathematical Physics: A modern introduction to its foundations. New York: Springer-Verlag.2.Boas, M. L. (1993). Mathematical Methods in the Physical Sciences. New York: John Wiley&Sons.3.Morse, P. M. & Feshbach, H. (1953). Methods of Theoretical Physics. New York: McGraw-Hill.. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Rotation of the coordinate axes |
| 2 | Vector operators, vector integration |
| 3 | Gauss’ Law, Stokes’ Law, Potential theory, Poisson’s equaation |
| 4 | Orthogonal coordinates |
| 5 | Special coordinate systems |
| 6 | Midterm Examination 1 |
| 7 | Tensor Analysis |
| 8 | Matrix algebra |
| 9 | Generators of continuous groups |
| 10 | Orbital angular momentum |
| 11 | Midterm Examination 2 |
| 12 | Angular momentum coupling |
| 13 | Lorentz covariance of Maxwell’s equations |
| 14 | Discrete groups |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.. Dr. Abdullah Alğın | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302511 | **TITLE** | Mathematical Physics II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Algebra of series, Series of functions, Power Series, Elliptic integrals, Complex algebra, Cauchy – Riemann Conditions, Singularities, Calculus of Residues, Applications of Fourier Series, Properties of Fourier Series, Gibbs Phenomenon, Discrete Fourier Transform, Integral Transforms, Fourier and Laplace transforms, Appilications of the Euler aquation, Lagrance multipliers problems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to introduce a mathematical background in the expressions, formulations, and understanding of the fundamental physical terms. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn how to use advanced calculus and advanced differential methods for understanding the physical structure of macro and micro universe. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to: Learn how to use mathematical methods in Physics.arn how to use mathematical methods in Phys Learn how to use mathematical methods in Physics.  1.Learn how to use mathematical methods in Physics.  2.apply knowledge of natural sciences (Mathematics, Physics).  3.justify and analyze natural phenomena.  4.identify, formulate, and solve field related problems.  5.interdisciplinary knowledge association and application.  6.get an understanding of professional and ethical responsibility.  7.get a recognition of the need for, and an ability to engage in life-long learning.  8.gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | Arfken, G. B. & Weber, H. J. (1995). Mathematical Methods for Physicists. New York: Academic Press. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Hassani, S. (1999). Mathematical Physics: A modern introduction to its foundations. New York: Springer-Verlag.2.Boas, M. L. (1993). Mathematical Methods in the Physical Sciences. New York: John Wiley&Sons.3.Morse, P. M. & Feshbach, H. (1953). Methods of Theoretical Physics. New York: McGraw-Hill.. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Algebra of series |
| 2 | Elliptic integrals |
| 3 | Complex algebra |
| 4 | Calculus of residues |
| 5 | Properties of Fourier series |
| 6 | Midterm Examination 1 |
| 7 | Gibbs phenomenon |
| 8 | Discrete Fourier transform |
| 9 | Integral transforms |
| 10 | Fourier and Laplace transforms |
| 11 | Midterm Examination 2 |
| 12 | İntegral equations |
| 13 | Appilications of the Euler aquation |
| 14 | Lagrance multipliers problems |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.. Dr. Abdullah Alğın | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 5013301501 | **TITLE** | Optoelectronics I |

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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 | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 40 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Light;Modulation of Light;Indicators;Lasers;Photodtectors | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The students must comprehend the basic knowledges in the field of optoelectronics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Basic concepts and application of optoelectronics will be thought to the students | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learning concepts;Analyse them,apply them and evaluate the outcomes. | | | | | | | |
| **TEXTBOOK** | | | | | "Optoelektronik" Değişm yayınları,Adapazarı,2000;Tranlated by Dr.İbrahim Okur. | | | | | | | |
| **OTHER REFERENCES** | | | | | "Optoelectronics"J.Wilson,J.F.B.Hawkes,1985,U.K. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Light |
| 2 | Modulation of Light |
| 3 | Electro-optic Effect |
| 4 | Kerr Modulators |
| 5 | Nonlinear optics |
| 6 | Midterm Examination 1 |
| 7 | Indicators |
| 8 | LEDs |
| 9 | Liquid crystal indicators |
| 10 | Lasers |
| 11 | Midterm Examination 2 |
| 12 | Laser modes |
| 13 | Photodetectors |
| 14 | Photonic apparatus |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.Mehmet Selami KILICKAYA | **Date:** | | 01.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301518 | **TITLE** | Advanced Electromagnetic Theory II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Understands the Fundamentals of electromagnetic theory. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain the obtained fundamentals laws of electromagnetic theory. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain the ability of problem solving. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Data to analyze, evaluate, test and design. | | | | | | | |
| **TEXTBOOK** | | | | | J.D.Jackson, Classical Electrodynamics, Second edition, John Wiley&Sons, New York, 1974 | | | | | | | |
| **OTHER REFERENCES** | | | | | L.D.Landau and E.M. Lifshitz, The Classical Theory of Fields,Oxford and Addison-wesley, 1971 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Planar Electromagnetic Waves |
| 2 | Wave propagations |
| 3 | Wave guides |
| 4 | Resonant cavities |
| 5 | Simple radiation systems |
| 6 | Midterm Examination 1 |
| 7 | Scattering and diffraction |
| 8 | Magneto hydrodynamics |
| 9 | Plasma |
| 10 | Collisions between charged particles |
| 11 | Midterm Examination 2 |
| 12 | Radiation by moving charges |
| 13 | Multipole fields |
| 14 | Multipole fields |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asist.Prof.Dr.Şadan KORKMAZ | **Date:** | | 08/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301518 | **TITLE** | Advanced Electromagnetic Theory I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Understands the Fundamentals of electromagnetic theory. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain the obtained fundamentals laws of electromagnetic theory. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain the ability of problem solving. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Data to analyze, evaluate, test and design. | | | | | | | |
| **TEXTBOOK** | | | | | J.D.Jackson, Classical Electrodynamics, Second edition, John Wiley&Sons, New York, 1974 | | | | | | | |
| **OTHER REFERENCES** | | | | | L.D.Landau and E.M. Lifshitz, The Classical Theory of Fields,Oxford and Addison-wesley, 1971 | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to electrostatic |
| 2 | Boundary-value problems of electrostatics |
| 3 | Orthogonal functions and expansions |
| 4 | Separation of variables |
| 5 | Laplace equation at Spherical coordinates |
| 6 | Midterm Examination 1 |
| 7 | Laplace equation at cylindrical coordinates |
| 8 | Multipole expansion |
| 9 | Magnetostatics |
| 10 | Boundary-value problems of Magnetostatics |
| 11 | Midterm Examination 2 |
| 12 | Time varying fields |
| 13 | Maxwell equations |
| 14 | Conservations laws |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asist.Prof.Dr.Şadan KORKMAZ | **Date:** | | 08/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301525 | **TITLE** | Industrial plasma applications I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Plasma and its characteristics, vacuum and vacuum systems units, plasma reactors and its design, plasma surface treatments, plasma thin film deposition technologies. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduction to applications of industrial plasma and its physics | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learn the plasma reactors design. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Data to analyze, evaluate, test and design. | | | | | | | |
| **TEXTBOOK** | | | | | Roth J.R. , Industrial Plasma Engineering Volume 1, IOP publishing 1995 | | | | | | | |
| **OTHER REFERENCES** | | | | | Roth,A. (1995) , Vacuum Technology, Amsterdam: Elsevier Publishing Company.Lieberman,M. , Lichtenberg,A.L., Principles of Plasma Discharges And Materials Processing, New York: Wiley-Interscience PublicationGrill,A. (1993), Cold Plasma in Materials Fabrcation, IEEE Press | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Plasma and its characteristics |
| 2 | Vacuum and vacuum systems units |
| 3 | Vacuum and vacuum systems units |
| 4 | Plasma reactors design |
| 5 | Plasma reactors design |
| 6 | Midterm Examination 1 |
| 7 | Plasma reactors design |
| 8 | Plasma surface treatments |
| 9 | Plasma surface treatments |
| 10 | Plasma surface treatments |
| 11 | Midterm Examination 2 |
| 12 | Plasma thin films deposition technologies |
| 13 | Plasma thin films deposition technologies |
| 14 | Plasma thin films deposition technologies |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr.Suat PAT | **Date:** | | 06/08/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301525 | **TITLE** | Industrial plasma applications I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Plasma lamps, plasma antennas, plasma chemistry-photon productions, plasma chemistry- material synthesis, plasma environments technologies and atmospheric pressure plasma generations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Introduction to applications of industrial plasma and its physics | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Learn the plasma reactors design. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Data to analyze, evaluate, test and design. | | | | | | | |
| **TEXTBOOK** | | | | | Roth J.R. , Industrial Plasma Engineering Volume 1, IOP publishing 1995 | | | | | | | |
| **OTHER REFERENCES** | | | | | Roth,A. (1995) , Vacuum Technology, Amsterdam: Elsevier Publishing Company.Lieberman,M. , Lichtenberg,A.L., Principles of Plasma Discharges And Materials Processing, New York: Wiley-Interscience PublicationGrill,A. (1993), Cold Plasma in Materials Fabrcation, IEEE Press | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Plasma lamps |
| 2 | Plasma antennas |
| 3 | Plasma chemistry- single signal photon production mechanism |
| 4 | Plasma chemistry- double signal photon production mechanism |
| 5 | Plasma chemistry- triple signal photon production mechanism |
| 6 | Midterm Examination 1 |
| 7 | Plasma chemistry- material synthesis |
| 8 | Plasma chemistry- material synthesiss |
| 9 | Plasma chemistry- material synthesis |
| 10 | plasma environments technologies |
| 11 | Midterm Examination 2 |
| 12 | Plasma environments technologies |
| 13 | Atmospheric pressure plasma generations. |
| 14 | Atmospheric pressure plasma generations. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assoc.Prof.Dr.Suat PAT | **Date:** | | 06/08/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302524 | **TITLE** | SOLAR CELLS-2 |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Before selecting this course, the student should review the course content. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Photovoltaic solar cells that make up the main structure of the crystals of semiconductors, electrical, optical, structural and surface properties are examined. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Application fields of semiconductors, photovoltaics and other acquisition techniques and physical properties, and to provide information about solar cells. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Contribute | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Semiconductors, solar cells and solar cells will increase the yield basic information about the account will gain theoretical knowledge about. | | | | | | | |
| **TEXTBOOK** | | | | | Solar Cells: Materials, Manufecture and Operation,Edited by; Tom Markvart and Luis Castaner,Elsevier(2006) | | | | | | | |
| **OTHER REFERENCES** | | | | | Handbook of Photovoltaic Science and Engineering, Edited by; Antonio Luque and Steven Hegedus, WileySemiconductors and Semimetals; Volume 11 Solar CellsHarold J.HOVEL(1975)GaAs, Si, thin film Solar Cells, Voltmeters and ammeters, connection cables | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What is a solar cells |
| 2 | Photovoltaic solar cell structure |
| 3 | Working principles of photovoltaic solar cells |
| 4 | Classification of photovoltaic solar cells |
| 5 | Photovoltaic solar cells acquisition techniques. |
| 6 | Midterm Examination 1 |
| 7 | Current-voltage characteristics of photovoltaic solar cells |
| 8 | The efficiency of photovoltaic solar cells |
| 9 | Factors affecting the efficiency of photovoltaic solar cells |
| 10 | Lives of photovoltaic solar cells |
| 11 | Midterm Examination 2 |
| 12 | Photovoltaic solar cells applications |
| 13 | Installation of photovoltaic solar cells |
| 14 | Evaluation Period |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prepared by: Assistant Professor Dr. Salih KÖSE | **Date:** | | 07,September,2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301523 | **TITLE** | SOLAR CELLS-1 |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | Before selecting this course, the student should review the course content. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Photovoltaic solar cells that make up the main structure of the crystals of semiconductors, electrical, optical, structural and surface properties are examined. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Application fields of semiconductors, photovoltaics and other acquisition techniques and physical properties, and to provide information about solar cells. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Contribute | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Semiconductors, solar cells and solar cells will increase the yield basic information about the account will gain theoretical knowledge about. | | | | | | | |
| **TEXTBOOK** | | | | | Solar Cells: Materials, Manufecture and Operation,Edited by; Tom Markvart and Luis Castaner,Elsevier(2006) | | | | | | | |
| **OTHER REFERENCES** | | | | | Handbook of Photovoltaic Science and EngineeringEdited by; Antonio Luque and Steven Hegedus, WileySemiconductors and Semimetals; Volume 11 Solar CellsHarold J.HOVEL(1975) | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Material Science |
| 2 | Semiconductor Crystal Structures |
| 3 | Types of Semiconductor Crystals |
| 4 | Crystal Structures Classification |
| 5 | Crystal defects |
| 6 | Midterm Examination 1 |
| 7 | Techniques Used to Obtain semiconductors |
| 8 | The implantation of semiconductors |
| 9 | Optical and Electrical Propertiesof of Semiconductors |
| 10 | Surface and structural properties of semiconductors |
| 11 | Midterm Examination 2 |
| 12 | pn junction structure |
| 13 | Characteristics of pn junction structures |
| 14 | Evaluation Period |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prepared by: Assistant Professor Dr. Salih KÖSE | **Date:** | | 07,September,2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301517 | **TITLE** | Particle Physics I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The photon, mesons, antiparticles, neutrinos, the quark model, Intermediate vector bosons, the standard model, the four forces, quantum electrodynamics (QED), quantum chromodynamics (QCD), weak interactions, Lorentz transformations, four vector, energy and momentum, collisions, symmetries, groups and conservation laws, addition of angular momentum, flavor symmetries, CP violation and TCP theorem. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to give knowledge about micro properties of matter and to introduce elementary particles and their interactions. Also, it is aimed to introduce the fundamental concepts and laws of high energy and particle physics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn how to use the theoretical and experimental methods of high energy physics for investigating the structures of quantum particle systems in universe | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to:  1.Learn knowledge about micro constituents of matter.  2.Realize the fundamental forces and their interactions.  3.apply knowledge of natural sciences (Mathematics, Physics).  4.justify and analyze natural phenomena.  5.identify, formulate, and solve field related problems.  6.design and conduct experiments as well as to analyze and interpret data.  7.use new technology and modern techniques such as computer and computer software to analyze and model the scientific problems.  8.interdisciplinary knowledge association and application.  9.direct correlation and application of gained knowledge with technology and industry.  10.get an understanding of professional and ethical responsibility.  11.get a recognition of the need for, and an ability to engage in life-long learning.  12. gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | Griffiths, D. (1987). Introduction to elemantary particles. New York: John Wiley&Sons. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Perkins, D.H. (1982). Introduction to High-Energy Physics. MA: Addison-Wesley.2.Gottfried, K.& Weisskoff, V.F. (1984). Concepts of Particle Physics. Oxford: Oxford Univ. Press.3.Martin, B. R. & Shaw, G. (1992). Particle Physics. New York: John Wiley&Sons.4.Cottingham, W.N.&Greenwood, D.A. Çeviri: Açıkgöz, İ.&Yıldırım, S. (2001). Çekirdek Fiziğine Giriş. İstanbul: Literatür Yayınları.5.Sakurai, J. J. (1994). Advanced Quantum Mechanics. Massachusetts: Addison-Wesley.6.Frauenfelder, H. Henley, E. M. (1991). Subatomic physics. New Jersey: Prentice Hall. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Elementary particles |
| 2 | The quark model |
| 3 | The standard model |
| 4 | Quantum electrodynamics 1 |
| 5 | Quantum electrodynamics 2 |
| 6 | Midterm Examination 1 |
| 7 | Quantum chromodynamics 1 |
| 8 | Quantum chromodynamics 2 |
| 9 | Weak interactions |
| 10 | Lorentz transformations |
| 11 | Midterm Examination 2 |
| 12 | Symmetries |
| 13 | Groups and conservation laws in particle physics |
| 14 | CP violation and TCP theorem |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.. Dr. Abdullah Alğın | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302510 | **TITLE** | Particle Physics II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The Schrödinger equation for a central potential, The hydrogen atom, Fine structure, Positronium, Quarkonium, Baryons, The Dirac equation, Bilinear covariants, The photon and applications, The Feynman Rules for quantum electrodynamics, The quark – quark interaction, Pair annihilation in QCD, Application of QCD, Charged leptonic weak interactions, Decay of the muon, Decay of the neutron, Decay of the pion and problems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to give knowledge about micro properties of matter and to introduce elementary particles and their interactions. Also, it is aimed to introduce the fundamental concepts and laws of high energy and particle physics. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Students will learn how to use the theoretical and experimental methods of high energy physics for investigating the structures of quantum particle systems in universe. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of this module students will be able to:  1.Learn knowledge about micro properties of matter.  2.Realize the fundamental forces and their interactions.  3.apply knowledge of natural sciences (Mathematics, Physics).  4.justify and analyze natural phenomena.  5.identify, formulate, and solve field related problems.  6.design and conduct experiments as well as to analyze and interpret data.  7.use new technology and modern techniques such as computer and computer software to analyze and model the scientific problems.  8.interdisciplinary knowledge association and application.  9.direct correlation and application of gained knowledge with technology and industry.  10.get an understanding of professional and ethical responsibility.  11.get a recognition of the need for, and an ability to engage in life-long learning.  12. gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | Griffiths, D. (1987). Introduction to elemantary particles. New York: John Wiley&Sons. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.Perkins, D.H. (1982). Introduction to High-Energy Physics. MA: Addison-Wesley.2.Gottfried, K.& Weisskoff, V.F. (1984). Concepts of Particle Physics. Oxford: Oxford Univ. Press.3.Martin, B. R. & Shaw, G. (1992). Particle Physics. New York: John Wiley&Sons.4.Cottingham, W.N.&Greenwood, D.A. Çeviri: Açıkgöz, İ.&Yıldırım, S. (2001). Çekirdek Fiziğine Giriş. İstanbul: Literatür Yayınları.5.Sakurai, J. J. (1994). Advanced Quantum Mechanics. Massachusetts: Addison-Wesley.6.Frauenfelder, H. Henley, E. M. (1991). Subatomic physics. New Jersey: Prentice Hall. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The Schrödinger equation for a central potential |
| 2 | Positronium, Quarkonium, Baryons |
| 3 | The Dirac equation |
| 4 | The Feynman Rules for quantum electrodynamics |
| 5 | The Feynman Rules for quantum chromodynamics |
| 6 | Midterm Examination 1 |
| 7 | The quark – quark interaction |
| 8 | Applications of QCD 1 |
| 9 | Applications of QCD 2 |
| 10 | Weak interactions and their examples |
| 11 | Midterm Examination 2 |
| 12 | Gauge theories |
| 13 | The Higgs mechanism |
| 14 | Grand unified theories |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.. Dr. Abdullah Alğın | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301521 | **TITLE** | Radiation Measurment Methods |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | | 5 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 30 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The course provides theoretical and experimental knowledge of the detection of ionizing radiation and a good knowledge on measurement technique. The course covers the measurement of small currents and charges, pulse height analysis, statistics and deadtime corrections. Gas-, scintillation- and semiconductor detectors are treated, as well as neutron detectors etc. It also covers gamma spectroscopy and radon measurements. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The students gain basic knowledge in radiation science, understand ionizing radiation as a public-health risk and how to approach it, develop concepts on how ionizing radiation is used in other ﬁelds. Also the course provides an introduction to the physics behind particle detectors, the utilization of that physics in practical instruments and the applications of detectors in experimental apparatus. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The course will give the student the opportunity to obtain a good background for conducting different experimental studies on environmental radiation, nuclear structure, and reactions in future. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Students will be able to understand how energetic particles interact with the matter they traverse; understand basic design criteria for practical detectors; recognize appropriate applications for the different types of detectors. | | | | | | | |
| **TEXTBOOK** | | | | | W.R. Leo - Techniques for Nuclear and Particle Physics Experiments, Springer-Verlag 1987G.F. Knoll - Radiation Detection and Measurement, Wiley 1989 | | | | | | | |
| **OTHER REFERENCES** | | | | | Web version of The Particle Detector BriefBook: http://www.cern.ch/Physics/ParticleDetector/BriefBook/M. Eisenbud, T. Gessell. Environmental Radioactivity. Academic Press (1997).W.D. Loveland, D.J. Morrissey, G.T. Seaborg. Modern Nuclear Chemistry. Wiley & Sons (2006).Nuclear data: www.nndc.bnl.govPhoton attenuation coeﬃcients: www.nist.gov/pml/data/xcom/index.cfmElectron, proton, and alpha particle ranges: www.nist.gov/pml/data/star/index.cfm | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Radiation sources (origin, energetic spectra, directional characteristics) |
| 2 | Interactions of radiation in matter |
| 3 | Computational methods for transport calculations and energy deposition |
| 4 | Principles of ionizing radiation detection and electronic signal processing |
| 5 | Detectors (principles, types, spectroscopy, efficiency, resolution, ...) |
| 6 | Midterm Examination 1 |
| 7 | Detectors based on ionization in gases (ionization chambers, proportional counters, Geiger-Muller counters) |
| 8 | Detectors based on ionization in semiconductors (silicon diode detectors, Germanium detectors) |
| 9 | Detectors based on scintillation (organic, inorganic, photomultipliers, resolution, gamma-ray spectroscopy) |
| 10 | Neutron detectors |
| 11 | Midterm Examination 2 |
| 12 | Radioactivity counting statistics |
| 13 | Gama-ray spectroscopy |
| 14 | Environmental radon detection |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Emel Alğın | **Date:** | | 3.6.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301528 | **TITLE** | Cellular Biophysics I |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 15 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Outlines of cellular biology and organelles, molecular organization of cells, structure and properties of DNA, RNA and proteins, energy and signal transfer in cells, cell as a whole, investigation of specialized cells. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to explore and understand biological systems at cellular level, and the events occurring in those systems by using physical concepts. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Elucidation of structural and functional properties of the cells of living organisms by physical point of view. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Knowledge about the physical mechanisms of biological activities occuring at the cellular and biomolecular level,  2. Ability to apply and associate interdisciplinary knowledge,  3. Ability to analyze natural sciences related biological problems by using modern theory, experimental techniques and technology and interpret the obtained results,  4. Ability to synthesize the nature related problems by using physics point of view, | | | | | | | |
| **TEXTBOOK** | | | | | Alberts B., et.al. (2002). Molecular Biology of the Cell. Garland Science. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Matthews G. G., (1998). Neurobiology. Blackwell Science.2. Hayrünisa Çavuşoğlu, Berrak Çağlayan Yeğen, (Guyton, Translation from Medical Physiology. 2007). Tıbbi Fizyoloji. Nobel Tıp Kitabevi. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Outlines of cellular biology and organelles, |
| 2 | Structural investigation of cell membrane and nucleus, |
| 3 | Molecular organization of cells, |
| 4 | Structure and properties of DNA, RNA and proteins, |
| 5 | Structure and properties of DNA, RNA and proteins, |
| 6 | Midterm Examination 1 |
| 7 | Energy and signal transfer in cells, |
| 8 | Energy and signal transfer in cells, |
| 9 | Cell as a whole, |
| 10 | Classification of cells and their functional and structural investigation, |
| 11 | Midterm Examination 2 |
| 12 | Investigation of specialized cells; seeing, |
| 13 | Investigation of specialized cells; touching, |
| 14 | Investigation of specialized cells; hearing |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Sertaç EROĞLU | **Date:** | | 09/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302521 | **TITLE** | Cellular Biophysics II |

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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 | |  | | | | 3 | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 15 |
| Project | | | | | 1 | | 15 |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Genetic coding and information transfer, cell growth and differentiation, cell adhesion, cell physiology and physical events occurring in cells, techniques and experimental setups used in cellular biology research. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is to explore and understand biological systems at cellular level, and the events occurring in those systems by using physical concepts. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Elucidation of structural and functional properties of the cells of living organisms by physical point of view. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Knowledge about the physical mechanisms of biological activities occuring at the cellular and biomolecular level,  2. Ability to apply and associate interdisciplinary knowledge,  3. Ability to analyze natural sciences related biological problems by using modern theory, experimental techniques and technology and interpret the obtained results,  4. Ability to synthesize the nature related problems by using physics point of view, | | | | | | | |
| **TEXTBOOK** | | | | | Alberts B., et.al. (2002). Molecular Biology of the Cell. Garland Science. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Matthews G. G., (1998). Neurobiology. Blackwell Science.2. Hayrünisa Çavuşoğlu, Berrak Çağlayan Yeğen, (Guyton, Translation from Medical Physiology. 2007). Tıbbi Fizyoloji. Nobel Tıp Kitabevi. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Genetic coding and information transfer, |
| 2 | Cell growth and differentiation, |
| 3 | Cell adhesion, |
| 4 | Cell physiology and physical events occurring in cells, |
| 5 | Cell physiology and physical events occurring in cells, |
| 6 | Midterm Examination 1 |
| 7 | Techniques used in cellular biology research; catalysis, sedimentation, |
| 8 | Techniques used in cellular biology research; chromatography, electrophoresis, |
| 9 | Biophysics experiments by using AFM, |
| 10 | Biophysics experiments by using NMR and ESR, |
| 11 | Midterm Examination 2 |
| 12 | Biophysics experiments by using optical tweezers and other micro manipulation techniques, |
| 13 | Biophysics experiments and experimental setup design, |
| 14 | Biophysics experiments and experimental setup design, |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Sertaç EROĞLU | **Date:** | | 09/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301526 | **TITLE** | Cold Plasmas I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Describing Features of Cold Plasmas and Analyses of Cold Plasmas | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To Investigate Cold Plasmas, Reactions in Cold Plasmas and interactions between cold plasmas and various surfaces | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To define and analyse natural sciences, relate and apply the knowledge in an interdisciplinary concept and follow contemporary professional subjects | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge of Cold Plasma, Apprehend of relation between gas and electrical energy, Analysis and Application of cold plasma surface interactions. | | | | | | | |
| **TEXTBOOK** | | | | | Grill, A. (1993). Cold Plasma in Materials Fabrication, IEEE pres, New York. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Roth, J. R. (1995). Industrial plasma engineering, vol. I, IOP publishing, Bristol and Philadelphia.2. Raizer, Y. P. (1991). Gas discharge physics, Springer-Verlag, USSR.3.. Nasser, E. (1971). Fundamentals of gaseous ionization and plasma electronics, Wiley. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Describing of fourth state of matter, |
| 2 | Analyzing of cold plasma production, |
| 3 | Plasma temperature, plasma density, plasma ionization degree, Debye length, Debye sheath, Plasma frequency, |
| 4 | Quasi-Neutrality, |
| 5 | Total Thermodynamic Equilibrium, Local and Non-Local Thermodynamic Equilibrium, |
| 6 | Midterm Examination 1 |
| 7 | Describing and classificition of Cold Plasmas, |
| 8 | Internal Cold Plasma Atomic and Moleculer Reactions, |
| 9 | Behavior of charged particles in a cold plasma in Electric Fields, |
| 10 | Cold Plasma diagnostic, |
| 11 | Midterm Examination 2 |
| 12 | Cold Plasma and electromagnetic wave, |
| 13 | Physical analyzing of cold plasma and surface interactions |
| 14 | Chemical analyzing of cold plasma and surface interactions |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Tamer AKAN | **Date:** | | June 1, 2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302523 | **TITLE** | Cold Plasmas II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **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** | | | | | Cold Plasma Production Systems and Technology Uses | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To Investigate Cold Plasma Production Systems and Technology Uses | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To define and analyse natural sciences, relate and apply the knowledge in an interdisciplinary concept and follow contemporary professional subjects | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knowledge, Apprehend, Analysis and Application of Cold Plasma Generation Systems. | | | | | | | |
| **TEXTBOOK** | | | | | Roth, J. R. (1995). Industrial plasma engineering, vol. I-II, IOP publishing, Bristol and Philadelphia. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Hippler, R. (2008). Low Temperature Plasmas, Wiley.2. Bellan P.M. (2006). Fundamentals of plasma physics, Cambridge Univ. Pr.3. Alexander, A. F. and Lawrence, A. K. (2004), Plasma Physics and Engineering, Taylor & Francis4. Becker, K.H., Kogelschatz, U., Schoenbach, K.H., Barker, R.J (2004). Non-Equilibrium Air Plasmas at Atm. Press., IOP. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Describing and Classifying of the Cold Plasmas, |
| 2 | D.C. Gas Discharge Plasma, |
| 3 | Dark Discharge, Corona Discharge plasma, |
| 4 | Breakdown and Paschen Law, |
| 5 | Glow Discharge Plasma and Plasma Lightining, |
| 6 | Midterm Examination 1 |
| 7 | Arc Discharge plasma, |
| 8 | Atmospheric Pressure Cold Plasmas, |
| 9 | A.C. Gas discharge plasma, |
| 10 | Dielectric Barrier Dscharge Plasma, |
| 11 | Midterm Examination 2 |
| 12 | Puls Discharge Plasma, |
| 13 | Flowing Plasmas, Plasma Jet and Plasma Pencil, |
| 14 | Inductive and Capacitive Radio Frequency Plasmas,  Microwave plasmas. |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Tamer AKAN | **Date:** | | June 01/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302532 | **TITLE** | SPECTROSCOPIC METHODS IN PHYSICS |

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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 | | | | | 2 | | 60 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 40 |
| **PREREQUISITE(S)** | | | | | none | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Spectroscopy and Quantum Mechanics, Development of Quantum Mechanics, The Schrödinger Equation and Some Solutions, Electromagnetic Radiation, Absorption and Emission of Radiation, Line Width, Electromagnetic spectrum, Some Spectroscopic Methods and Applications in Physics, Spectrum techniques. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learning the theoretical concepts in the spectroscpy field and ready to apply these in the applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Some spectroscopic methods and applications to physics.  2. Interdisciplinary knowledge association and application skills;  3. Computer problems related to basic science using modern methods and new technologies such as computer software, modeling and analyzing skills;  4. Associate gained knowledge with technology and industry directly and practices;  5. Professional skills of contemporary issues. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Problems in the field of spectroscopy to identify, formulate and solve; | | | | | | | |
| **TEXTBOOK** | | | | | C.N. Banwell, Fundamentals of Molecular Spectroscopy, McGraw-Hill | | | | | | | |
| **OTHER REFERENCES** | | | | | T. Gündüz,İnstrumental Analiz Yönt, Ankara Üniversitesi, F. Köksal, R. Köseoğlu, Spektroskopi ve Laserlere Giriş | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Electromagnetic Radiation |
| 2 | Spectroscopic Methods |
| 3 | UV Spectroscopy |
| 4 | Visible Spectroscopy |
| 5 | Infrared Spectroscopy |
| 6 | Midterm Examination 1 |
| 7 | Raman Spectroscopy |
| 8 | Atomic Spectroscopy |
| 9 | Molecular Spectroscopy |
| 10 | NMR Spectroscopy |
| 11 | Midterm Examination 2 |
| 12 | Mass Spectroscopy |
| 13 | X-ray spectroscopy |
| 14 | Mössbauer Spectroscopy |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Assoc. Prof. Dr. Güneş Süheyla KÜRKÇÜOĞLU | **Date:** | | 02.06.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301504 | **TITLE** | The Quantum Theory of Solids I |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Wave mehanics, variation method, perturbation method, many-electron problem, Hartree method, one-electron approximation, metallic cohesion, Hartree-Fock method, coulomb ccorrelations, Free-electron approximation, Bloch’s function and Brillouin Zones | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Its aim is to give fundamental knowledge about solids (metals). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | They will be able to follow doing studies about solids (metals). | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learning concepts;Analyse them,apply them and evaluate the outcomes. | | | | | | | |
| **TEXTBOOK** | | | | | The Wave Mechanics of electrons in metals – S. RAIMES | | | | | | | |
| **OTHER REFERENCES** | | | | | Solid State Theory - Walter A. HARRISONPrinciples of the Theory of Solids - J. M. ZIMAN | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The basic principles of wave mechanics |
| 2 | The variational method, Perturbation method |
| 3 | The many-electron method and the one-electron approximation, The Hartree method |
| 4 | Electron spin and Pauli principle, determinantal wave function |
| 5 | Metallic cohesion, The Hartree-Fock method |
| 6 | Midterm Examination 1 |
| 7 | Coulomb correlations and Fermi hole |
| 8 | The free-electron approximation, Sommerfeld model |
| 9 | The Hartree method and Hartree-Fock method applied to a free-electron gas |
| 10 | The exchange charge density and the Fermi hole in a free-electron gas, The Thomas-Fermi approximation |
| 11 | Midterm Examination 2 |
| 12 | Nearly-free electron model The motion of an electron in a one-dimensional lattice, Bloch’s theorem |
| 13 | The tight-binding approximation, the crystal structure of metals |
| 14 | The reciprocal lattice: Brillouin zones, Energy bands and energy gaps, energy surfaces |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Mustafa AKARSU | **Date:** | | 02,06,2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302503 | **TITLE** | The Quantum Theory of Solids II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Semiconductors, statistics of electrons and holes, Hall effect and magnetoresistance, scattering mechanism and mobility of charge carries, drift mobility and Haynes-Shockley experiment, Cooper pairs and BCS theory, the Josephson effect, the London equation, the Ginsburg-Landau theory: the Ginsburg-Landau equations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Its aim is to give fundamental knowledge about solids (metals). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | They will be able to follow doing studies about solids (metals). | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learning concepts;Analyse them,apply them and evaluate the outcomes. | | | | | | | |
| **TEXTBOOK** | | | | | The Wave Mechanics of electrons in metals – S. RAIMES | | | | | | | |
| **OTHER REFERENCES** | | | | | Solid State Theory - Walter A. HARRISONPrinciples of the Theory of Solids - J. M. ZIMAN | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Semiconductors: intrinsic and impurity semiconductors |
| 2 | Statistics of electrons and holes |
| 3 | Conductivity, the Hall effect and magnetoresistance |
| 4 | Cyclotron resonance and ellipsoidal energy surfaces |
| 5 | Scattering mechanism and mobility of charge carries |
| 6 | Midterm Examination 1 |
| 7 | Transport behavior of excess carriers; the continuity equation |
| 8 | Drift mobility and Haynes-Shockley experiment |
| 9 | The Shockley-Read theory of recombination, Measurement of excess carrier lifetime |
| 10 | Superconductivity: Cooper pairs, type I material, BCS theory |
| 11 | Midterm Examination 2 |
| 12 | The superconducting wavefunction or order parameter |
| 13 | The Josephson effect, The London equation |
| 14 | The Ginsburg-Landau Theory: The Ginsburg-Landau equations, Type II materials |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Asst. Prof. Mustafa AKARSU | **Date:** | | 02,06,2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301527 | **TITLE** | THIN FILM PHYSICS I |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (PRESENTATION) | | | | | 1 | | 50 |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Thin film concept and historical view, vacuum science and technology, Thin film growth mechanisms, physical vapour deposition, chemical vapour deposition | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To coach equipped students for thin film technology and thin film production. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To learn thin film coating technologies and concepts on this field, to realize the importance of thin film technology, to gain knowledge. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Apply knowledge of natural sciences (Mathematics, Physics, Chemistry)  Identify and solve field related problems  Design experiments as well as to analyze and interpret data  Interdisciplinary knowledge association  Direct correlation of gained knowledge with technology and industry  Gain a knowledge of contemporary issues | | | | | | | |
| **TEXTBOOK** | | | | | Milton OHRING, The Material Science of Thin Films. | | | | | | | |
| **OTHER REFERENCES** | | | | | L. B. Freund, S. Suresh, Thin Film Materials,K. L. Chopra, S. R. Das, Thin Film Solar Cells, E.M.MURT and W.L.GULDNER, Physical Measurement and Analysis of Thin Films, John P. McKelvey, Solid State and Semiconductor Physics, O. S. HEAVENS, Thin Film Physics. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Thin film concept and historical view |
| 2 | Vacuum science and technology |
| 3 | Thin film growth mechanisms |
| 4 | Physical vapour deposition |
| 5 | Evaporation techniques |
| 6 | Midterm Examination 1 |
| 7 | Molecular beam epitaxy technique |
| 8 | Sputtering technique |
| 9 | Chemical vapour deposition |
| 10 | Spray pyrolysis technique |
| 11 | Midterm Examination 2 |
| 12 | SILAR technique |
| 13 | Dip-Coating technique |
| 14 | Sol-Gel technique |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | PROF.DR.İDRİS AKYÜZ | **Date:** | | 01/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302526 | **TITLE** | THIN FILM PHYSICS II |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (PRESENTATION) | | | | | 1 | | 50 |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of thin film characterizationtechniques, x-ray diffraction, optical characterization and spectroscopic ellipsometry, scannimg probe microscopy, electron microscopy, electrical characterization, laboratory applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To coach equipped students for thin film characterization techniques such as structural, surface, optical and electrical properties, for the devices used in this field and for commenting results. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To learn and apply thin film characterization technologies, to use the devices related to this field and to make comments on the results. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Apply knowledge of natural sciences (Mathematics, Physics, Chemistry)  Identify, formulate, and solve field related problems  Design and conduct experiments as well as to analyze and interpret data  Interdisciplinary knowledge association and application  Direct correlation and application of gained knowledge with technology and industry  Function as a team member  Gain a knowledge of contemporary issues | | | | | | | |
| **TEXTBOOK** | | | | | E.M.MURT and W.L.GULDNER, Physical Measurement and Analysis of Thin Films | | | | | | | |
| **OTHER REFERENCES** | | | | | L. B. Freund, S. Suresh ,Thin Film Materials,K. L. Chopra, S. R. Das, Thin Film Solar Cells, , John P. McKelvey, Solid State and Semiconductor Physics, O. S. HEAVENS, Thin Film Physics. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and Classification of thin film characterization techniques |
| 2 | x-ray diffraction technique |
| 3 | Film thickness and optical constants |
| 4 | Spectroscopic ellipsometry technique |
| 5 | Absorption spectroscopy |
| 6 | Midterm Examination 1 |
| 7 | Optical method and determination of band gap |
| 8 | Laboratory application |
| 9 | Scannin probe microscopies and atomic force microscope |
| 10 | Laboratory application |
| 11 | Midterm Examination 2 |
| 12 | Electron microscopes |
| 13 | Elemental analysis |
| 14 | Electrical characterization techniques |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | PROF.DR.İDRİS AKYÜZ | **Date:** | | 02/06/2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501301502 | **TITLE** | Ultrasound I |

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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 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The production of ultrasound waves, detection and measurement of ultrasound, measurement techniques of the speed and absorption of ultrasonic , non-destructive measurement of materials | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Generation of ultrasound, dedection and mesurement of ultrasound, measuring techniques of ultrasound,non-destructive testing of materials | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Skill of the effective usage of information technology, selection, development and usage of the modern techniques and tools which are necessary for the application of optical devices uses.  Having sufficient knowledge optical devices uses and the skill of applying for modelling and solving of optical devices uses problems by the theoretical and experiential informations about these areas. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Learn generation of ultrasound.  2.Learn dedection and mesurement of ultrasound.  3.Learn measuring techniques of ultrasound.  4.Learn non-destructive testing of materials | | | | | | | |
| **TEXTBOOK** | | | | | Heinrich Kuttruff Ultrasonics Fundamentals and Applications | | | | | | | |
| **OTHER REFERENCES** | | | | | Robert T.Beyer, Stephen V. Letcher, Physical Ultrasonics | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The production of ultrasonic waves |
| 2 | Ultrasonic wave generating transducer types |
| 3 | Ultrasonic wave generating transducer technologies |
| 4 | Detection and measurement of ultrasound |
| 5 | Ultrasound detection and measurement in liquid |
| 6 | Midterm Examination 1 |
| 7 | Ultrasound detection and measurement in gas |
| 8 | Ultrasound detection and measurement in solids |
| 9 | Measurement techniques of ultrasound speed |
| 10 | Measurement techniques of ultrasound absorption |
| 11 | Midterm Examination 2 |
| 12 | Non-destructive measurement of materials |
| 13 | Ultrasound measurement methods used in the industry |
| 14 | Ultrasound measurement methods used in the construction industry |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof. Dr. Gökhan SAVAROĞLU | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302501 | **TITLE** | Ultrasound II |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( x ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In various environments ultrasound propagation, absorption, refraction and dispersion Generation and detection of hypersound,appllication of ultrasound in medical diagnostic, special methods of ultrasonic imaging, application of high intensity ultrasouınd | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main aim of the course is give information on the fundamental concepts and terminology of Ultrasound , application of high intensity ultrasound and methods of ultrasonic imaging | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Skill of the effective usage of information technology, selection, development and usage of the modern techniques and tools which are necessary for the application of ultrasound.  Having sufficient knowledge ultrasound and the skill of applying for modelling and solving of ultrasound problems by the theoretical and experiential informations about these areas | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1.Learn generation and detection of hypersound.  2.Learn appllication of ultrasound in medical diagnostic.  3.Learn special methods of ultrasonic imaging  4.Learn application of high intensity ultrasouınd . | | | | | | | |
| **TEXTBOOK** | | | | | Heinrich Kuttruff Ultrasonics Fundamentals and Applications | | | | | | | |
| **OTHER REFERENCES** | | | | | Robert T.Beyer, Stephen V. Letcher, Physical Ultrasonics | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Reflection of ultrasonic waves in various medium |
| 2 | refraction of ultrasonic waves in various medium |
| 3 | dispersion of ultrasonic waves in various medium |
| 4 | Absorbsion of ultrasonic waves in various medium |
| 5 | Scattering of ultrasonic waves in human tissue |
| 6 | Midterm Examination 1 |
| 7 | The use of the definition of hypersonic sound waves  G |
| 8 | Generate of hypersonic sound waves |
| 9 | Detection of hypersonic sound waves |
| 10 | Ultrasound diagnostic methods used in medicine |
| 11 | Midterm Examination 2 |
| 12 | Therapeutic ultrasound systems used in medicine |
| 13 | 2D ultrasonic imaging |
| 14 | Applications of high intensity ultrasound |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Prof.Dr. Gökhan SAVAROĞLU | **Date:** | |  | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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

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

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

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE INSTITUTE’S GRADUATE PROGRAMME’S LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (M.Sc.-Ph.D.)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Having the scientific and vocational ethics’ understanding and being able to defend this understanding in every medium. | | |  | |  |  |
| **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** | Physics | **SEMESTER** | Fall-Spring |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Modern Quantum Mechanics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| MSc | 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 (√)]** | | | | | | |
| 3.0 | | - | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 30 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 20 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fundamental concepts, Quantum dynamics, Quantum harmonic oscillator, Quantum theory of angular momentum, Spin-(1/2) systems and finite rotations, Symmetries in quantum mechanics, approximation methods, quantum identical particles and their applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main objectives are: To investigate fundamentals of quantum mechanics, to teach physical principles of quantum theory and their mathematical foundations, to teach general effects and applications of quantum mechanics in other physical areas of research. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Applying the quantum mechanical methods and approximations in many areas of physical research. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learn knowledge about quantum constituents of matter, realize the fundamental principles of quantum theory, apply knowledge of quantum principles to fundamental sciences (Mathematics, physics, chemistry, biology), identify, formulate, and solve field related problems, interdisciplinary knowledge association and application, direct correlation and application of gained knowledge with technology and industry, gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK (Turkish)** | | | | | Sakurai, J.J. (1994). Modern Quantum Mechanics. Addison-Wesley, New York. | | | | | | | |
| **OTHER REFERENCES** | | | | | **1-**Zettili, N. (2006). Quantum Mechanics. Wiley, New York.  **2-**Shankar, R. (1994). Principles of Quantum Mechanics. Kluwer Academic, New York.  **3-**Dereli, T., Verçin A. (2009). Kuantum Mekaniği: Temel kavramlar ve uygulamaları (in Turkish). TÜBA yayınları no:5, Ankara. | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamental concepts (Measurements, observables, uncertainty relations) |
| 2 | Fundamental concepts (Position and momentum spaces, wave functions) |
| 3 | Quantum dynamics (Fundamental postulates, Schrödinger picture and its properties, an application) |
| 4 | Quantum dynamics (Heisenberg picture and its properties, an application) |
| 5 | Quantum harmonic oscillator |
| 6 | Quantum harmonic oscillator and its application |
| 7 | Quantum theory of angular momentum |
| 8 | Spin-(1/2) systems and finite rotations |
| 9 | Quantum theory of angular momentum (Addition of angular momenta and the related properties) |
| 10 | Symmetries in quantum mechanics, conservation laws, some applications |
| 11 | Approximation methods (Perturbation theory, variational method, some applications) |
| 12 | Time-dependent potentials: The interaction picture and its properties |
| 13 | Quantum identical particle systems and their applications (For bosons) |
| 14 | Quantum identical particle systems and their applications (For fermions) |
| 15,16 | Mid-term exam, Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | |  | **Date:** | | 30.03.2017 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Glass Science and Technology |

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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 (√)]** | | | | | | |
| 3 | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Inorganic glass formation, Glass production techniques, Types of glass, Oxide and non-oxide glass structures, Thermal properties of glass, Optical properties of glass, Electrical properties of glass. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To give the students the basic principles of glass formation principles, composition, mass and surface structure and properties. To be able to transfer the production techniques of glass to traditional and developing methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To reach scientific knowledge, to define and apply advanced concepts of Material Science, to review the literature carefully and to establish a link between their own results and the previous literature, to improve the awareness of continuous learning with modern technology | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | • To explain the basics of amorphous structure  • Understand why some materials form glass and some do not.  • To know the production techniques of glass  • To analyze the physical, thermal and electrical properties of oxide glasses.  • To understand the difference of the glass structure of the crystal materials. | | | | | | | |
| **TEXTBOOK** | | | | | Introduction to Glass Science and Technology, J.E. Shelby. | | | | | | | |
| **OTHER REFERENCES** | | | | | CAM Kimyası, Özellikleri, Uygulaması. D.KocabağGlass Science, R.H.Doremus | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction and history of glass |
| 2 | Glass formation |
| 3 | Structural approaches in glass formation |
| 4 | Atomic regulation and crystallization in glasses |
| 5 | Types of glass |
| 6 | Midterm Examination 1 |
| 7 | Density and viscosity in glasses |
| 8 | Thermal properties of glasses |
| 9 | Opticall properties of glasses |
| 10 | Colouration of glass, colloidal color additives and decolorization |
| 11 | Midterm Examination 2 |
| 12 | Electrical properties of glasses, Conductivity mechanism in glass and affecting factors |
| 13 | Technological glasses |
| 14 | An overview |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Doç.Dr. Sadiye ÇETİNKAYA ÇOLAK | **Date:** | | 05.11.2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS** | **SEMESTER** | Fall |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | NANOSTRUCTURES |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  (  x ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | - | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Free Electron Transportation in Metals, Charging Nanostructures, Molecular Electronics, 1-D Conductors, 2-D Nanoelectronics: Superlattices and Heterostructures, 3-D Photonic Bandgap Materials | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Learns the properties of nano-structured materials in physics. Have knowledge about current topics | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Nanoyapıları learns.  Learns the bases of quantum mechanics.  Learn the Kramer's theorem.  Learn kinetic control of growth | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | "Introduction to Nanoscience", S.M. LINDSAY, Oxford University Press, 2010 | | | | | | | |
| **OTHER REFERENCES** | | | | | "Nanoscience: The Science of the Small in Physics, Engineering, Chemistry, Biology and Medicine", Hans-Eckhardt Schaefer | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Electrons in Nanstructures |
| 2 | Free Electron Transportation in Metals |
| 3 | Charging Nanostructures |
| 4 | Molecular Electronics |
| 5 | Hybridization of Atomic Orbitals |
| 6 | Midterm Examination 1 |
| 7 | Delocalization Energy |
| 8 | 1-D Conductors |
| 9 | Nanostructures for Electronics |
| 10 | 2-D Nanoelectronics: Superlattices and Heterostructures |
| 11 | Midterm Examination 2 |
| 12 | 3-D Photonic Bandgap Materials |
| 13 | Nanostructured Thermal Devices |
| 14 | Superhyrophobic Nanostructured Surfaces |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  | **x** |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  | **x** |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | | **x** | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | | **x** | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | | **x** |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | | **x** |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | | **x** |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  | **x** |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | | **x** |  |
| **LO 10** | Getting and using the initiative independently. | | |  | | **x** |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  | **x** |
| **Prepared by :** | | | Doç.Dr. Şadan KORKMAZ | **Date:** | | 13,11,2018 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Materials Science |

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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 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Seminar | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | No | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classification of materials. The internal structure of materials: atomic structure, ionic bond, covalent bond, metallic bond, Van der waals bond, bond energy concept. Crystal structure and types. Amorphous structures. Phase transformations. Electrical properties of materials. Optical properties of materials. Thermal properties of materials. Mechanical properties. Physical properties. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To be able to comprehend basic material science knowledge by the student. Recognition of contemporary materials. Microstructure and properties of materials, basic production methods and synthesis processes of students to grasp. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To reach scientific knowledge, to define and apply advanced concepts of Material Science, to review the literature carefully and to establish a link between their own results and the previous literature, to improve the awareness of continuous learning with modern technology | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | • Classify materials  • Describe the effects of atomic bonds, atomic sequences and crystallography and bonding on the properties of materials.  • To be able to define the difference between crystal and amorphous structure  • Define basic material properties and factors affecting properties | | | | | | | |
| **TEXTBOOK** | | | | | 1. Fundamentals of Materials Science and Engineering, William D.Callister, David G.Rethwisch, John Wiley & Sons, 2008.2. Malzeme Bilimi, Prof. Dr. Kaşif Onaran | | | | | | | |
| **OTHER REFERENCES** | | | | | Materials: Engineering, Science, Processing and Design by Michael Ashby, Hugh Shercliff, and David Cebon | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to Materials Science and classification of materials |
| 2 | The structure of atoms, bonding forces between atoms. |
| 3 | Crystal structures |
| 4 | Amorphous structures |
| 5 | Structure defects |
| 6 | Midterm Examination 1 |
| 7 | Phase transformations |
| 8 | Phase diagrams |
| 9 | Malzemelerin elektriksel özellikleri |
| 10 | Semiconductors |
| 11 | Midterm Examination 2 |
| 12 | Optical properties of materials |
| 13 | Thermal properties of materials |
| 14 | An overview |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Doç.Dr. Sadiye ÇETİNKAYA ÇOLAK | **Date:** | | 27.03.2019 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** | 501302520 | **TITLE** | Nuclear Reaction Model Codes Education |

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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** | | | | | Simulation calculation codes for elastic and inelastic scattering, DWBA theory, DWUCK 4-5 code R-matrix, T-matrix | | | | | | | |
| **COURSE OBJECTIVES** | | | | | It is aimed to train the codes required for experimental nuclear data analysis. It is aimed to introduce nuclear codes and make calculations for nuclear scattering, light elements and heavy ion reactions. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To learn how to simulate nuclear reactions on the computer, to gain the ability to use and develop simulation programs. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | DWBA Theory |
| 2 | DWUCK-4 Code |
| 3 | DWUCK-5 Code |
| 4 | FRESCO Code for elastic scattering |
| 5 | FRESCO Code for inelastic scattering |
| 6 | FRESCO Code for heavy elements nuclear reactions |
| 7 | FRESCO Code for light elements nuclear reactions |
| 8 | Compound Nuclear reactions theory |
| 9 | Single resonance structure |
| 10 | R-matrix theory |
| 11 | AZURE Code for elastic scattering |
| 12 | AZURE Code for inelastic scattering |
| 13 | T-matrix method |
| 14 | TALYS Code for reactions |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (MSc)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Using the knowledge of undergraduate education in postgraduate level. | | |  | |  |  |
| **LO 2** | Gaining the investigator feature with vocational responsibility. | | |  | |  |  |
| **LO 3** | To be able to improve themselves by following the innovations in the field of Physics which are important in the development of science and technology. | | |  | |  |  |
| **LO 4** | Sharing their concepts in seminar, symposium, conference etc. by using the skills of self-study. | | |  | |  |  |
| **LO 5** | To be able to prepare a scientific publication with the knowledges obtained from graduate and postgraduate studies. | | |  | |  |  |
| **LO 6** | Tracing the developments of physics in national and international fields. | | |  | |  |  |
| **LO 7** | Design and apply theoretical, experimental and model-based research; the ability to analyze and resolve complex problems that arise during this process. | | |  | |  |  |
| **LO 8** | To be able to join interdisciplinary and multidisciplinary team works. | | |  | |  |  |
| **LO 9** | To be able to make literature search, presentation, experimental setup preparation, application and explication of results. | | |  | |  |  |
| **LO 10** | Getting and using the initiative independently. | | |  | |  |  |
| **LO 11** | Having the scientific and vocational wafer and defending this apprehension in every medium. | | |  | |  |  |
| **Prepared by :** | | | Dr. Ali İhsan KILIÇ | **Date:** | | 07.11.2022 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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| **DEPARTMENT** | **PHYSICS (MSc)** | **SEMESTER** |  |

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| **COURSE** | | | |
| **CODE** |  | **TITLE** | Nuclear Reaction Theory for Astrophysics |

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| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **MSc** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | ENGLISH |
| **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** | | | | | Fundamental nuclear physics, reaction theory, detectors, neutron stars, black holes, giant planets, pulsars. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The basic mechanism of astrophysical phenomena is based on the concept of nuclear reactions. It is aimed to form the theoretical infrastructure about the formation of the universe, the formation of celestial bodies and how the basic elements are formed. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To be able to acquire knowledge about the nuclear reaction theory and scientific and technological developments in the field of astrophysics. To be able to do scientific work and share it as a scientific publication by using the knowledge gained. | | | | | | | |
| **TEXTBOOK** | | | | |  | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

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| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamental Nuclear Physics |
| 2 | Introduction to nuclear reaction theory |
| 3 | Nuclear Optics Model |
| 4 | Direct Reactions |
| 5 | Compound reactions |
| 6 | Nuclear Detectors |
| 7 | Big-Bang Theory |
| 8 | DWBA Method |
| 9 | ADWA Method |
| 10 | R-matrix Method |
| 11 | Electron Screening Effect |
| 12 | Experimental Methods |
| 13 | Stellar Nucleosinthesis |
| 14 | Neutron stars, Pulsars, black holes, Giant planets |
| 15,16 | Final Examination |

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| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE PHYSICS MSc PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
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| **Prepared by :** | | | Dr. Ali İhsan KILIÇ | **Date:** | | 07.11.2022 | | | |

**Signature**: