**MATHEMATIC-COMPUTER PhD PROGRAMME**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **First Year** | | | | | | |
| **I. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501011101 | [THE SCIENTIFIC RESEARCH METHODS AND ITS ETHICS](#C131) | 7.5 | 3+0 | 3 | **C** | Turkish |
| 501711636 | [FUNDAMENTALS OF MATHEMATICS](#C130) | 7.5 | 3+0 | 3 | **C** | Turkish |
|  | Elective Course-1 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-2 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Total of l. Semester | 30 |  | 12 |  |  |
| **II. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
|  | Elective Course-3 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-4 | 7.5 | 3+0 | 3 | E | Turkish |
|  | Elective Course-5 | 7.5 | 3+0 | 3 | E | Turkish |
| 501712001 | PhD Seminar | 7.5 | 0+1 | - | **C** | Turkish |
|  | Total of II. Semester | 30 |  | 9 |  |  |
|  | TOTAL OF FIRST YEAR | 60 |  | 21 |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Second Year** | | | | | | |
| **III. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501711801 | PhD PROFICIENCY | 30 | 0+1 | **-** | **C** | Turkish |
|  | Total of III. Semester | 30 |  |  |  |  |
| **IV. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501011102 | THESIS PROPOSAL | 30 | 0+1 | **-** | **C** | Turkish |
|  | Total of IV. Semester | 30 |  |  |  |  |
|  | TOTAL OF SECOND YEAR | 60 |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Third Year** | | | | | | |
| **V. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501711802 | PhD THESIS STUDY | 25 | 0+1 | **-** | **C** | Turkish |
| 501711803 | SPECIALIZATION FIELD COURSE | 5 | 3+0 | **-** | **C** | Turkish |
|  | Total of V. Semester | 30 |  |  |  |  |
| **VI. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501711802 | PhD THESIS STUDY | 25 | 0+1 | **-** | **C** | Turkish |
| 501711803 | SPECIALIZATION FIELD COURSE | 5 | 3+0 | - | **C** | Turkish |
|  | Total of VI. Semester | 30 |  |  |  |  |
|  | TOTAL OF THIRD YEAR | 60 |  |  |  |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Fourth Year** | | | | | | |
| **VII. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501711802 | PhD THESIS STUDY | 25 | 0+1 | **-** | **C** | Turkish |
| 501711803 | SPECIALIZATION FIELD COURSE | 5 | 3+0 | **-** | **C** | Turkish |
|  | Total of VII. Semester | 30 |  |  |  |  |
| **VIII. Semester** | | | | | | |
| Code | Course Title | ECTS | T+P | Credit | C/E | Language |
| 501711802 | PhD THESIS STUDY | 25 | 0+1 | **-** | **C** | Turkish |
| 501711803 | SPECIALIZATION FIELD COURSE | 5 | 3+0 | - | **C** | Turkish |
|  | Total of VIII. Semester | 30 |  |  |  |  |
|  | TOTAL OF FOURTH YEAR | 60 |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Elective Courses** | | | | | | | | | | | | | | | | | | |
| Code | | Course Title | | | ECTS | | | T+P | | | Credit | | | C/E | | | Language | |
| 501711603 | | [ADVANCED INTEGRAL EQUATIONS](#C46) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711606 | | [ADVANCED TAXICAB GEOMETRY I](#C54) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712608 | | [ADVANCED TAXICAB GEOMETRY II](#C55) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711632 | | [APPLIED FUNCTIONAL ANALYSIS I](#C125) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712632 | | [APPLIED FUNCTIONAL ANALYSIS II](#C126) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711638 | [Blockchain](#C143) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712640 | [COMPLEXITON SOLUTIONS OF DIFFERENTIAL EQUATIONS](#C138) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711627 | | [EXACT SOLUTION METHODS OF NONLINEAR EQUATIONS-I](#C81) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712617 | | [EXACT SOLUTION METHODS OF NONLINEAR EQUATIONS-II](#C82) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711621 | | [FORCE AND MOTION I](#C77) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712625 | | [FORCE AND MOTION II](#C78) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712638 | [FRACTAL GEOMETRY AND APPLICATIONS](#C136) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711639 | [Fractals and Chaos](#C141) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712603 | | [FRACTIONAL DIFFERENTIAL EQUATIONS](#C69) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711610 | | [FUZZY PLANE PROJECTIVE GEOMETRY I](#C22) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712602 | | [GALOIS GEOMETRY AND FINITE PROJECTIVE SPACES I](#C23) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712618 | | [GAP PROGRAMMING](#C25) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712626 | | [GENERALIZED QUADRANGLES II](#C27) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711616 | | [HASKELL FUNCTIONAL PROGRAMMING](#C35) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711622 | | [HIGHER DIMENSIONAL CATEGORIES I](#C127) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712613 | | [HIGHER DIMENSIONAL CATEGORIES II](#C128) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711607 | | [HOMOLOGICAL ALGEBRA](#C40) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712604 | | [HOMOLOGICAL ALGEBRA II](#C41) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712635 | | [HOMOLOGICAL ALGEBRA PROGRAMMING](#C42) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712611 | | [INTEGRABILITY AND PERTURBATION METHODS II](#C63) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712606 | | [INTEGRABLE SYSTEMS II](#C61) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711640 | [Introduction to Advaced Functional Analysis](#C142) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712639 | [INVERSION THEORY](#C137) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711629 | | [ISOMETRIES I](#C65) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712614 | | [ISOMETRIES II](#C66) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711633 | | [KNOTS AND SURFACES I](#C17) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712628 | | [LIGTHLIKE HYPERSURFACES](#C80) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712610 | | [LORENTZIAN GEOMETRY I](#C83) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711619 | | [METRIC GEOMETRY I](#C88) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712621 | | [METRIC GEOMETRY II](#C89) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711611 | | [MINIQUATERNION GEOMETRY I](#C90) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711614 | | [MOVEMENT GEOMETRY I](#C34) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712601 | | [NUMERICAL SOLUTIONS OF THE PARTIAL DIFFERANTIAL EQUATIONS II](#C74) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712622 | | [PACKAGE WRITING WITH GAP](#C24) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712636 | | [PARALLEL PROGRAMMING TECHNICS](#C96) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711613 | | [PROJECTIVE SPACES OVER FINITE FIELDS I](#C108) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712615 | | [PROJECTIVE SPACES OVER FINITE FIELDS II](#C109) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711620 | | [SELECTED TOPIC ON GEOMETRY I](#C28) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711601 | | [SELECTED TOPIC ON GEOMETRY II](#C29) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711631 | | [SELECTING SUBJECTS IN MINKOWSKI SPACE I](#C92) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712631 | | [SELECTING SUBJECTS IN MINKOWSKI SPACE II](#C94) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711623 | | [SEMIAFFINE LINEAR SPACES I](#C101) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712629 | | [SEMIAFFINE LINEAR SPACES II](#C102) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712623 | | [SIMPLICIAL GROUPS](#C107) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712624 | | [SPACELIKE HYPERSURFACES GLOBAL DIFFERANTIAL GEOMETRY II](#C118) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711612 | | [SPECTRAL METHODS AND APPLICATIONS](#C119) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712616 | | [SPECTRAL METHODS FOR DIFFERENTIAL EQUATIONS](#C13) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711615 | | [SYMMETRIES AND INTEGRABILITY I](#C104) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712612 | | [SYMMETRIES AND INTEGRABILITY II](#C105) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711628 | | [THE EMBEDDINGS IN FINITE PROJECTIVE SPACES I](#C115) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711630 | | [THE SELECTED SUBJECTS IN FINITE PROJECTIVE SPACES I](#C116) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712633 | | [THE SELECTED SUBJECTS IN FINITE PROJECTIVE SPACES II](#C58) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711624 | | [THEORETICAL EXAMINE OF FINITE ELEMENT METHOD I](#C110) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712630 | | [THEORETICAL EXAMINE OF FINITE ELEMENT METHOD II](#C111) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711637 | [THEORY OF INTEGRABILITY](#C133) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712634 | | [THEORY OF PARTIAL DIFFERENTIAL EQUATIONS](#C72) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711605 | | [TOPOLOGICAL GROUPS I](#C123) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712605 | | [TOPOLOGICAL GROUPS II](#C124) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501711625 | | [UNITALS IN PROJECTIVE PLANES I](#C98) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |
| 501712627 | | [UNITALS IN PROJECTIVE PLANES II](#C99) | | 7.5 | | | 3+0 | | | 3 | | | E | | | Turkish | | |

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712616 | **TITLE** | Spectral Methods for Differential Equations |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | .Ordinary differential equations, Fourier analysis, finite difference approximations, accuracy, stabiliy and convergence, boundary conditions, Fourier spectral methods, Chebyshev spectral methods, Iterations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to give the students the solution methods for various problems, to solve of the problems by using computer programming, to provide a basis using numerical methods for solving problems which arise in applied science, to analysis and evaluate the measurement values that are obtained experimentally using numerical approaches. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. The knowledge of concept of the spectral methods,  5. The skill of the adaptation,  6. The skill which makes solving the problem using numerical approaches, 7. The skill modelling by using the fundamental mathematics and engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Yakowitz,S & Szidarovszky,F.(1986).An Introducion to Numerical Computations. Macmillan Publishing Company,New York. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- Yakowitz,S & Szidarovszky,F.(1986).An Introducion to Numerical Computations. Macmillan Publishing Company,New York. 2- Trefethen,L.N.(1996).Finite difference and Spectral Methods for Ordinary and Partial Differential Equations. Cornell University. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Ordinary differential equations |
| 2 | Ordinary differential equations |
| 3 | Ordinary differential equations |
| 4 | Fourier analysis |
| 5 | Finite difference approximations |
| 6 | Midterm Examination 1 |
| 7 | Accuracy, stabiliy and convergence |
| 8 | Accuracy, stabiliy and convergence |
| 9 | Boundary conditions |
| 10 | Boundary conditions |
| 11 | Midterm Examination 2 |
| 12 | Fourier spectral methods |
| 13 | Chebyshev spectral methods |
| 14 | Iterations |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Bülent SAKA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711633 | **TITLE** | Knots and Surfaces I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Knots, Polynomials, Isotopy and Surfaces. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Presenting main concepts and techniques in the content of the lesson, improving students’ knot theory skills by practising these concepts and techniques. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To have base concept of Knots and surfaces,  2. To have skill of the problem analysis,  3. All this problems evaluate solution,  4. To have analytical thinking, discussion and evaluation. | | | | | | | |
| **TEXTBOOK** | | | | | Knots and Surfaces, N.D.Gilbert, T. Porter, Oxford. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Preliminaries |
| 2 | Preliminaries |
| 3 | Knots, Links and diagrams |
| 4 | Knots, Links and diagrams |
| 5 | Knots, Links and polynomials |
| 6 | Midterm Examination 1 |
| 7 | Knots, Links and polynomials |
| 8 | İdentification spaces |
| 9 | Knots and isotopy |
| 10 | Knots and isotopy |
| 11 | Midterm Examination 2 |
| 12 | Euler charactaristic |
| 13 | Combinatorial surfaces |
| 14 | Knots and surfaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | : Assoc. Prof. Enver Önder USLU | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711610 | **TITLE** | Fuzzy Plane Projective Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The fuzzy set and fuzzy vectors, Fuzzy vectors defined on fuzzy set,  Fuzzy base of fuzzy linear transformation. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To obtain information about fuzzy set, fuzzy vector, fuzzy base, fuzzy linear transformation. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn the fuzzy set,  2. Learn fuzzy vectors,  3. To obtain fuzzy vectors defined on fuzzy set,  4. To obtain fuzzy base of fuzzy linear transformation. | | | | | | | |
| **TEXTBOOK** | | | | | P. Lubczonok., Fuzzy Vector Spaces, Fuzzy sets and Systems, (1990). | | | | | | | |
| **OTHER REFERENCES** | | | | | K.S. Abdukhalikov and . C. Kim., Fuzzy Linear Maps, (1998). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The fuzzy set |
| 2 | The fuzzy set |
| 3 | The fuzzy set |
| 4 | Fuzzy vectors |
| 5 | Fuzzy vectors |
| 6 | Midterm Examination 1 |
| 7 | Fuzzy vectors |
| 8 | Fuzzy base |
| 9 | Fuzzy base |
| 10 | Fuzzy base |
| 11 | Midterm Examination 2 |
| 12 | Fuzzy linear transformation |
| 13 | Fuzzy linear transformation |
| 14 | Fuzzy linear transformation |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. ZİYA AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712602 | **TITLE** | Galois Geometry and Finite Projective Spaces I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Galois Geometry, Regular spreads, arcs, characterization of quadrics, k-arcs, Hermitian surfaces, Hermitian arcs, The representation of lines of PG(3,q) and PG(5,q). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give Galois geometry and Spreads, arcs, quadrics and Ovaloids in finite projective space. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | J.W. P. Hırschfeld, Finite Projective Spaces of Three Dimensions, Oxford Science Publication. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Galois Geometry |
| 2 | Regular spreads |
| 3 | Arcs |
| 4 | Characterization of quadrics |
| 5 | Characterization of quadrics |
| 6 | Midterm Examination 1 |
| 7 | K-arcs |
| 8 | Hermitian surfaces |
| 9 | Hermitian arcs |
| 10 | Hermitian arcs |
| 11 | Midterm Examination 2 |
| 12 | The representation of lines of PG(3,q) and PG(5,q) |
| 13 | The representation of lines of PG(3,q) and PG(5,q) |
| 14 | The representation of lines of PG(3,q) and PG(5,q) |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. ZİYA AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712622 | **TITLE** | Package writing with GAP |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | A First Session with GAP, Lists and Records, Recursion, Changing the Structure, GAP macro file, Library Files, File Types, File Structure, Version Numbers, Operation Functions, Methods, Weak Pointers, Stabilizer chains, Hash keys, GAP share packages and package writing. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The understanding and application the notions of the GAP pragramming and writing a GAP share package. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics, Apply knowledge of basic mathematics,  2. Know and apply GAP program language, Know and apply GAP program language,  3. Know and apply GAP share package writing,  4. Writing a GAP package. Know and apply GAP share package writing.e write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | GAP reference manual. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.GAP reference manual, 2. Extending GAP, The GAP Group, 2007,  3. Algebra interactive, Cohen, Arjeh M., Springer, 1999. (QA 155/C63). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | A First Session with GAP |
| 2 | Lists and Records |
| 3 | Recursion |
| 4 | Changing the Structure |
| 5 | GAP macro file |
| 6 | Midterm Examination 1 |
| 7 | Library Files, File Types, File Structure |
| 8 | Version Numbers |
| 9 | Operation Functions, Methods |
| 10 | Weak Pointers |
| 11 | Midterm Examination 2 |
| 12 | Stabilizer chains |
| 13 | Hash keys |
| 14 | GAP share packages and package writing |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist. Prof. Ahmet Faruk ASLAN | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712618 | **TITLE** | GAP Programming |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Permutations, Symmetric groups, Cayley’s theorem, GAP (Group, Algortihm and Programming) system, GAP interface, GAP program language, GAP functions, GAP share package, GAP share package and create new package, PC groups, Group products in GAP, Group Libraries, Matrix groups, Character tables and GAP. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The understanding and application the notions of the GAP working system, Programming language and Group Libraries. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics,  2. Know and apply Gap program language,  3. Know and apply Gap Share package,  4. Writing a Gap package. Know and apply GAP share package. Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | GAP reference manual. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. GAP reference manual, 2. Abstract algebra with GAP, J. Rainbolt, 2003, lecture notes, 3. Algebra interactive, Cohen, Arjeh M., Springer, 1999. (QA 155/C63). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Permutations |
| 2 | Symmetric groups |
| 3 | Cayley’s theorem |
| 4 | GAP (Group, Algortihm and Programming) system |
| 5 | GAP interface |
| 6 | Midterm Examination 1 |
| 7 | GAP program language |
| 8 | GAP functions |
| 9 | GAP share package |
| 10 | GAP share package and create new package |
| 11 | Midterm Examination 2 |
| 12 | PC groups |
| 13 | Group products in GAP |
| 14 | Group Libraries, Matrix groups, Character tables and GAP |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Ass. Prof. Alper ODABAŞ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712626 | **TITLE** | Generalized Quadrangles II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Flocks, Translation in Flocks, Flocks of cones, Semifield flocks, Eggs, Veronesean surfaces. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give generalized quadrangles and generalized quadrangles in finite projective space. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | J. A. Thas, K. Thas, H. Van Maldeghem, Translation Generalized Quadrangles, Series in Pure Mathematics Volume 26, Vorld Scientific. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Flocks |
| 2 | Flocks |
| 3 | Flocks |
| 4 | Translation in Flocks |
| 5 | Translation in Flocks |
| 6 | Midterm Examination 1 |
| 7 | Flocks of cones |
| 8 | Flocks of cones |
| 9 | Semifield flocks |
| 10 | Semifield flocks |
| 11 | Midterm Examination 2 |
| 12 | Eggs |
| 13 | Veronesean surfaces |
| 14 | Veronesean surfaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. ZİYA AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711620 | **TITLE** | Selected Topic on Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to examine selected topics with related to Projective geometry. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Content of the course is as follows: Fundamental notions of lattice theory, Projective geometries and projective lattices, Closure spaces and matroids, Dimension theory, Geometries of degree n, Morphisms of projective geometries, Embeddings and Quotient maps. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand basic concepts of Lattice theory, Understand basic concepts of Lattice theory,  2. Understand projective geometries and projective lattices, Understand projective geometries and projective lattices,  3. Have knowledge about degree of n geometries, Have knowledge about degree of n geometries,  4. Learn transformations of projective geometry. Learn transformations of projective geometry Understand various geometric structure which satisfy axioms of Euclidean geometry | | | | | | | |
| **TEXTBOOK** | | | | | 1- Krause, E. F. (1975), Taxicab Geometry, Addision-Wesley, Menlo Park, California. 2- Pitts, C. G. C. (1972), Introduction Metric Space, Oliver & Boyd Edinburgh. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Fundamental notions of lattice theory |
| 2 | Fundamental notions of lattice theory |
| 3 | Projective geometries and projective lattices |
| 4 | Projective geometries and projective lattices |
| 5 | Closure spaces and matroids |
| 6 | Midterm Examination 1 |
| 7 | Closure spaces and matroids |
| 8 | Dimension theory, Geometries of degree n |
| 9 | Dimension theory, Geometries of degree n |
| 10 | Morphisms of projective geometries |
| 11 | Midterm Examination 2 |
| 12 | Morphisms of projective geometries |
| 13 | Embeddings and Quotient maps. |
| 14 | Embeddings and Quotient maps. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Özcan Gelişgen | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711601 | **TITLE** | Selected Topic on Geometry II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to examine selected topics with related to Projective geometry. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Content of the course is as follows: Endomorphisms and the Desargues property, Homogeneous coordinates, Morphisms and semilinear maps, Duality, Related Categories, Lattices of closed subspaces, Orthogonality. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand Endomorphisms and the Desargues property, Understand Endomorphisms and the Desargues property,  2. Have knowledge about homogeneous coordinates, Have knowledge about homogeneous coordinates,  3. Learn duality and related categories, Learn duality and related categories,  4. Understand lattices of closed subspaces. | | | | | | | |
| **TEXTBOOK** | | | | | Millman, R. S., Parker, G. D. () Geometry, A metric approach with models, Springer-Verlag New York Inc. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Endomorphisms and the Desargues property |
| 2 | Endomorphisms and the Desargues property |
| 3 | Endomorphisms and the Desargues property |
| 4 | Homogeneous coordinates |
| 5 | Homogeneous coordinates |
| 6 | Midterm Examination 1 |
| 7 | Homogeneous coordinates |
| 8 | Morphisms and semilinear maps |
| 9 | Morphisms and semilinear maps |
| 10 | Morphisms and semilinear maps |
| 11 | Midterm Examination 2 |
| 12 | Duality, Related Categories |
| 13 | Lattices of closed subspaces |
| 14 | Orthogonality |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Özcan Gelişgen | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711614 | **TITLE** | MOVEMENT GEOMETRY I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1- Basic definitions and theorems related to D-Module, Quaternions theory, rotations, tranlations and screw motions,  2- Linear ray complex, linear line congruence,  3- Ruled surfaces and their dual vectorial presentation,  4- One parameter motions in D-Module and line-space,  5- Orbit surfaces, orbit curve of a fixed line in moving space, the elements of the orbit of a dual point,  6- Elements of trajectory of dual points are studied in detail,  7- Tangent, binormal and principal normal of trajectory of dual points are studied in detail. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Basic definitions and theorems related to D-Module, Quaternions theory, rotations, tranlations and screw motions, linear line complex, ruled surfaces and their dual vectorial presentation, one parameter motions in D-Module and line-space, elements of trajectory of dual points are studied in detail. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics,  2. Conduct applications as well as to analyze and interpret data,  3. Function on multi-disciplinary teams,  4. Identify, formulate, and solve mathematical problems,  5. Computer, software as contemporary methods, techniques apply to mathematics,  6. Communicate effectively ,  7. Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context,  8. Get a recognition of the need for, and an ability to engage in life-long learning,  9. Gain a knowledge of contemporary issues,  10. Develop a research skills for their dissertation. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Müller, H. R., Kinematik Dersleri, Ankara Üniversitesi Yayınları, (1963). 2- Biran, L., Kinematik, İstanbul Üniversitesi yayınları, 1949.  3- Hacısalihoğlu, H. H., Diferensiyel Geometri, Cilt I-II, Ankara, 2004.  4- Hacısalihoğlu H. H., Hareket Geometrisi ve Kuaternionlar Teorisi, Ankara, 1983. 5- R. Kaya, Lineer Cebir (Redaksiyon), Eskişehir, (2000). | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic definitions and theorems related to D-Module, Quaternions theory, rotations, tranlations and screw motions |
| 2 | Basic definitions and theorems related to D-Module, Quaternions theory, rotations, tranlations and screw motions |
| 3 | Linear ray complex, linear line congruence |
| 4 | Linear ray complex, linear line congruence |
| 5 | Ruled surfaces and their dual vectorial presentation |
| 6 | Midterm Examination 1 |
| 7 | One parameter motions in D-Module and line-space |
| 8 | One parameter motions in D-Module and line-space |
| 9 | Orbit surfaces, orbit curve of a fixed line in moving space, the elements of the orbit of a dual point |
| 10 | Orbit surfaces, orbit curve of a fixed line in moving space, the elements of the orbit of a dual point |
| 11 | Midterm Examination 2 |
| 12 | Elements of trajectory of dual points are studied in detail |
| 13 | Elements of trajectory of dual points are studied in detail |
| 14 | Tangent, binormal and principal normal of trajectory of dual points are studied in detail |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Cumali Ekici | **Date:** | 05.05.2015 |

**Signature**:

|  |  |
| --- | --- |
| **WEEK** | **TOPICS** |
| 1 | Haskell programming language |
| 2 | Types and Typeclasses |
| 3 | Syntax in Functions |
| 4 | Recursion, Higher Order Functions |
| 5 | Modules, Input and Output |
| 6 | Midterm Examination 1 |
| 7 | Functionally Solving Problems |
| 8 | Functors and Monoids |
| 9 | Monads |
| 10 | Haskell and Category Theory |
| 11 | Midterm Examination 2 |
| 12 | Haskell and Category Theory |
| 13 | Haskell and Category Theory |
| 14 | Haskell and Category Theory |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist. Prof. Alper ODABAŞ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711607 | **TITLE** | Homological Algebra |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Presenting main concepts and techniques in the content of the lesson, improving students’ Homological Algebra knowledge by practising these concepts and techniques. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Tensor Products, Free Modules, Projective Modules, Injective Modules, Homology, Derived functors, Ext, Tor. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics, Apply knowledge of basic mathematics,  2. Understanding the notion of Tensor products, Understanding the notion of Tensor products  3. Know and apply Projective Modules, Know and apply Projective Modules,  4. Know and apply Injective Modules, Know and apply Injective Modules Know and apply Injective Modules Know and apply Injective Modules  5. Know and apply Homology, Know and apply Homology ,  6. Know and apply Ext and Tor. Know and apply Ext and Tor. | | | | | | | |
| **TEXTBOOK** | | | | | An Introduction to Homological Algebra (J.J.Rotman) Academic Pres, Inc. 1979. | | | | | | | |
| **OTHER REFERENCES** | | | | | Homological Algebra (H. Cartan & S. Elinberg) Princeton, Univ. Pres 1956. An Introduction to Homological Algebra (D.G. Northcott) Cambridge 1960. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Tensor Product |
| 2 | Tensor Product |
| 3 | Free Modules |
| 4 | Free Modules |
| 5 | Projective Modules |
| 6 | Midterm Examination 1 |
| 7 | Projective Modules |
| 8 | Injective Modules |
| 9 | Injective Modules |
| 10 | Homology |
| 11 | Midterm Examination 2 |
| 12 | Homology |
| 13 | Derived Functors |
| 14 | Ext, Tor |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Zekeriya ARVASİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712604 | **TITLE** | Homological Algebra II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) |  |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Presenting main concepts and techniques in the content of the lesson, improving students’ Homological Algebra knowledge by practising these concepts and techniques. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Integral Domains, The field of quotiens, Inversible ideals, Prüfer rings, Dedekind rings, Abelian groups, Tor1(A,C). | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics, Apply knowledge of basic mathematics,  2. Understanding the notion of Integral Domains, Understanding the notion of Integral Domains  3. Know and apply Inversible ideals, Know and apply Inversible ideals,  4. Know and apply Prüfer rings, Know and apply Prüfer rings,  5. Know and apply Dedekind rings, Know and apply Dedekind rings,  6. Know and apply Tor1(A,C). Know and apply Tor1(A,C). | | | | | | | |
| **TEXTBOOK** | | | | | An Introduction to Homological Algebra (J.J.Rotman) Academic Pres, Inc. 1979. | | | | | | | |
| **OTHER REFERENCES** | | | | | Homological Algebra (H. Cartan & S. Elinberg) Princeton, Univ. Pres 1956. An Introduction to Homological Algebra (D.G. Northcott) Cambridge 1960. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Integral Domains |
| 2 | Integral Domains |
| 3 | The Field of Quotiens |
| 4 | The Field of Quotiens |
| 5 | Inversible Ideals |
| 6 | Midterm Examination 1 |
| 7 | Inversible Ideals |
| 8 | Prüfer Rings |
| 9 | Prüfer Rings |
| 10 | Dedekind Rings |
| 11 | Midterm Examination 2 |
| 12 | Dedekind Rings |
| 13 | Abelian Groups |
| 14 | Tor1(A,C) |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Zekeriya ARVASİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712635 | **TITLE** | Homological Algebra Programming |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Examining basic algebraic structures in HAP programming. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The understanding and application the notions of the HAP pragramming. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | HAP programming on computer. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Examining HAP programming,  2. Understanding fundamental HAP functions,  3. Knowing Homology's structure,  4. Examining HAP packages. | | | | | | | |
| **TEXTBOOK** | | | | | HAP, The HAP share package, 2007, Algebra interactive, Cohen, Arjeh M., Springer, 1999. (QA 155/C63). | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. HAP reference manual, 2. HAP, The HAP Sahre Package, 2007,  3. Algebra interactive, Cohen, Arjeh M., Springer, 1999. (QA 155/C63). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Resolutions of the ground ring |
| 2 | Resolutions of the ground ring |
| 3 | Resolutions of modules |
| 4 | Resolutions of modules |
| 5 | Functors |
| 6 | Midterm Examination 1 |
| 7 | Chain complexes |
| 8 | Chain complexes |
| 9 | Homology and cohomology groups |
| 10 | Homology and cohomology groups |
| 11 | Midterm Examination 2 |
| 12 | Cohomology ring structures |
| 13 | Commutative and nonabelian tensor computations |
| 14 | Lie commutators and nonabelian Lie tensors |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist Prof. Alper ODABAŞ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711603 | **TITLE** | Advanced Integral Equations |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The defination and classifications of integral equations, converting IVP to Integral equations, converting Integral equations to ODE. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give some methods of integral equations (Fredholm integral equations, Volterra integral equations, integro-differential equations, et.al) and can solving to use for further processes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams, Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems, Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, | | | | | | | |
| **TEXTBOOK** | | | | | A.M. Wazwaz, A first course in Integral Equations, World Scientific Publishing Company, New Jersey and Singapore, 1997. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. A. Kiselev, G. Makeronko, M. Krasnov, Çeviri: Cevdet Cerit, İntegral Denklemler, Alfa Yayınları, İstanbul, 1976 2. A. D. Polyanin, A. V. Manzhirov, Handbook of Integral Equations, Chapman & Hall/CRC Press, 2008 | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The defination and classifications of integral equations. |
| 2 | Converting IVP to Integral equations. |
| 3 | Converting Integral equations to ODE. |
| 4 | Convolution type integral equations. |
| 5 | Fixed and dejenerate kernal integral equations and solutions. |
| 6 | Midterm Examination 1 |
| 7 | Successive approximations method, Adomian decomposition method, Modified decomposition method. |
| 8 | Series solution method for Volterra integral equations. |
| 9 | Solution method for Fredholm integral equations. |
| 10 | İntegro-differential equations. |
| 11 | Midterm Examination 2 |
| 12 | Volterra integro- differential equations and Fredholm integro- differential equations. |
| 13 | Singular integral equations. |
| 14 | Nonlinear integral equations. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ahmet Bekir | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711606 | **TITLE** | Advanced Taxicab Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 3 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to introduce Taxicab Geometri that is one of models of Non-Euclidean Geometry. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Content of the course is as follows: Foundations of taxicab plane geometry, Distance formulas in the taxicab geometry, Conics in the taxicab geometry, Applications of taxicab geometry to the daily life (Communication, transportation, distribution nets of water electricity roads ect.), Taxicab geometry and Euclidean geometry compared. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand Taxicab geometry that is Non-Euclidean Geometry, Understand Taxicab geometry that is Non-Euclidean Geometry,  2. Learn conics in the taxicab geometry, Learn conics in the taxicab geometry,  3. Know applications of taxicab geometry to the daily life, Know applications of taxicab geometry to the daily life,  4. Compare Taxicab geometry and Euclidean geometry. Compare Taxicab geometry and Euclidean geometry. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Krause, E. F. (1975), Taxicab Geometry, Addision-Wesley, Menlo Park, California. 2- Pitts, C. G. C. (1972), Introduction Metric Space, Oliver & Boyd Edinburgh. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Foundations of taxicab plane geometry |
| 2 | Foundations of taxicab plane geometry |
| 3 | Foundations of taxicab plane geometry |
| 4 | Distance formulas in the taxicab geometry |
| 5 | Distance formulas in the taxicab geometry |
| 6 | Midterm Examination 1 |
| 7 | Distance formulas in the taxicab geometry |
| 8 | Conics in the taxicab geometry |
| 9 | Conics in the taxicab geometry |
| 10 | Conics in the taxicab geometry |
| 11 | Midterm Examination 2 |
| 12 | Applications of taxicab geometry to the daily life (Communication, transportation, distribution nets of water electricity roads ect.) |
| 13 | Taxicab geometry and Euclidean geometry compared |
| 14 | Taxicab geometry and Euclidean geometry compared |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist. Prof. Temel ERMİŞ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712608 | **TITLE** | Advanced Taxicab Geometry II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to learn detailed knoewledge with related to Taxicab geometry. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Isometries of taxicab geometry, Taxicab trigonometry, Taxicab spaces of dimension n, Inner product and Norm in the taxicab spaces, Taxicab analogous of the theorems of Euclidean geometry. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand isometries of taxicab geometry, Understand isometries of taxicab geometry,  2. Learn Taxicab trigonometry, Learn Taxicab trigonometry,  3. Study on taxicab space of higher dimension , Study on taxicab space of higher dimension ,  4. Know Taxicab analogous of the theorems of Euclidean geometry. Know Taxicab analogous of the theorems of Euclidean geometry. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Krause, E. F. (1975), Taxicab Geometry, Addision-Wesley, Menlo Park, California. 2- Pitts, C. G. C. (1972), Introduction Metric Space, Oliver & Boyd Edinburgh. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Isometries of taxicab geometry, |
| 2 | Isometries of taxicab geometry, |
| 3 | Isometries of taxicab geometry, |
| 4 | Taxicab trigonometry |
| 5 | Taxicab trigonometry |
| 6 | Midterm Examination 1 |
| 7 | Taxicab trigonometry |
| 8 | Taxicab spaces of dimension n |
| 9 | Taxicab spaces of dimension n |
| 10 | Taxicab spaces of dimension n |
| 11 | Midterm Examination 2 |
| 12 | Inner product and Norm in the taxicab spaces |
| 13 | Taxicab analogous of the theorems of Euclidean geometry |
| 14 | Taxicab analogous of the theorems of Euclidean geometry |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist. Prof. Temel Ermiş | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712633 | **TITLE** | The selected subjects in finite projective spaces II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | |  |  | | | 3 |  | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Türkisch |
| **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 | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Quadrics, Hermitian Varieties, Grassmann Varieties, Veronese and Segre Varieties in Finite Projective Spaces II | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to review and comment on issues of high-dimensional projective spaces | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | General Galois Geometries, J.W.P. Hirschfeld | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Canonical Forms |
| 2 | İnvariants |
| 3 | Generators |
| 4 | the characterization of quadrics |
| 5 | Tangency and polarity |
| 6 | Midterm Examination 1 |
| 7 | the characterization of hermitian varietes |
| 8 | the characterization of projections of quadrics |
| 9 | Plücker ve Grassman coordinates |
| 10 | Grassman varieties and its characterization |
| 11 | Midterm Examination 2 |
| 12 | Veronese varieties and its characterization |
| 13 | Segre varieties and its characterization |
| 14 | Polar spaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof.Dr. Süheyla Ekmekçi | **Date:** | 25/11/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712606 | **TITLE** | Integrable Systems II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course to explain the problems that appear in mathematical modelling of some physical , chemical and biological formations are not solvable. Our aims are to determine these problems which we can face with, in various fields are solvable or not. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course to explain the problems that appear in mathematical modelling of a lot of physical , chemical and biological formations are not solvable. Our aims are to determine these problems which we can face with, in various fields are solvable or not. Then to solve using perturbation methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Appreciate the alternative methods for solving PDEs,  2. To understand the solvability of PDEs,  3. Be conversant with mathematics in the other science (engineering, physics),  4. Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **TEXTBOOK** | | | | | 1- M.N. Özer, Related Integrable Hamiltonian Systems.(PhD),  2- A.P. Fordy, Soliton Theory:a survey of result, 3- E.J. Hinch, Perturbation Methods. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- V.I. Arnold, Mathematical Methods of Classical Mechanics. 2- F.Taşcan, İntegrallenebilirlik ve Pertürbasyon Teori(PhD). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 2 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 3 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 4 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 5 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 6 | Midterm Examination 1 |
| 7 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 8 | Content of the course is as follows: Solving PDEs using multiple-scale methods, |
| 9 | Normal Forms |
| 10 | Normal Forms |
| 11 | Midterm Examination 2 |
| 12 | Normal Forms |
| 13 | Normal Forms |
| 14 | Normal Forms |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Mehmet Naci ÖZER | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711629 | **TITLE** | Isometries I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In plane euclidean geometry, reflections, congruence and isometries, symmetry groups, translations, rotations, glide reflections, structure of the symmetry group, fixed points and fixed lines of isometries, affine transformations, the affine group AF(2), affine reflections, affine symmetries, symmetries of a segment, symmetries of an angle, symmetries of a triangle. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to introduce students to obtain information about isometries and understand works about isometries. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advance knowledge about a subdomain of mathematics and computer sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- Learn reflections, congruence,  2- Isometries in plane euclidean geometry,  3- Construct symmetry groups,  4- Learn structure of isometric group. | | | | | | | |
| **TEXTBOOK** | | | | | Patrick J. Ryan (1986),Euclidean and non-euclidean Geometry. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | In plane euclidean geometry |
| 2 | Reflections |
| 3 | Congruence and isometries |
| 4 | Symmetry groups |
| 5 | Translations, rotations, glide reflections |
| 6 | Midterm Examination 1 |
| 7 | Structure of the symmetry group |
| 8 | Fixed points and fixed lines of isometries |
| 9 | Affine transformations |
| 10 | The affine group AF(2) |
| 11 | Midterm Examination 2 |
| 12 | Affine reflections, affine symmetries |
| 13 | Affine symmetries of a segment |
| 14 | Affine symmetries of a triangle |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Süheyla EKMEKÇİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712614 | **TITLE** | Isometries II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Cyclic and dihedral groups, conjugate subgroups, regular polygons, symmetry of regular polygons, incidence geometry of sphere, finite rotation groups, finite groups of isometries of S2. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To introduce students to obtain information about isometries and understand works about isometries in upper level. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advance knowledge about a subdomain of mathematics and computer sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1- Learn cyclic and dihedral groups,  2- Determine conjugate subgroups,  3- Learn regular polygons,  4- Find symmetries of regular polygons. | | | | | | | |
| **TEXTBOOK** | | | | | Patrick J. Ryan (1986), Euclidean and non-euclidean Geometry. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Cyclic and dihedral groups |
| 2 | Conjugate subgroups |
| 3 | Regular polygons |
| 4 | Regular polygons |
| 5 | Symmetry of regular polygons |
| 6 | Midterm Examination 1 |
| 7 | Symmetry of regular polygons |
| 8 | Incidence geometry of sphere |
| 9 | Incidence geometry of sphere |
| 10 | Finite rotation groups |
| 11 | Midterm Examination 2 |
| 12 | Finite rotation groups |
| 13 | Finite groups of isometries of S2 |
| 14 | Finite groups of isometries of S2 |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Süheyla EKMEKÇİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712603 | **TITLE** | Fractional Differential Equations |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Special functions of the fractional calculus, Fractional integrals and Fractional derivatives, Ordinary Fractional differential equations and existence and uniqueness theorems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give defination and classifications of fractional differential equations and this equations can solving to use for further processes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams, Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems, Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, | | | | | | | |
| **TEXTBOOK** | | | | | I. Podlubny, Fractional Differential Equations, Volume 198: An Introduction to Fractional Derivatives, Fractional Differential Equations, to Methods of Their Solution and Some of Their Applications, Academic Prees,1999. | | | | | | | |
| **OTHER REFERENCES** | | | | | A.A. Kilbas, H.M. Srivastava, J.J. Trujillo, Theory and applications of fractional differential equations, Elsevier, 2006. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Special functions of the fractional calculus, Fractional integrals and Fractional derivatives, Ordinary Fractional differential equations and existence and uniqueness theorems. |
| 2 | Special functions of the fractional calculus. |
| 3 | Special functions of the fractional calculus. |
| 4 | Fractional integrals and Fractional derivatives. |
| 5 | Fractional integrals and Fractional derivatives. |
| 6 | Midterm Examination 1 |
| 7 | Ordinary Fractional differential equations and existence and uniqueness theorems. |
| 8 | Ordinary Fractional differential equations and existence and uniqueness theorems. |
| 9 | Ordinary Fractional differential equations and existence and uniqueness theorems. |
| 10 | Solutions of Fractional differential equations. |
| 11 | Midterm Examination 2 |
| 12 | Solutions of Fractional differential equations. |
| 13 | Numerical solutions of Fractional differential equations. |
| 14 | Numerical solutions of Fractional differential equations. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ahmet Bekir | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712634 | **TITLE** | Theory of Partial Differential Equations |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | | 1 | | 25 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Theory of Partial Differential Equations | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain knowledge of solution of partial differential equations and their physical applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about Mathematics and applied science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn physical problems in applied science,  2. Examining partial diferential equations,  3. Analysis theoritical structure,  4. Understanding the solition process. | | | | | | | |
| **TEXTBOOK** | | | | | Lokenath Debnath, Nonlinear Partial Differential equations for Scientists and Engineers, Birkhauser. | | | | | | | |
| **OTHER REFERENCES** | | | | | Notes on internet. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction |
| 2 | First order linear partial differential equations |
| 3 | First order nonlinear partial differential equations |
| 4 | Application of first order linear Partial differential equations |
| 5 | Application of first order linear Partial differential equations |
| 6 | Midterm Examination 1 |
| 7 | Second order linear partial differential equations |
| 8 | Canonical form |
| 9 | parabolic,elliptic and hyperbolic equations |
| 10 | parabolic,elliptic and hyperbolic equations |
| 11 | Midterm Examination 2 |
| 12 | Initial value problems |
| 13 | Initial value problems |
| 14 | Boundary value problems |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Dursun IRK | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712601 | **TITLE** | Numerical solutions of the partial differantial equations II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Kısmi Türevli Diferensiyel Denklemlerinin Sonlu Elemanlar metodları ile yaklasık çözümleri anlatılacaktır. Numerical solutions of the partial diferential equations using the finite element methods are thought. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Ability to solve partial differential equations which are met in applied sciences. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Produce approximate solutions to the partial diffrential equations and design algorithm for getting the numerical solutions of the the partial differential equations. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | 1. Gaining ability to develop new finite element tecniques,  2. Write the computer codes to these tecniques,  3. Solve partial differential equations in various fields,  4. Stability and convergence of finite element methods. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **TEXTBOOK** | | | | | Finite element method J. N. Reddy. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Numerical solution of the partial differential equations by finite element method, Çlaes Johnson(Cambridge University Press). 2. Finite Element Analysis and applications R. Wait and A. R. Mitchel(Johm Wiley and Sons Publication). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Introduction to the finite element method |
| 2 | Variational methods: Rayleigh-Ritz methods , method of weighted residuals |
| 3 | Weak formulation of the boundary value problems linear and bilinear forms and quadratic functionals |
| 4 | Solutions of Second order boundary value problems using finite element method. |
| 5 | İntroduction to finite element error analysis |
| 6 | Midterm Examination 1 |
| 7 | Solutions of the time dependent problems using finite element method. |
| 8 | Numerical integration and computer implementation |
| 9 | Solutions of the two dimensional diferential equations using finite element method:model problem, discretization of problem domain, derivation of the shape functions |
| 10 | Solutions of the two dimensional diferential equations using finite element method:Weak formulation, drivation of the element matrices, assembly of element matrices , |
| 11 | Midterm Examination 2 |
| 12 | Solutions of the two dimensional diferential equations using finite element method:application of the initial and boundary conditions and writimg computer codes to the finite element algorithm. |
| 13 | Parabolic differential equations and their finite element solutions |
| 14 | Parabolic differential equations and their finite element solutions |
| 15,16 | Final Examination |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | | | **CONTRIBUTION LEVEL** | | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | | | **3**  High | | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. | | |  | |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. | | |  | |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. | | |  | |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. | | |  | |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. | | |  | |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. | | |  | |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. | | |  | |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. | | |  | |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. | | |  | |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. | | |  | |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. | | |  | |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. | | |  | |  |  |
| **Prepared by :** | | Prof. Dr. İdris Dağ | **Date:** | | 05.05.2015 | | | |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711621 | **TITLE** | Force and Motion I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Searching for the solution of the mathematical methods encountered in physics and physical interpretations of dynamic problems.Expressing the movement of particle and particle systems by different methods (Hamilton, Lagrange, Hamilton Jakobi ) and searching for the solutions. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course to explain the problems that appear in mathematical modelling of a lot of physical , chemical and biological formations are not solvable. Our aims are to determine these problems which we can face with, in various fields are solvable or not. Then to solve using perturbation methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Get an understanding of professional and ethical responsibility,  2. Identify, formulate, and solve mathematical physics problems,  3. Be conversant with mathematics in the other science (engineering, physics),  4. Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **TEXTBOOK** | | | | | 1. M.N. Özer, Related Integrable Hamiltonian Systems.(PhD),  2. A.P. Fordy, Soliton Theory:a survey of result, 3. M. Spiegel, Theoretical Mechanics. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. D. A. Wells, Langrangian Dynamics. 2. F.Taşcan, İntegrallenebilirlik ve Pertürbasyon Teori(PhD).  3. A. Y. Özemre, Klasik Teorik Mekanik. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Evaluation equations |
| 2 | Evaluation equations |
| 3 | Conservation laws |
| 4 | Conservation laws |
| 5 | Conservation laws |
| 6 | Midterm Examination 1 |
| 7 | Recursion operator |
| 8 | Hamiltonian |
| 9 | Lagrangian |
| 10 | Hamilton Jakobi equation |
| 11 | Midterm Examination 2 |
| 12 | Hamilton Jakobi equation |
| 13 | Poisson Bracket |
| 14 | Liouville's Theorem |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Mehmet Naci ÖZER | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712625 | **TITLE** | Force and Motion II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The course provides an overview of perturbation theory, integral transformations, ordinary and partial differential equations with applications to various physics problems. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course to explain the problems that appear in mathematical modelling of a lot of physical , chemical and biological formations are not solvable. Our aims are to determine these problems which we can face with, in various fields are solvable or not. Then to solve using perturbation methods. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Get an understanding of professional and ethical responsibility,  2. Identify, formulate, and solve mathematical physics problems,  3. Be conversant with mathematics in the other science (engineering, physics)  4.Design and conduct experiments as well as to analyze and interpret data. | | | | | | | |
| **TEXTBOOK** | | | | | 1- M.N. Özer, Related Integrable Hamiltonian Systems.(PhD)  2- A.P. Fordy, Soliton Theory:a survey of result. 3- A. Mous, A Short Introduction to Theoretical Mechanics. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- J. Marsden, Introduction to Mechanics and Symmetry. 2- F.Taşcan, İntegrallenebilirlik ve Pertürbasyon Teori(PhD).  3- A. Y. Özemre, Klasik Teorik Mekanik. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The Laws of Motion |
| 2 | The Laws of Motion |
| 3 | Generalized Coordinate Systems |
| 4 | Generalized Coordinate Systems |
| 5 | Vector Analysis |
| 6 | Midterm Examination 1 |
| 7 | Vector Analysis |
| 8 | Intecrating Systems of Rigid Bodies |
| 9 | Intecrating Systems of Rigid Bodies |
| 10 | Momentum Maps |
| 11 | Midterm Examination 2 |
| 12 | Momentum Maps |
| 13 | Introduction to Lie Algebras |
| 14 | Introduction to Lie Algebras |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Mehmet Naci ÖZER | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712628 | **TITLE** | LIGTHLIKE HYPERSURFACES |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Semi -Euclidean Spaces, Semi-Reimannian Manifolds,Lightlike Manifolds,the induced geometrical on a lightlike hypersurfaces,the Gauss-Codazzi equations for a lightlike hypersurfaces,Lightlike hypersurfaces of semi-Euclidean spaces. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Semi -Euclidean Spaces, Semi-Reimannian Manifolds, Lightlike Manifolds, The induced geometrical on a lightlike hypersurface, The Gauss -Codazzi equations for lightlike hypersurfaces,The fundemantel theorem for lightlike hypersurfaces, Totally umbilical lightlike hypersurfaces, Lightlike hypersurfaces of semi-Euclidean spaces. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics, Apply knowledge of basic mathematics,  2. Conduct applications as well as to analyze and interpret data, Conduct applications as well as to analyze and interpret data  3. Function on multi-disciplinary teams, Function on multi-disciplinary teams  4. Identify, formulate, and solve mathematical problems, Identify, formulate, and solve mathematical problems  5. Computer, software as contemporary methods, techniques apply to mathematics, Computer, software as contemporary methods, techniques apply to mathematics  6. Communicate effectively, Communicate effectively  7. Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context, Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context  8. Get a recognition of the need for, and an ability to engage in life-long learning, Get a recognition of the need for, and an ability to engage in life-long learning  9. Gain a knowledge of contemporary issues, Gain a knowledge of contemporary issues  10. Develop a research skills for their dissertation. Develop a research skills for their dissertation | | | | | | | |
| **TEXTBOOK** | | | | | K.L. Duggal and A. Bejancu, Lightlike Submanifolds of Semi-Riemannian Manifolds and Applications. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- B. O'Neill, Elementary Differential Geometry, Academic Press Inc., London (1966).  2- Hacısalihoğlu, H. H., Diferensiyel Geometri, Cilt I, Ankara Üniversitesi, Fen Fakültesi Yayınları, 1998.  3- Hacısalihoğlu H. H., Diferensiyel Geometri, Cilt II, Ankara Üniversitesi, Fen Fakültesi Yayınları, 2000. 4- Sabuncuoğlu, A., Diferensiyel Geometri, Nobel Yayınevi, 2001. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Semi -Euclidean Spaces, Semi-Reimannian Manifolds |
| 2 | Semi -Euclidean Spaces, Semi-Reimannian Manifolds |
| 3 | Lightlike Manifolds |
| 4 | Lightlike Manifolds |
| 5 | The induced geometrical on a lightlike hypersurfaces |
| 6 | Midterm Examination 1 |
| 7 | The Gauss-Codazzi equations for a lightlike hypersurfaces |
| 8 | The Gauss-Codazzi equations for a lightlike hypersurfaces |
| 9 | The Gauss-Codazzi equations for a lightlike hypersurfaces |
| 10 | The Gauss-Codazzi equations for a lightlike hypersurfaces |
| 11 | Midterm Examination 2 |
| 12 | The Gauss-Codazzi equations for a lightlike hypersurfaces |
| 13 | Lightlike hypersurfaces of semi-Euclidean spaces |
| 14 | Lightlike hypersurfaces of semi-Euclidean spaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Cumali Ekici | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711627 | **TITLE** | Exact Solution Methods of Nonlinear Equations-I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The defination and classifications of nonlinear partial differential equations, the solutions and classifications of nonlinear partial differential equations. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give some methods of nonlinear equations (evolution equations, differential-difference equations, fractional order differential equations, et.al) and can solving to use for further processes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams, Function on multi-disciplinary teams.  2. Identify, formulate and solve mathematical problems, Identify, formulate and solve mathematical problems.  3. Gain a knowledge of contemporary issues,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, Gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | A.M. Wazwaz, Partial Differential Equation: Method and Applications, Balkema Publishers, Netherlands, 2002. | | | | | | | |
| **OTHER REFERENCES** | | | | | M.J. Ablowitz, P.A. Clarkson, Solitons, Nonlinear Evolution Equations and Inverse Scattering Transform, Cambridge University Press, Cambridge, 1990. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The defination and classifications of nonlinear partial differential equations, the solutions and classifications of nonlinear partial differential equations, Tanh method and applications, Sine-Cosine method and applications, rational function method and applications, (G’/G)-expansion method and applications. |
| 2 | The defination and classifications of nonlinear partial differential equations. |
| 3 | The defination and classifications of nonlinear partial differential equations. |
| 4 | The solutions and classifications of nonlinear partial differential equations. |
| 5 | The solutions and classifications of nonlinear partial differential equations. |
| 6 | Midterm Examination 1 |
| 7 | The solutions and classifications of nonlinear partial differential equations. |
| 8 | Tanh method and applications. |
| 9 | Tanh method and applications. |
| 10 | Sine-Cosine method and applications. |
| 11 | Midterm Examination 2 |
| 12 | Sine-Cosine method and applications. |
| 13 | Rational function method and applications, (G’/G)-expansion method and applications. |
| 14 | Rational function method and applications, (G’/G)-expansion method and applications. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ahmet Bekir | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712617 | **TITLE** | Exact Solution Methods of Nonlinear Equations-II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The defination and classifications of nonlinear partial differential equations, the solutions and classifications of nonlinear partial differential equations, Extended tanh method and applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give some methods of nonlinear equations (evolution equations and systems, differential-difference equations, fractional order differential equations, et.al) and can solving to use for further processes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams, Function on multi-disciplinary teams.  2. Identify, formulate and solve mathematical problems, Identify, formulate and solve mathematical problems.  3. Gain a knowledge of contemporary issues,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, Gain a knowledge of contemporary issues. | | | | | | | |
| **TEXTBOOK** | | | | | A.M. Wazwaz, Partial Differential Equation: Method and Applications, Balkema Publishers, Netherlands, 2002. | | | | | | | |
| **OTHER REFERENCES** | | | | | M.J. Ablowitz, P.A. Clarkson, Solitons, Nonlinear Evolution Equations and Inverse Scattering Transform, Cambridge University Press, Cambridge, 1990. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The defination and classifications of nonlinear partial differential equations. |
| 2 | The solutions and classifications of nonlinear partial differential equations. |
| 3 | Extended tanh method and applications. |
| 4 | Extended tanh method and applications. |
| 5 | Exp-function method and applications. |
| 6 | Midterm Examination 1 |
| 7 | Exp-function method and applications. |
| 8 | Sech-Cosech method. |
| 9 | Sech-Cosech method. |
| 10 | Jacobi elliptic function method. |
| 11 | Midterm Examination 2 |
| 12 | Jacobi elliptic function method. |
| 13 | Riccati equation expansion method. |
| 14 | Riccati equation expansion method. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ahmet Bekir | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712610 | **TITLE** | Lorentzian Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Two dimensional Lorentz space, Lorentz metric, Lorentz inner product, vectors and causal of curves in this space, Timecone and angle concept in Lorentz space,to give vector product and its property with similar concepts in Minkowski 3-space,to express causal of surface and to introduce some geometric property of timelike surface. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Two dimensional Lorentz space, Lorentz metric, Lorentz inner product, vectors and causal of curves in this space, timecone and angle concept in Lorentz space. Then also, to give vector product and its property with similar concepts in Minkowski 3-space. Moreover, to express causal of surface and to introduce some geometric property of timelike surface. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics, Apply knowledge of basic mathematics,  2. Conduct applications as well as to analyze and interpret data, Conduct applications as well as to analyze and interpret data  3. Function on multi-disciplinary teams, Function on multi-disciplinary teams  4. Identify, formulate, and solve mathematical problems, Identify, formulate, and solve mathematical problems  5. Computer, software as contemporary methods, techniques apply to mathematics, Computer, software as contemporary methods, techniques apply to mathematics  6. Communicate effectively, Communicate effectively  7. Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context, Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context  8. Get a recognition of the need for, and an ability to engage in life-long learning, Get a recognition of the need for, and an ability to engage in life-long learning  9. Gain a knowledge of contemporary issues, Gain a knowledge of contemporary issues  10. Develop a research skills for their dissertation. Develop a research skills for their dissertation | | | | | | | |
| **TEXTBOOK** | | | | | B. O'Neill, Semi-Riemannian Geometry with Applications to Relativity, Academic Press Inc., London (1983). | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- H. H. Uğurlu, A. Çalışkan, Darboux Ani Dönme vektörleri ile Spacelike ve Timelike Yüzeyler Geometrisi, Ders Notu.  2- Hacısalihoğlu, H. H., Diferensiyel Geometri, Cilt I-II, Ankara Üniversitesi, Fen Fakültesi Yayınları, 1993.  3- Ergin, A. A., Lorentz Düzleminde Kinematik Geometri, Doktora Tezi, Ankara, 1989. 4- Lecture Notes On Lorentzian Geometry. 5- Turgut A., 3-Boyutlu Minkowski uzayında Timleke ve Spacelike Regle Yüzeyler, Doktora Tezi, Ankara, 1995. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Two dimensional Lorentz space |
| 2 | Two dimensional Lorentz space |
| 3 | Lorentz metric |
| 4 | Lorentz inner product |
| 5 | Vectors and causal of curves in two dimensional Lorentz space |
| 6 | Midterm Examination 1 |
| 7 | Timecone and angle concept in Lorentz space |
| 8 | Timecone and angle concept in Lorentz space |
| 9 | To give vector product and its property with similar concepts in Minkowski 3-space |
| 10 | To give vector product and its property with similar concepts in Minkowski 3-space |
| 11 | Midterm Examination 2 |
| 12 | To express causal of surface |
| 13 | introduce some geometric property of timelike surface |
| 14 | introduce some geometric property of timelike surface |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Cumali Ekici | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501602616 | **TITLE** | Mathematical Modelling II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Non | | | | | | | |
| **SHORT COURSE CONTENT** | | | | |  | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to give an introduction to mathematical modelling subjects which are form the connecting tissue between the real life problems which we want to solve and quantitative analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | \_\_\_ | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Identify of model, mathematical models, modeling and mathematical modeling and to recognize the mathematical modeling process.  2.Ability to solve mathematical modeling for different real-life problems  3.To create real-life problems that require mathematical modeling and Analyzing  4.To benefit from the technology of mathematical modeling process | | | | | | | |
| **TEXTBOOK** | | | | | Mathematical Biology, Jeffrey R. Chasnov, Lecture notes for MATH 365 | | | | | | | |
| **OTHER REFERENCES** | | | | | Lecture Notes in Mathematical Biology, Eduardo D. Sontag, Rutgers University | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Population Dynamics |
| 2 | Population Dynamics |
| 3 | Age-structured Populations |
| 4 | Age-structured Populations |
| 5 | Stochastic Population Growth |
| 6 | Midterm Examination 1 |
| 7 | Infectious Disease Modeling |
| 8 | Growth of Tumours |
| 9 | Population Genetics |
| 10 | Population Genetics |
| 11 | Midterm Examination 2 |
| 12 | Biochemical Reactions |
| 13 | Cell motion |
| 14 | Sequence Alignment, DNA |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. İdiris Dağ | **Date:** | 25/08/2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711619 | **TITLE** | Metric Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 20 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to introduce fundemental topics and concepts of Euclidean geometry and metric geometries. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Content of the course is as follows: Definitions and models of incidence geometry, Metric geometry, Special coordinate systems, An alternative description of the Cartesian plane, Betweenness, Line segments and rays, Angles and triangle, The plane separation axiom, Plane separation axiom for the Euclidean and Poincare planes, Pasch geometries, The crossbar theorem, Convex quadrilateral, The measure of an angle, The Moulton plane, Euclidean and Poincare angle measure. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand models of incidence geometry, Understand models of incidence geometry,  2. Have knowledge about metric geometries, Have knowledge about metric geometries,  3. Learn axioms of Euclidean geometry, Learn axioms of Euclidean geometry,  4. Understand various geometric structure which satisfy axioms of Euclidean geometry. Understand various geometric structure which satisfy axioms of Euclidean geometry | | | | | | | |
| **TEXTBOOK** | | | | | Millman, R. S., Parker, G. D. () Geometry, A metric approach with models, Springer-Verlag New York Inc. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Definitions and models of incidence geometry |
| 2 | Metric geometry |
| 3 | Special coordinate systems |
| 4 | An alternative description of the Cartesian plane, Betweenness, Line segments and rays |
| 5 | Angles and triangle |
| 6 | Midterm Examination 1 |
| 7 | The plane separation axiom |
| 8 | Plane separation axiom for the Euclidean and Poincare planes |
| 9 | Pasch geometries |
| 10 | The crossbar theorem |
| 11 | Midterm Examination 2 |
| 12 | Convex quadrilateral |
| 13 | The measure of an angle |
| 14 | The Moulton plane, Euclidean and Poincare angle measure |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Özcan Gelişgen | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712621 | **TITLE** | Metric Geometry II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The main of the course is to introduce fundemental topics and concepts of Euclidean geometry and metric geometries. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The side-angle-side axiom, Basic triangle congruence theorems, The exterior angle theorem and its consequences, Right triangles, Circles and their tangent lines, Two circle theorem, The synthetic approach, The existence of parallel lines, Saccheri quadrilaterals, The critical function, Asymptotic rays and triangles, Angle sum and the defect of a triangle, The distance between parallel lines. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand Pacsh geometry, Understand Pacsh geometry,  2. Understand Neutral geometry, Understand Neutral geometry,  3. Learn right triangles, circles and their tangent lines, Learn right triangles, circles and their tangent lines,  4. Have knowledge about axiom of parallelness. Have knowledge about axiom of parallelness Understand various geometric structure which satisfy axioms of Euclidean geometry | | | | | | | |
| **TEXTBOOK** | | | | | Millman, R. S., Parker, G. D. () Geometry, A metric approach with models, Springer-Verlag New York Inc. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | The side-angle-side axiom |
| 2 | Basic triangle congruence theorems, The exterior angle theorem and its consequences, Right triangles |
| 3 | Circles and their tangent lines, Two circle theorem |
| 4 | The synthetic approach |
| 5 | The existence of parallel lines |
| 6 | Midterm Examination 1 |
| 7 | Saccheri quadrilaterals |
| 8 | The critical function |
| 9 | Asymptotic rays and triangles |
| 10 | Angle sum and the defect of a triangle |
| 11 | Midterm Examination 2 |
| 12 | Angle sum and the defect of a triangle |
| 13 | The distance between parallel lines. |
| 14 | The distance between parallel lines. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Özcan Gelişgen | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711611 | **TITLE** | Miniquaternion Geometry I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1. Near field of order 9,  2. Miniquaternion system,  3. Collinations of projective plane of order 9. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To obtain information about projective planes of order 9 | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learn the near field of order 9,  2. To obtain Miniquaternion system,  3. Find the collinations of projective plane of order 9. | | | | | | | |
| **TEXTBOOK** | | | | | T. G. Room and P. B. Kirkpatrick., Miniquaternion geometry. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Near field of order 9 |
| 2 | Near field of order 9 |
| 3 | Near field of order 9 |
| 4 | Near field of order 9 |
| 5 | Miniquaternion systems |
| 6 | Midterm Examination 1 |
| 7 | Miniquaternion systems |
| 8 | Miniquaternion systems |
| 9 | Miniquaternion systems |
| 10 | Collinations of projective plane of order 9 |
| 11 | Midterm Examination 2 |
| 12 | Collinations of projective plane of order 9 |
| 13 | Collinations of projective plane of order 9 |
| 14 | Solving problems. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ziya AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711631 | **TITLE** | SELECTING SUBJECTS IN MINKOWSKI SPACE I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | The basic definitions and theorems known for Minkowski space, theory of ruled surfaces, curves and surfaces, searching papers related to this subject, found papers must be selected by students , recent papers about this subjects are studied in detail | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course provides the basic definitions and theorems known for Minkowski space, theory of ruled surfaces, curves and surfaces for the students. Also having found by searching papers related to this subject, recent papers about this subjects are studied in detail. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics,  2. Conduct applications as well as to analyze and interpret data,  3. Function on multi-disciplinary teams,  4. Identify, formulate, and solve mathematical problems,  5. Computer, software as contemporary methods, techniques apply to mathematics,  6. Communicate effectively,  7. Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context,  8. Get a recognition of the need for, and an ability to engage in life-long learning,  9. Gain a knowledge of contemporary issues,  10. Develop a research skills for their dissertation. | | | | | | | |
| **TEXTBOOK** | | | | | O’Neill, B., Semi-Riemannin Geometry, New york london, 1983. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Beem, K. J., Ehrlich, E. P., Global Lorentzian Geometry, New York and Basel, 1981. 2. Hacısalihoğlu, H. H., Diferensiyel Geometri I-II-III, Ankara, 2004. 3. Hacısalihoğlu, H. H., Hareket Geometrisi ve Kuaternionlar Teorisi, Ankara, 1983. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Minkowski space |
| 2 | Minkowski space |
| 3 | theory of ruled surfaces |
| 4 | theory of ruled surfaces |
| 5 | theory of ruled surfaces |
| 6 | Midterm Examination 1 |
| 7 | Recent papers about this subjects are studied in detail |
| 8 | Recent papers about this subjects are studied in detail |
| 9 | Recent papers about this subjects are studied in detail |
| 10 | Recent papers about this subjects are studied in detail |
| 11 | Midterm Examination 2 |
| 12 | Recent papers about this subjects are studied in detail |
| 13 | Recent papers about this subjects are studied in detail |
| 14 | Recent papers about this subjects are studied in detail |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Cumali Ekici | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712631 | **TITLE** | SELECTING SUBJECTS IN MINKOWSKI SPACE II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Türkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1- Basic definitions and theorems related to Minkowski space,  2- Known for curves and surfaces curvatures,  3- Theory of surfaces, surfaces elements and fundamental forms,  4- Curvatures of surfaces and Gauss map, ruled and revelation surfaces,  5- Minimal surfaces, surfaces and hypersurfaces in Minkowski space,  6- Having found by searching papers related to this subject,  7- Recent papers about this subjects are studied in detail the five-six articles. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course provides the basic definitions and theorems related to Minkowski space, theory of surfaces, surfaces elements and fundamental forms, curvatures of surfaces and Gauss map, ruled and revelation surfaces, minimal surfaces, surfaces and hypersurfaces in Minkowski space. Also having found by searching papers related to this subject, recent papers about this subjects are studied in detail. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply knowledge of basic mathematics,  2. Conduct applications as well as to analyze and interpret data,  3. Function on multi-disciplinary teams,  4. Identify, formulate, and solve mathematical problems,  5. Computer, software as contemporary methods, techniques apply to mathematics,  6. Communicate effectively,  7. Understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context,  8. Get a recognition of the need for, and an ability to engage in life-long learning,  9. Gain a knowledge of contemporary issues,  10. Develop a research skills for their dissertation. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Müller, H. R., Kinematik Dersleri, Ankara Üniversitesi Yayınları, (1963). 2- Biran, L., Kinematik, İstanbul Üniversitesi yayınları, 1949. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. O’Neill, B., Semi-Riemannin Geometry, New york london, 1983. 2. Beem, K. J., Ehrlich, E. P., Global Lorentzian Geometry, New York and Basel, 1981. 3. Hacısalihoğlu, H. H., Diferensiyel Geometri I-II-III, Ankara, 2004. 4. Hacısalihoğlu, H. H., Hareket Geometrisi ve Kuaternionlar Teorisi, Ankara, 1983. 5- R. Kaya, Lineer Cebir (Redaksiyon), Eskişehir, (2000). | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic definitions and theorems related to Minkowski space, |
| 2 | Basic definitions and theorems related to Minkowski space, |
| 3 | Known for curves and surfaces curvatures |
| 4 | Known for curves and surfaces curvatures |
| 5 | Theory of surfaces, surfaces elements and fundamental forms, |
| 6 | Midterm Examination 1 |
| 7 | Curvatures of surfaces and Gauss map, ruled and revelation surfaces, |
| 8 | Curvatures of surfaces and Gauss map, ruled and revelation surfaces, |
| 9 | Minimal surfaces, surfaces and hypersurfaces in Minkowski space. |
| 10 | Minimal surfaces, surfaces and hypersurfaces in Minkowski space. |
| 11 | Midterm Examination 2 |
| 12 | Having found by searching papers related to this subject, |
| 13 | Recent papers about this subjects are studied in detail the five-six articles. |
| 14 | Recent papers about this subjects are studied in detail the five-six articles. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Cumali Ekici | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712636 | **TITLE** | Parallel Programming Technics |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Examining parallel programming structures. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The understanding and application the notions of the parallel pragramming.Parallel programming on computer. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Parallel programming on computer. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Examining Parallel programming,  2. Examining parallel programming platforms,  3. Understanding parallel programming notions,  4. Examining parallel programming application. | | | | | | | |
| **TEXTBOOK** | | | | | Introduction to parallel computing, Ananth Grama, Anshul Gupta,George Karypis, Vipin Kumar, 2003. | | | | | | | |
| **OTHER REFERENCES** | | | | | Introduction to parallel computing, Blaise Barney, Lawrence Livermore National Laboratory. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Architecture |
| 2 | Architecture |
| 3 | Communication |
| 4 | Communication |
| 5 | Performance |
| 6 | Midterm Examination 1 |
| 7 | Algorithms |
| 8 | Development Platforms |
| 9 | Development Platforms |
| 10 | Tools |
| 11 | Midterm Examination 2 |
| 12 | Applications |
| 13 | Monitoring |
| 14 | Project presentations |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assist Prof. Alper ODABAŞ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711625 | **TITLE** | Unitals in Projective Planes I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Nondegenerate Hermitian curves, Degenerate Hermitian curves, Unitals, Translation planes, The Bruck-Bose representation, Baer subplanes, The Bruck-Bose construction and coordinates. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give Hermitian Curves, Unitals and Translation Planes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | Susan Barwick-Gary Ebert, Unitals in Projective Planes, Springer Monographs in Mathematics. | | | | | | | |
| **OTHER REFERENCES** | | | | | None | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Nondegenerate Hermitian curves |
| 2 | Nondegenerate Hermitian curves |
| 3 | Degenerate Hermitian curves |
| 4 | Degenerate Hermitian curves |
| 5 | Unitals |
| 6 | Midterm Examination 1 |
| 7 | Translation planes |
| 8 | Translation planes |
| 9 | Spreads |
| 10 | The Bruck-Bose representation |
| 11 | Midterm Examination 2 |
| 12 | Baer subplanes |
| 13 | The Bruck-Bose construction and coordinates |
| 14 | The Bruck-Bose construction and coordinates |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. ZİYA AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712627 | **TITLE** | Unitals in Projective Planes II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Unitals in Desaguesian planes, Buekenhout constructions, Unitals in Non-Desaguesian planes, Unitals in Hall planes, Unitals in semifield planes, Unitals in Nearfield planes. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | In this lecture our aim is to give unitals in projective planes. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | Susan Barwick-Gary Ebert, Unitals in Projective Planes, Springer Monographs in Mathematics. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Unitals in Desaguesian |
| 2 | Unitals in Desaguesian |
| 3 | Buekenhout constructions |
| 4 | Unitals in Non-Desaguesian planes |
| 5 | Unitals in Non-Desaguesian planes |
| 6 | Midterm Examination 1 |
| 7 | Unitals in Hall planes |
| 8 | Unitals in Hall planes |
| 9 | Unitals in semifield planes |
| 10 | Unitals in semifield planes |
| 11 | Midterm Examination 2 |
| 12 | Unitals in Nearfield planes |
| 13 | Unitals in Nearfield planes |
| 14 | Unitals in Nearfield planes |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. ZİYA AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711623 | **TITLE** | Semiaffine Linear Spaces I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | A-semiaffine linear spaces, {0,1}-semiaffine linear spaces, {0,s,t}-semiaffine linear spaces with non-constant point degree, {s-1,s}-semiaffine linear spaces with constant point degree, {0,1,s}-semiaffine linear spaces with constant point degree, Studies on research problems on semiaffine spaces. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. To give knowledge about semiaffine linear spaces,  2. To be able to analyse the problem which are met in the theory of semiaffine linear and to gain the ability of problem solving. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To have knowledge about semiaffine linear spaces,  2.To have knowledge about projective linear spaces,  3. To have be able to analyse the problem which are met in the theory of semiaffine linear and to gain the ability of problem solving,  4. To have be able to analyse the problem which are met in the theory of projective linear spaces and to gain the ability of problem solving. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Kaya, R. (2005) Projektif Geometri, Osmangazi üniversitesi yayınları , yayın no:111, Eskişehir. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- Batten, L.M. and Beutelspacher, A. (1993). The theory of finite linear spaces, Cambridge university press. 2- Batten, L.M. (1986). Combinatorics of finite geometries, Cambridge university press. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | A-semiaffine linear spaces |
| 2 | A-semiaffine linear spaces |
| 3 | A-semiaffine linear spaces |
| 4 | A-semiaffine linear spaces |
| 5 | A-semiaffine linear spaces |
| 6 | Midterm Examination 1 |
| 7 | Studies on research problems on semiaffine spaces |
| 8 | Studies on research problems on semiaffine spaces |
| 9 | Studies on research problems on semiaffine spaces |
| 10 | Studies on research problems on semiaffine spaces |
| 11 | Midterm Examination 2 |
| 12 | Studies on research problems on semiaffine spaces |
| 13 | Studies on research problems on semiaffine spaces |
| 14 | Studies on research problems on semiaffine spaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. İbrahim Günaltılı | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712629 | **TITLE** | Semiaffine Linear Spaces II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Semiaffine linear spaces with large order, embedding linear spaces with constant point degree, embedding linear spaces with non- constant point degree, embedding (n+1,1)-designs in projective planes, characterization of semiaffine spaces, relations between graphs and linear spaces. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. To give knowledge about semiaffine linear spaces.  2. To be able to analyse the problem which are met in the theory of semiaffine linear and to gain the ability of problem solving. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To have knowledge about semiaffine linear spaces,  2. To have knowledge about affine linear spaces,  3. To have be able to analyse the problem which are met in the theory of semiaffine linear and to gain the ability of problem solving,  4. To have be able to analyse the problem which are met in the theory of affine linear and to gain the ability of problem solving. | | | | | | | |
| **TEXTBOOK** | | | | | 1- Kaya, R. (2005) Projektif Geometri, Osmangazi üniversitesi yayınları , yayın no:111, Eskişehir. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- Batten, L.M. and Beutelspacher, A. (1993). The theory of finite linear spaces, Cambridge university press. 2- Batten, L.M. (1986). Combinatorics of finite geometries, Cambridge university press. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Semiaffine linear spaces with large order |
| 2 | Semiaffine linear spaces with large order |
| 3 | Embedding linear spaces with constant point degree |
| 4 | Embedding linear spaces with constant point degree |
| 5 | Embedding linear spaces with constant point degree |
| 6 | Midterm Examination 1 |
| 7 | Embedding linear spaces with non- constant point degree |
| 8 | Embedding linear spaces with non- constant point degree |
| 9 | Embedding (n+1,1)-designs in projective planes |
| 10 | Embedding (n+1,1)-designs in projective planes |
| 11 | Midterm Examination 2 |
| 12 | Characterization of semiaffine spaces |
| 13 | Characterization of semiaffine spaces |
| 14 | Relations between graphs and linear spaces. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. İbrahim Günaltılı | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711615 | **TITLE** | Symmetries and Integrability I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 5,0 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Lie groups of transformations, Infinitesimal generators of transformations, point tranformations and prolangations, invariant solutions, Solutions of ODE under symmetries. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course to explain and to solve the problems that appear in mathematical modelling of a lot of physical , chemical and biological formations. Our aims are to determine and to solve using symmetries some ODEs and PDEs , directly or indirectly which we can face with, in various fields , to give fundamental solution method and to inform about its mathematical theory. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To improve mathematical observation and thought,  2. Appreciate the alternative methods for solving ODEs and PDEs,  3. Understanding role of Lie algebra in applied mathematics,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, | | | | | | | |
| **TEXTBOOK** | | | | | N.H. Ibragimov, Lie Group Analysisi of Differential Equations. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. G.W. Bluman, S. Kumei, Symmetries and Differential Equations. 2. G.W. Bluman, S. Anco, Symmetry and Integration Methods for Differential Equations. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Lie groups of transformations. |
| 2 | Lie groups of transformations. |
| 3 | Lie groups of transformations. |
| 4 | Infinitesimal generators of transformations. |
| 5 | Infinitesimal generators of transformations. |
| 6 | Midterm Examination 1 |
| 7 | Point tranformations and prolangations. |
| 8 | Point tranformations and prolangations. |
| 9 | Invariant solutions. |
| 10 | Invariant solutions. |
| 11 | Midterm Examination 2 |
| 12 | Solutions of ODE under symmetries. |
| 13 | Solutions of ODE under symmetries. |
| 14 | Solutions of ODE under symmetries. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Doç. Dr. Filiz Taşcan | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712612 | **TITLE** | Symmetries and Integrability II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 5,0 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 25 |
| Quiz | | | | | 1 | | 25 |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Content of the course is as follows: Solutions of higher-order ODEs under point and contact symmetries, First integrals, Symmetries of PDEs. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course to explain and to solve the problems that appear in mathematical modelling of a lot of physical , chemical and biological formations. Our aims are to determine and to solve using symmetries some ODEs and PDEs , directly or indirectly which we can face with, in various fields , to give fundamental solution method and to inform about its mathematical theory. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To improve mathematical observation and thought,  2. Appreciate the alternative methods for solving ODEs and PDEs,  3. Solutions of boundary value problem,  4. To improve mathematical observation and thought. Gain a knowledge of contemporary issues, | | | | | | | |
| **TEXTBOOK** | | | | | N.H. Ibragimov, Lie Group Analysisi of Differential Equations. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1.G.W. Bluman, S. Kumei, Symmetries and Differential Equations. 2.G.W. Bluman, S. Anco, Symmetry and Integration Methods for Differential Equations. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Solutions of higher-order ODEs under point and contact symmetries. |
| 2 | Solutions of higher-order ODEs under point and contact symmetries. |
| 3 | Solutions of higher-order ODEs under point and contact symmetries. |
| 4 | Solutions of higher-order ODEs under point and contact symmetries. |
| 5 | Solutions of higher-order ODEs under point and contact symmetries. |
| 6 | Midterm Examination 1 |
| 7 | First integrals. |
| 8 | First integrals. |
| 9 | First integrals. |
| 10 | First integrals. |
| 11 | Midterm Examination 2 |
| 12 | Symmetries of PDEs. |
| 13 | Symmetries of PDEs. |
| 14 | Symmetries of PDEs. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Doç. Dr. Filiz Taşcan | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712623 | **TITLE** | Simplicial Groups |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | | 1 | | 40 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Simplicial Objects in Algebraic Topology. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Presenting main concepts and techniques in the content of the lesson, improving students’ Simplicial Groups knowledge by practising these concepts and techniques. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To have base concept of Simplical groups,  2. To have skill of the problem analysis,  3. All this problems evaluate solution,  4. To have analytical thinking, discussion and evaluation. | | | | | | | |
| **TEXTBOOK** | | | | | Simplicial Objects in Algebraic Topology (Peter May). | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Simplicial Objects |
| 2 | Homotopy |
| 3 | Fibrations and Minimal Complexes |
| 4 | Fibrations and Minimal Complexes |
| 5 | Twisted Cartesian Product |
| 6 | Midterm Examination 1 |
| 7 | Twisted Cartesian Product |
| 8 | Eilenberg-Maclane Complexes |
| 9 | Eilenberg-Maclane Complexes |
| 10 | Postkinov Systems |
| 11 | Midterm Examination 2 |
| 12 | Postkinov Systems |
| 13 | Loop Groups |
| 14 | Tensor Product |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | : Assoc. Prof. Enver Önder USLU | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711613 | **TITLE** | Projective spaces over finite fields I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Projective spaces, the basic properties of PG (n, q), subspaces of PG (n, q), partition of PG(n, q). | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the basics of projective spaces over finite fields were constructed. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advance knowledge about a subdomain of mathematics and computer sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learning of the structure of projective spaces,  2. Learning of the structure of subspaces,  3. Learning of the structure of r-spaces,  4. PG(n,q) subspaces. | | | | | | | |
| **TEXTBOOK** | | | | | J. W. P. Hirschfeld, Projective Geometries over Finite Fields. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Projective spaces |
| 2 | Projective spaces |
| 3 | Projective spaces |
| 4 | Projective spaces |
| 5 | The basic properties of PG (n, q) |
| 6 | Midterm Examination 1 |
| 7 | The basic properties of PG (n, q) |
| 8 | The basic properties of PG (n, q) |
| 9 | The basic properties of PG (n, q) |
| 10 | Subspaces of PG (n, q) |
| 11 | Midterm Examination 2 |
| 12 | Subspaces of PG (n, q) |
| 13 | Partition of PG(n, q) |
| 14 | Partition of PG(n, q) |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Süheyla EKMEKÇİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712615 | **TITLE** | Projective spaces over finite fields II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Projective spaces arcs, ovals and blokings sets. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To teach the basics of projective spaces over finite fields were constructed. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advance knowledge about a subdomain of mathematics and computer sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Learning of Projective spaces,  2. Learning of arcs,  3. Learning of ovals ,  4. Learning of blocking sets. | | | | | | | |
| **TEXTBOOK** | | | | | J. W. P. Hirschfeld, Projective Geometries over Finite Fields. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Projective spaces |
| 2 | Projective spaces |
| 3 | Projective spaces arcs |
| 4 | Projective spaces arcs |
| 5 | Projective spaces arcs |
| 6 | Midterm Examination 1 |
| 7 | Projective spaces ovals |
| 8 | Projective spaces ovals |
| 9 | Projective spaces ovals |
| 10 | Projective spaces ovals |
| 11 | Midterm Examination 2 |
| 12 | Projective spaces blocking sets |
| 13 | Projective spaces blocking sets |
| 14 | Projective spaces blocking sets |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Süheyla EKMEKÇİ | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711624 | **TITLE** | Theoretical examine of finite element method I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Theoretical examine of finite element method. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to learn theory of the finite element method. Content of the course is as follows. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics snd Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Recognize Sobolev spaces which are one of the basic subjects of finite element theory,  2. Form variational formulation of a differential equation,  3. Learn the negative norms,  4. Do both stability analysis and convergence analysis of the finite element method (FEM) when the FEM is applied to the some partial differential equations. | | | | | | | |
| **TEXTBOOK** | | | | | Susanne C. Brenner and L. Ridgway Scott, The matematical theory of finite element method. | | | | | | | |
| **OTHER REFERENCES** | | | | | None | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Basic concepts, error estimates |
| 2 | Weak formulations of boundary value problems |
| 3 | Ritz-Galerkin approximation |
| 4 | Finite element method, local estimates, weighted norm estimates |
| 5 | Sobolev spaces, weak derivatives, trace theorem, negative norms and duality |
| 6 | Midterm Examination 1 |
| 7 | Variational formulation of elliptic boundary value problems |
| 8 | Inner production spaces, hilbert spaces |
| 9 | Projections onto subspaces |
| 10 | Triangular finite elements, quadrileteral finite elements |
| 11 | Midterm Examination 2 |
| 12 | Polynomial approximation theory in sobolev spaces, averaged Taylor polynomials and error representation |
| 13 | Bounds for the interpolation error, inverse estimates |
| 14 | N-dimension variational problems |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. İdris Dağ | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712630 | **TITLE** | Theoretical examine of finite element method II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Theoretical examine of finite element method. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to learn theory of the finite element method. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics snd Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Apply finite element multigirid method to differential equations,  2. Estimate to solution domain with curved-boundary using isoparametric elements,  3. Reduce variational crime errors which come from numerical solution obtained by finite element method,  4. Learn operator-interpolation theory,  5. Do both stability analysis and convergence analysis of the finite element method. Apply finite element multigirid method to differential equations | | | | | | | |
| **TEXTBOOK** | | | | | Susanne C. Brenner and L. Ridgway Scott, The matematical theory of finite element method. | | | | | | | |
| **OTHER REFERENCES** | | | | | None | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Susanne C. Brenner and L. Ridgway Scott, The matematical theory of finite element method |
| 2 | A model problem |
| 3 | Multigirid method, mesh-dependent norms, approximation property |
| 4 | Full multigrid convergence analysis and work estimates |
| 5 | Main theorem for max-norms estimates, reduction to weighted estimates |
| 6 | Midterm Examination 1 |
| 7 | Nonconforming finite elements, isoparametric finite elements |
| 8 | Applications to planar elasticity, mixed method, iterative techniques for mixed methods |
| 9 | Iterated penalty method, stopping criteria, applications to the Naiver-Stokes equations |
| 10 | Application of operator-interpolation theory |
| 11 | Midterm Examination 2 |
| 12 | Real method of interpolation |
| 13 | Real interpolation of sobolev spaces |
| 14 | Finite element convergence estimates, the simultaneous approximation theorem |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. İdris Dağ | **Date:** | 05.05.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711628 | **TITLE** | The Embeddings in Finite Projective Spaces I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1. Finite Affine and Projective Spaces,  2. Sub geometries of finite projective spaces,  3.Linear Embeddings,  4. Veronesean Embeddings. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To obtain information about the Embeddings in Finite Projective Spaces I. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advance knowledge about a subdomain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. Full attendance throughout the semester facilities,  5. Fulfillment of assignet tasks and term papers, use of library and computer-based facilities. | | | | | | | |
| **TEXTBOOK** | | | | | 108T340 Tubitak Project. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Finite Affine and Projective Spaces |
| 2 | Finite Affine and Projective Spaces |
| 3 | Finite Affine and Projective Spaces |
| 4 | Finite Affine and Projective Spaces |
| 5 | Sub geometries of finite projective spaces |
| 6 | Midterm Examination 1 |
| 7 | Sub geometries of finite projective spaces |
| 8 | Sub geometries of finite projective spaces |
| 9 | Linear Embeddings |
| 10 | Linear Embeddings |
| 11 | Midterm Examination 2 |
| 12 | Linear Embeddings |
| 13 | Veronesean Embeddings |
| 14 | Veronesean Embeddings |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Ayşe Bayar | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711630 | **TITLE** | The selected subjects in finite projective spaces I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 |  | COMPULSORY  ( x ) | | ELECTIVE  (   ) | turkisch |
| **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 | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 60 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In finite projective spaces coordinates, quadrics and polarities | | | | | | | |
| **COURSE OBJECTIVES** | | | | | to study, toexamine, to review and to make comments at advanced level issues in finite projective spaces. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Please write minimum four learning outcomes for the course. | | | | | | | |
| **TEXTBOOK** | | | | | Finite Projective Spaces of Three Dimensions, J.W.P. Hirschfeld | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | lines in PG(3,q) |
| 2 | lines in PG(5,q) |
| 3 | Coordinates |
| 4 | Linear Komplex |
| 5 | Polarities |
| 6 | Midterm Examination 1 |
| 7 | The representation of lines of PG(3, q) in PG(5, q) |
| 8 | Ovaloids |
| 9 | Characterization of quadrics |
| 10 | Characterization of quadrics |
| 11 | Midterm Examination 2 |
| 12 | Stereographic projection |
| 13 | Lamda-polarities |
| 14 | Lamda-polarities |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr.Süheyla Ekmekçi | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712624 | **TITLE** | Spacelike hypersurfaces Global Differantial Geometry II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | In this lecture, we will teach Omari-Yau maximum principle and applications. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Bernstein type results in Minkowski space. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To have base concept of curves and surfaces,  2. To have skill of the problem analysis,  3. All this problems evaluate solution,  4. To have analytical thinking, discussion and evaluation. | | | | | | | |
| **TEXTBOOK** | | | | | Luis Alias, Global differential geometry of spacelike hypersurfaces in spacetime, 2009, Phd lecture notes. | | | | | | | |
| **OTHER REFERENCES** | | | | | None. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Omari-Yau Maksimum principle |
| 2 | Omari-Yau Maksimum principle |
| 3 | Omari-Yau Maksimum principle |
| 4 | Bernstein type results in Minkowski space |
| 5 | Bernstein type results in Minkowski space |
| 6 | Midterm Examination 1 |
| 7 | Causality relations |
| 8 | Causality relations |
| 9 | Causality relations |
| 10 | Comparison theory for the Lorentzian distance |
| 11 | Midterm Examination 2 |
| 12 | Comparison theory for the Lorentzian distance |
| 13 | Comparison theory for the Lorentzian distance |
| 14 | Comparison theory for the Lorentzian distance |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Nevin Gürbüz | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711612 | **TITLE** | Spectral Methods and Applications |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Basis functions, types of error, Galerkin's method, Chebyshev polynomials, spectral methods, nonlinear problems, numerical experiments. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The main of the course is to give the students the solution methods for various problems, to solve of the problems by using computer programming, to provide a basis using numerical methods for solving problems which arise in applied science, to analysis and evaluate the measurement values that are obtained experimentally using numerical approaches. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Function on multi-disciplinary teams,  2. Identify, formulate and solve mathematical problems,  3. Gain a knowledge of contemporary issues,  4. The knowledge of concept of the spectral methods,  5. The skill of the adaptation, the skill which makes solving the problem using numerical approaches,  6. The skill modelling by using the fundamental mathematics and engineering. | | | | | | | |
| **TEXTBOOK** | | | | | Yakowitz,S & Szidarovszky,F.(1986).An Introducion to Numerical Computations. Macmillan Publishing Company,New York. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1- Yakowitz,S & Szidarovszky,F.(1986).An Introducion to Numerical Computations. Macmillan Publishing Company,New York. 2- Trefethen,L.N.(1996).Finite difference and Spectral Methods for Ordinary and Partial Differential Equations. Cornell University. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Function on multi-disciplinary teams |
| 2 | Function on multi-disciplinary teams |
| 3 | Identify, formulate and solve mathematical problems |
| 4 | Identify, formulate and solve mathematical problems |
| 5 | Gain a knowledge of contemporary issues |
| 6 | Midterm Examination 1 |
| 7 | The knowledge of concept of the spectral methods |
| 8 | The skill of the adaptation |
| 9 | The skill which makes solving the problem using numerical approaches |
| 10 | The skill which makes solving the problem using numerical approaches |
| 11 | Midterm Examination 2 |
| 12 | The skill modelling by using the fundamental mathematics and engineering |
| 13 | The skill modelling by using the fundamental mathematics and engineering |
| 14 | The skill modelling by using the fundamental mathematics and engineering |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Bülent SAKA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711605 | **TITLE** | Topological Groups I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 40 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | | 60 |
| **Final Examination** | | | | | | |  |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Concept covered include basic concepts of groups, topological spaces, topological groups, topological division rings, linear representations compact topological groups. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course is an introduction to Topological groups. The aim of this course is to familiarise the student with the topological groups. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Students are expected to learn how to write, in logical manner, proofs using important theorems and properties of topological groups,  2. Studends learn to solve problems using the concept of topological groups,  3. Students will be able to divise, organise and present brief solutions based on definitions and theorems of metric spaces,  4. Students who successfully complete this course should be capable of understanding the concept of groups, topological spaces, topological groups, topological division rings, linear representations compact topological groups. | | | | | | | |
| **TEXTBOOK** | | | | | Pontryagin, L.S., Topological groups, Gordon and Breach, Science Publishers, Inc. 1966. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Higgins, P,J., An Introduction to Topological groups, Cambridge University Press 1974.  2. Lipschutz, L., General Topology, Schaum's outline Series 1965. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Topological spaces |
| 2 | Topological spaces |
| 3 | Topological groups |
| 4 | Topological groups |
| 5 | Topological groups |
| 6 | Midterm Examination 1 |
| 7 | Topological division rings |
| 8 | Topological division rings |
| 9 | Topological division rings |
| 10 | Topological division rings |
| 11 | Midterm Examination 2 |
| 12 | Linear representations |
| 13 | Linear representations |
| 14 | Compact topological groups. |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Mahmut KOÇAK | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712605 | **TITLE** | Topological Groups II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( x ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| x | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Concept covered include basic concepts of locally compact commutative groups, the concept of a Lie group, structure of compact groups, locally isomorphic groups, Lie groups and Lie algebras. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | This course is an introduction to Topological groups. The aim of this course is to familiarise the student with the topological groups. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about a sub-domain of Mathematics and Computer Science. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Students are expected to learn how to write, in logical manner, proofs using important theorems and properties of topological groups,  2. Studends learn to solve problems using the concept of topological groups.  3. Students will be able to divise, organise and present brief solutions based on definitions and theorems of metric space,  4. Students who successfully complete this course should be capable of understanding the concept of locally compact commutative groups, the concept of a Lie group, structure of compact groups, locally isomorphic groups, Lie groups and Lie algebras. | | | | | | | |
| **TEXTBOOK** | | | | | Pontryagin, L.S., Topological groups, Gordon and Breach, Science Publishers, Inc. 1966. | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Higgins, P,J., An Introduction to Topological groups, Cambridge University Press 1974.  2. Lipschutz, L., General Topology, Schaum's outline Series 1965. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Locally compact commutative groups |
| 2 | Locally compact commutative groups |
| 3 | Locally compact commutative groups |
| 4 | Lie group |
| 5 | Lie group |
| 6 | Midterm Examination 1 |
| 7 | Structure of compact groups |
| 8 | Structure of compact groups |
| 9 | Locally isomorphic groups |
| 10 | Locally isomorphic groups |
| 11 | Midterm Examination 2 |
| 12 | Lie groups |
| 13 | Lie groups |
| 14 | Lie algebras |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Mahmut KOÇAK | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711632 | **TITLE** | Applied Functional Analysis I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | | 1 | | 25 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Functional analysis and applied mathematics | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to learn the concept of functional analysis and application of functional analysis. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about basic concepts, principles and methods of funcctional analysis and its applications. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Use the existing concepts in understanding the theoretical analysis of numerical and analytical solution of the differential equations,  2. Do operations on vector spaces,  3. Understand Lebesque integration,  4. Understand LP spaces. Understand Lebesque integration. | | | | | | | |
| **TEXTBOOK** | | | | | Erwin Kreyszig, Introductory Functional Analysis with Applications. | | | | | | | |
| **OTHER REFERENCES** | | | | | Notes on internet Tinsley.  Oden-Leszek F. Demkowicz, Applied functional analysis: An introduction to numerical analysis. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Metric spaces |
| 2 | Metric spaces |
| 3 | Normed spaces |
| 4 | Banach spaces |
| 5 | Problems |
| 6 | Midterm Examination 1 |
| 7 | Inner product spaces |
| 8 | Hilbert spaces |
| 9 | Fundamental theorems for normed and Banach spaces |
| 10 | Banach fixed point theorem |
| 11 | Midterm Examination 2 |
| 12 | Banach fixed point theorem |
| 13 | Approximation theory |
| 14 | Approximation theory |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Dursun Irk | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712632 | **TITLE** | Applied Functional Analysis II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 25 |
| Project | | | | | 1 | | 25 |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None. | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Functional analysis and applied mathematics. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To gain knowledge of functional analysis and its applications. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledged about basic concepts, principles and methods of functional analysis and its applications. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand functional analysis methods,  2. Learn principles of functional analysis,  3. Examining basic notions,  4. Examining basic applications. | | | | | | | |
| **TEXTBOOK** | | | | | Kendall Atkinson, Weimin Han, Theoretical Numerical analysis A functional Analysis Framework. | | | | | | | |
| **OTHER REFERENCES** | | | | | Notes on internet. Erwin Kreyszig, Introductory Functional Analysis with Applications. Tinsley Oden-Leszek F. Demkowicz, Applied functional analysis: An introduction to numerical analysis. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Interpolation theory |
| 2 | Best approximation |
| 3 | Nonlinear equations and their solutions by iteration |
| 4 | Nonlinear equations and their solutions by iteration |
| 5 | Finite difference method |
| 6 | Midterm Examination 1 |
| 7 | Finite difference method |
| 8 | Sobolev spaces |
| 9 | Sobolev spaces |
| 10 | The Galerkin methods and its variants |
| 11 | Midterm Examination 2 |
| 12 | Finite element analysis |
| 13 | Finite element analysis |
| 14 | Finite element analysis |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Dursun IRK | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501711622 | **TITLE** | Higher Dimensional Categories I |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Categories, Functors, Group object, Internal categories, Crossed modules. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to introduce students to group objects and category objects in a category. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand the Group objects in a category, Understand the Group objects in a category,  2. Understand the Category objects in a category, Understand the Category objects in a category,  3. Understand the Internal categories, Understand the Internal categories,  4. Understand the Crossed modules, Understand the Crossed modules,  5. Understand the Relations between Internal categories and crossed modules. | | | | | | | |
| **TEXTBOOK** | | | | | Herrlich Horst, Strecker E. George, (1973) Category Theory. | | | | | | | |
| **OTHER REFERENCES** | | | | | Forrester-Barkar M. (2002). Group objects and Internal categories. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Categories |
| 2 | Categories |
| 3 | Functors |
| 4 | Functors |
| 5 | Group Object |
| 6 | Midterm Examination 1 |
| 7 | Group Object |
| 8 | Internal Categories |
| 9 | Internal Categories |
| 10 | Internal Categories |
| 11 | Midterm Examination 2 |
| 12 | Crossed Modules |
| 13 | Crossed Modules |
| 14 | Crossed Modules |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. İ. İlker AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501712613 | **TITLE** | Higher Dimensional Categories II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 2-Categories, 2-grouboids, 2-groups, Relations between Internal categories and 2-groups, relations between crossed modules and 2-groups. 2-algebras. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to introduce students to higher dimensional categories. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | The aim of the course is to introduce students to higher dimensional categories. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. Understand the 2-category, Understand the 2-category,  2. Understand the 2-grouboids and 2-groups, Understand the 2-grouboids and 2-groups,  3. Understand the Relations between Internal categories and 2-groups, Understand the Relations between Internal categories and 2-groups,  4. Understand the relations between crossed modules and 2-groups, Understand the relations between crossed modules and 2-groups,  5. Understand the 2-algebras. | | | | | | | |
| **TEXTBOOK** | | | | | Herrlich Horst, Strecker E. George, (1973) Category Theory. | | | | | | | |
| **OTHER REFERENCES** | | | | | Forrester-Barkar M. (2002). Group objects and Internal categories. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | 2-Categories |
| 2 | 2-Categories |
| 3 | 2-grouboids and 2-groups |
| 4 | 2-grouboids and 2-groups |
| 5 | Relations between Internal categories and 2-groups |
| 6 | Midterm Examination 1 |
| 7 | Relations between Internal categories and 2-groups |
| 8 | Relations between Internal categories and 2-groups |
| 9 | Relations between crossed modules and 2-groups |
| 10 | Relations between crossed modules and 2-groups |
| 11 | Midterm Examination 2 |
| 12 | Relations between crossed modules and 2-groups |
| 13 | 2-Algebras |
| 14 | 2-Algebras |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. İ. İlker AKÇA | **Date:** |  |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** | 501602511 | **TITLE** | HIGHER DIFFERENTIAL GEOMETRY II |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | Türkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | 1-Concepts of Lie groups, topological space, manifold and differential groups  2- Lie subgroups,  3-Matrix Lie groups and frame bundles  4-Parallellism for matrix Lie groups  5-Invariant vector fields and left invariant forms on matrix Lie groups  6-Structure equations of matrix Lie groups | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Aim of this course is to teach the subjects such as Lie groups and differentials, matrix lie groups and frame bundle theory adding to the basic subjects of differential geometry. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | |  | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of the course students should be able to:  1.apply knowledge of basic mathematics,  2.conduct applications as well as to analyze and interpret data,  3.function on multi-disciplinary teams,  4.identify, formulate, and solve mathematical problems,  5.computer, software as contemporary methods, techniques apply to mathematics  6.communicate effectively  7.understand the broad education necessary to understand the impact of mathematical solutions in a global and societal context  8.get a recognition of the need for, and an ability to engage in life-long learning  9.gain a knowledge of contemporary issues  10.Develop a research skills for their dissertation | | | | | | | |
| **TEXTBOOK** | | | | | 1- Müller, H. R., Kinematik Dersleri, Ankara Üniversitesi Yayınları, (1963).2- Biran, L., Kinematik, İstanbul Üniversitesi yayınları, 1949.3- Hacısalihoğlu, H. H., Diferensiyel Geometri, Cilt I-II, Ankara, 2004.4- Hacısalihoğlu H. H., Yüksek Diferensiyel Geometriye Giriş, Fırat Üniversitesi Yayınları, 1980,5- R. Kaya, Lineer Cebir (Redaksiyon), Eskişehir, (2000). | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Concepts of Lie groups, topological space, manifold and differential groups |
| 2 | Concepts of Lie groups, topological space, manifold and differential groups |
| 3 | Lie subgroups, |
| 4 | Matrix Lie groups and frame bundles |
| 5 | Matrix Lie groups and frame bundles |
| 6 | Midterm Examination 1 |
| 7 | Matrix Lie groups and frame bundles |
| 8 | Parallellism for matrix Lie groups |
| 9 | Parallellism for matrix Lie groups |
| 10 | Invariant vector fields and left invariant forms on matrix Lie groups |
| 11 | Midterm Examination 2 |
| 12 | Invariant vector fields and left invariant forms on matrix Lie groups |
| 13 | Structure equations of matrix Lie groups |
| 14 | Structure equations of matrix Lie groups |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Prof. Dr. Cumali Ekici | **Date:** | 23.11.2015 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Fundamentals of Mathematics |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  ( X ) | | ELECTIVE  (   ) | 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 | | | | | 2 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | Take the course named Mathematics | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Some special concepts and applications of all areas in Mathematics and computer science | | | | | | | |
| **COURSE OBJECTIVES** | | | | | Teaching basic concepts for Ph.D education. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To gain advanced knowledge about a sub-domain of Mathematics and Computer Sciences. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | By the end of the course students should be able to:  1. Apply knowledge of basic mathematics,  2. Ability of searching information related area,  3. Ability to develop new and original ideas and methods,  4. Ability of finding the techniques necessary for the study field. | | | | | | | |
| **TEXTBOOK** | | | | | None | | | | | | | |
| **OTHER REFERENCES** | | | | | None | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Number Systems, Modular Arithmetics |
| 2 | Cryptology Systems |
| 3 | Norm spaces, Banach spaces, Hilbert spaces |
| 4 | Product and quotient spaces |
| 5 | Relations between mathematical concepts |
| 6 | Midterm Examination 1 |
| 7 | Relations between mathematical concepts |
| 8 | Line, Plane and surface equations |
| 9 | Laplace and applications, Linear Equations Systems |
| 10 | Numerical solution of differential equations |
| 11 | Midterm Examination 2 |
| 12 | Matrice algebra, Special Matrices, The rank of Matrices |
| 13 | Characteristic and minimum polynom, eigen value and eigen vectors |
| 14 | Ortogonal transformations, Gram-Schmidt method |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

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

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

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

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

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **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. | | | | | | | |

|  |  |
| --- | --- |
| **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 |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **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**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Complexiton Solutions of Differential Equations |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Complexiton solutions, Extended-Transformed rational function method, Simplified Hirota method, Transformed rational fuction method, Double sub-equation method. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. Understanding complexiton solutions notion and to be able to distinguish from other type solutions  2. To be able to apply Extended-Transformed rational function method to differential equations  3. To be able to obtain complexiton solutions of differential equations via simplified Hirota method and give meanings in physics to obtained solutions  4. To be able to obtain complexiton solutions via transformed rational function method  5. To be able to get complexiton solutions via double sub-equation method, sketch wave graphs of these solutions and give meanings | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To be able to have advanced knowledge on a subfield of Mathematics-Computer sciences | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To be able to comprehend the type of complexiton solution, determine the differences of complexiton solutions apart from other type solutions  2. To be able to analyze to determine method while solving the given differential equation and obtain compexiton solutions by using suitable one  3. Tobe able to comprehend sketching obtained complexiton solutions via packet programs and evaluating them from physical point of wiev.  4. To be able to synthesize and evaluate current methods and then found new complexiton solutions methods | | | | | | | |
| **TEXTBOOK** | | | | | W. X. Ma, Complexiton solutions to the Korteweg-de Vries equation, Physics Letters A, 301(2002), 35-44. | | | | | | | |
| **OTHER REFERENCES** | | | | | H. Q. Zhang and W. X. Ma, Extended transformed rational function method and applications to complexiton solutions, Applied Mathematics and Computation, 230(2014), 509-515.W. X. Ma, Complexiton solutions to integrable equations, Nonlinear Analysis, 63(2005), e2461--e2471. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Types and classifications of solutions |
| 2 | Complexiton solutions |
| 3 | Extended-transformed rational function method |
| 4 | Extended-transformed rational function method |
| 5 | Simplified Hirota method |
| 6 | Midterm Examination 1 |
| 7 | Simplified Hirota method |
| 8 | Transformed rational function method |
| 9 | Transformed rational function method |
| 10 | Double sub-equation method |
| 11 | Midterm Examination 2 |
| 12 | Double sub-equation method |
| 13 | Graphics of complexiton solutions |
| 14 | Meanings of complexiton solutions in physics |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Asst. Prof. Ömer Ünsal | **Date:** | 06.11.2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Inversion Theory |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 5 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Classical Inversion Theory in the Plane, Linear Fractional Transformations, Conformal Maps | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to describe the concept of inversion, to obtain the properties of the inversion and to teach the students the theory of the theory of evolution by using linear fractional transformations. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To have knowledge about inversion theory which has many application fields. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1 Introduces the concept of inversion and teaches history.  2 Teaches the transformation and properties of equilibrium in plane.  3 Teaches linear fractional transformations from significant transformations.  4 Uses and teaches the applications of the theory of evolution. | | | | | | | |
| **TEXTBOOK** | | | | | Inversion Theory and Conformal Mappings, American Mathematical Society, Student Mathematical Library | | | | | | | |
| **OTHER REFERENCES** | | | | | 1 Eves, H. Modern Elementary Geometry, Jones and Bartlett, Boston, London, 1992. 2 Ewald, G., Geometry: An Introduction, Wadsworth, Belmont, CA, 1971. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Classical inversion theory in the plane |
| 2 | Definition and basic properties |
| 3 | Cross ratio |
| 4 | Applications |
| 5 | Miquel's theorems |
| 6 | Midterm Examination 1 |
| 7 | Feuerbach's theorem |
| 8 | Complex numbers |
| 9 | The extended complex plane and stereographic projection |
| 10 | Linear fractional transformations |
| 11 | Midterm Examination 2 |
| 12 | Some special linear fractional transformations |
| 13 | Extended Möbius transfromations |
| 14 | The Poincare models of hyperbolic geometry |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Dr. Özcan GELİŞGEN | **Date:** | 7.11.2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Fractal Geometry and Applications |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 5 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Metric Spaces, Equivalent Spaces, Classification of Subsets, Space of Fractals, Transformations in Metric Spaces, Fractal Dimension | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to teach students to fractal geometry with properties, dimension, self-similarity and examples in nature. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To have knowledge about a new geometry which is also included in the MEB programs in recent years. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1 Introduces the concept of fractal and teaches history of fractals.  2 Teaches to obtain new shapes from the usual geometric shapes.  3 Teaches geometry of transformations in the plane.  4 Teaches self-similarity which is one of the important properties of fractals.  5 Teaches how to calculate of the dimension by introducing the concept of dimension in some special fractals.  6 Teaches the calculation of the length of a fractal curve.  7 Introduces examples of fractals in nature. | | | | | | | |
| **TEXTBOOK** | | | | | Fractals Everywhere, Michael F. Barnsley | | | | | | | |
| **OTHER REFERENCES** | | | | | 1. Edgar, G., Measure, topology, and fractal geometry, Springer, 2000.2. Prof. Dr.H.Hilmi Hacısalihoğlu, Araş.Gör. Nergis Yaz, Fraktal Geometri I, Ankara Üniversitesi Fen Fakültesi, Matematik Bölümü, Ankara, 2007. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Classical fractals and the notion of self-similarity |
| 2 | Complete metric spaces, Contraction maps and Fixed point theorem |
| 3 | Hausdorff metric |
| 4 | Iterated function systems (IFS) |
| 5 | The notion of attractor and its examples |
| 6 | Midterm Examination 1 |
| 7 | Examples of iterated function system |
| 8 | Examples for IFS |
| 9 | Countable iterated function system (CIFS) |
| 10 | Examples for CIFS |
| 11 | Midterm Examination 2 |
| 12 | IFS with condensation |
| 13 | Collage theorem |
| 14 | Graph-directed IFS |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Assoc. Dr. Özcan GELİŞGEN | **Date:** | 7.11.2017 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Theory of Integrability |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 1 | | 50 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Bell Polynomials, Backlund Transformations, Lax Pairs, Soliton Solutions. | | | | | | | |
| **COURSE OBJECTIVES** | | | | | 1. Understanding Bell polynomials notion and to be able to distinguish its types  2. To be able to construct Bell polynomial form of a given partial differential equation  3. To be able to obtain Backlund transformation and Lax Pair of differential equations in Bell polynomail form.  4. To be able to obtain complexiton solutions via transformed rational function method  5. To be able to get soliton solutions of a equation given in bilinear form via Hirota method. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To be able to have advanced knowledge on a subfield of Mathematics-Computer sciences | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | 1. To be able to apply Bell polinomial approach to equations and system of equations.  2. To be able to analyze writability of a differential equation in Bell polynomial form and conditions.  3. Tobe able to evaluate the transition between Backlund transformation and Lax pairs.  4. To be able to obtain soliton solutions of partial differential equations by applying Hirota method. | | | | | | | |
| **TEXTBOOK** | | | | | Z. Yi, W.W. Wei, C.T. Fei, S. Yang, Binary Bell polynomial application in generalized (2+1) dimensional KdV equation with variable coefficients, Chinese Physics B, 20 (2011), 110204. | | | | | | | |
| **OTHER REFERENCES** | | | | | Y.C. Hon, E. Fan, Binary Bell polynomial approach to the non-isospectral and variable -coefficient KP equations, IMA Journal of Applied Mathematics, 77(2012), 236-251.Z.Y. Feng, H. Zhong, H. Tam, On the integrable properties for Two Variable-Coefficient Evolution Equations, Commun. Theor. Phys, 59(2013), 671-678. | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Bell polynomials and its classification |
| 2 | Bilinear form |
| 3 | Bilinear form |
| 4 | Backlund transformation |
| 5 | Backlund transformation |
| 6 | Midterm Examination 1 |
| 7 | Backlund transformation |
| 8 | Lax Pairs |
| 9 | Lax Pairs |
| 10 | Lax Pairs |
| 11 | Midterm Examination 2 |
| 12 | Hirota method |
| 13 | Hirota method |
| 14 | Hirota method |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Asst. Prof. Ömer Ünsal | **Date:** | 26.03.2018 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Blockchain |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7.5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
|  | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | | 1 | | 50 |
| Quiz | | | | |  | |  |
| Homework | | | | |  | |  |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (     ) | | | | |  | |  |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | |  | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Fundementals of Blockchain, history of Blockchain, how Blockchain works, usage areas, cryptocurrencies and Blockchain applications | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To learn the meaning and uses of Blockchain technology and develop applications with this technology. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | Understand the basics of Blockchain and develop Blockchain applications | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Ability to understand the basics of Blockchain  An ability to understand and practice the working principle of cryptocurrencies and blockchain  Ability to develop Blockchain applications | | | | | | | |
| **TEXTBOOK** | | | | | Ahmet Usta, Serkan Doğantekin - Blockchain 101 | | | | | | | |
| **OTHER REFERENCES** | | | | |  | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | What is Blockchain? |
| 2 | What is Blockchain? |
| 3 | History of Blockchain |
| 4 | Cryptocurrencies and markets |
| 5 | How Blockchain works? |
| 6 | Midterm |
| 7 | How Blockchain works? |
| 8 | What is cryptocurrency mining? |
| 9 | Problems with Blockchain |
| 10 | Blockchain usage areas |
| 11 | Bitcoin, Ethereum and Altcoins |
| 12 | Blockchain applications |
| 13 | Blockchain applications |
| 14 | Blockchain applications |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

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

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Introduction to Advaced Functional Analysis |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (Seminear) | | | | | 2 | | 20 |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Metric Spaces, Normed Spaces, Banach Spaces, Inner Product Spaces, Hilbert Spaces, Fundamental Theorems for Normed and Banach Spaces | | | | | | | |
| **COURSE OBJECTIVES** | | | | | To introduce students the basic terminology, notation and basic results and concepts of operators on Banach and Hilbert spaces. Finding some important theorical results and showing some applications. To prepare students to follow the literature which has a large amount of ideas used related to Hilbert spaces. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | It will facilitate understanding of the basic concepts encountered in many areas. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Knows basic foundation and properties of Banach and Hilbert spaces.  Knows basic definitions and properties of linear bounded operators, and can apply them to several operators.  Understands three fundamental principles of functional analysis.  Learns some operator classes and their properties, and can use them to examine some specific operators. | | | | | | | |
| **TEXTBOOK** | | | | | Erwin Kreyszig - Introductory Functional Analysis with Applications (1989, Wiley). | | | | | | | |
| **OTHER REFERENCES** | | | | | A. Taylor, Introduction to Functional Analysis J. Conway, A Course in Functional Analysis | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Metric Spaces |
| 2 | Open Set, Closed Set, Neighborhood |
| 3 | Convergence, Cauchy Sequence, Completeness |
| 4 | Normed Space. Banach Space |
| 5 | Further Properties of Normed Spaces |
| 6 | Compactness and Finite Dimension |
| 7 | Linear Operators |
| 8 | Bounded and Continuous Linear Operators |
| 9 | Linear Operators and Functionals on Finite Dimensional Spaces |
| 10 | Inner Product Space. Hilbert Space |
| 11 | Orthogonal Complements and Direct Sums |
| 12 | Representation of Functionals on Hilbert Spaces |
| 13 | Fundamental Theorems for Normed and Banach Spaces |
| 14 | Fundamental Theorems for Normed and Banach Spaces |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Özcan GELİŞGEN | **Date:** | 02.04.2019 |

**Signature**:

**T.R.**

**ESKISEHIR OSMANGAZI UNIVERSITY**

**GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES**

**COURSE INFORMATION FORM**

|  |  |  |  |
| --- | --- | --- | --- |
| **DEPARTMENT** | **MATHEMATICS-COMPUTER (PhD)** | **SEMESTER** |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **COURSE** | | | |
| **CODE** |  | **TITLE** | Fractals and Chaos |

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **LEVEL** | **HOUR/WEEK** | | | | | | **Credit** | **ECTS** | **TYPE** | | | **LANGUAGE** |
| **Theory** | | **Practice** | **Laboratory** | | |
| **PhD** | 3 | | 0 | 0 | | | 3 | 7,5 | COMPULSORY  (   ) | | ELECTIVE  ( X ) | Turkish |
| **CREDIT DISTRIBUTION** | | | | | | | | | | | | |
| **Basic Science** | | **Basic Engineering** | | | | **Knowledge in the discipline**  **[if it contains considerable design content, mark with (√)]** | | | | | | |
| X | |  | | | |  | | | | | | |
| **ASSESSMENT CRITERIA** | | | | | | | | | | | | |
| **SEMESTER ACTIVITIES** | | | | | **Evaluation Type** | | | | | **Number** | | **Contribution**  **( % )** |
| Midterm | | | | |  | |  |
| Quiz | | | | |  | |  |
| Homework | | | | | 3 | | 30 |
| Project | | | | |  | |  |
| Report | | | | |  | |  |
| Other (Seminear) | | | | | 2 | | 20 |
| **Final Examination** | | | | | | | 50 |
| **PREREQUISITE(S)** | | | | | None | | | | | | | |
| **SHORT COURSE CONTENT** | | | | | Iterates of Functions, Fixed points, Periodic points, Families of functions, The quadratic family, Chaos, Conjugacy, Cantor sets, Iterated function systems, Chaotic dynamics on fractals, Julia and Mandelbrot sets | | | | | | | |
| **COURSE OBJECTIVES** | | | | | The aim of the course is to teach students to fractal geometry with properties, dimension, self-similarity and examples in nature. | | | | | | | |
| **COURSE CONTRIBUTION TO THE PROFESSIONAL EDUCATION** | | | | | To have knowledge about a new geometry which is also included in the MEB programs in recent years. | | | | | | | |
| **LEARNING OUTCOMES OF THE COURSE** | | | | | Learn the chaotic dynamics on fractals after understanding the concepts of periodic points and chaotic dynamic systems systems.  Understand and apply fractal structures.  Understands repetitive function systems.  Teach Julia and Mandelbrot sets. | | | | | | | |
| **TEXTBOOK** | | | | | Encounters with Chaos and Fractals, Gulick D., CRC Press, 2012. | | | | | | | |
| **OTHER REFERENCES** | | | | | Fractals Everywhere, Michael F. Barnsley | | | | | | | |

|  |  |
| --- | --- |
| **COURSE SCHEDULE (Weekly)** | |
| **WEEK** | **TOPICS** |
| 1 | Iterates of Functions |
| 2 | Fixed points |
| 3 | Periodic points |
| 4 | Families of functions |
| 5 | The quadratic family |
| 6 | Bifurcations |
| 7 | Period-3 points |
| 8 | Chaos |
| 9 | Conjugacy |
| 10 | Cantor sets |
| 11 | Iterated function systems |
| 12 | Symbolic dynamics |
| 13 | Chaotic dynamics on fractals |
| 14 | Julia and Mandelbrot sets |
| 15,16 | Final Examination |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **CONTRIBUTION OF THE COURSE LEARNING OUTCOMES TO THE MATHEMATICS-COMPUTER PhD PROGRAM LEARNING OUTCOMES** | | **CONTRIBUTION LEVEL** | | |
| **NO** | **LEARNING OUTCOMES (PhD)** | **3**  High | **2**  Mid | **1**  Low |
| **LO 1** | Through scientific research in the field of reaches the knowledge widely and in-depth, evaluates, comments and applies the knowledge. |  |  |  |
| **LO 2** | With current techniques and methods applied in the field has information on level of expertise of these constraints. |  |  |  |
| **LO 3** | Using the uncertain, limited or incomplete data with scientific methods completes the knowledge and implements; able to use together information from different disciplines. |  |  |  |
| **LO 4** | Aware of new and developing applications related to professions, learn and examine these applications when needed. |  |  |  |
| **LO 5** | Ability to formulate and ıdentify problems that are related to study field, develop methods for solving problems and apply innovative methods in solution. |  |  |  |
| **LO 6** | Ability to develop new and / or original ideas and methods; design complex systems or processes and develop innovative / alternative solutions in his design. |  |  |  |
| **LO 7** | Theoretical, experimental and modeling based design research and practice; examines the complex problems encountered in this process and solutions. |  |  |  |
| **LO 8** | Ability to work effectively in inner or multi-disciplinary teams, is able to lead in the such team and able to develop solution approaches in complex cases; work independently and take responsibility. |  |  |  |
| **LO 9** | Ability to communicate in written and oral forms, use at least one foreign language European Language Portfolio C1 General Level. |  |  |  |
| **LO 10** | The process and results of the studies, at this or outside areas national and international environment be transfer systematically and clearly written or oral. |  |  |  |
| **LO 11** | The stages of collection, interpretation, dissemination of data and all events in profession supervise social, scientific and effect values. |  |  |  |
| **LO 12** | The techniques necessary for the study field, the skills and gain the ability of using modern tools on level of expertise. |  |  |  |

|  |  |  |  |
| --- | --- | --- | --- |
| **Prepared by :** | Prof. Dr. Özcan GELİŞGEN | **Date:** | 02.04.2019 |

**Signature**: