Form No:ÜY-FR-0305

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|  | **ECTS Course Description Form** |
| **PART I ( Senate Approval)** |
| **Offering School**  | College of Engineering |
| **Offering Department** | Civil Engineering |
| **Program(s) Offered to** | Civil Engineering | Elective |
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|  |  |
| **Course Code**  | CE 454 |
| **Course Name** | Design of Fiber Reinforced Polymer Composite Structures  |
| **Language of Instruction** | English |
| **Type of Course** | Lecture/Project |
| **Level of Course** | Undergraduate |
| **Hours per Week** | **Lecture:** 3 | **Laboratory:** | **Recitation:**  | **Practical:**  | **Studio:** | **Other:** |
| **ECTS Credit** | 5 |
| **Grading Mode** | Letter Grade |
| **Pre-requisites** | - |
| **Co-requisites** | - |
| **Registration Restriction** | - |
| **Educational Objective** | The objective of this course is to introduce basics of mechanics and design of fiber reinforced polymer (FRP) matrix composites. |
| **Course Description** | This course conveys crucial knowledge of analysis and design of FRP composites to students. The course introduces what FRP is and where FRP is used. With such a basic idea, students learn theory with regard to FRP composites. After micro mechanics of FRP composites are provided, students learn macro mechanics of FRP composites. Finally, students gain knowledge of how to design FRP composites. |
| **Learning Outcomes**  | **LO1** | 1. Know the definition and characteristics of FRP composite materials. 2. Obtain knowledge of how to fabricate FRP composites.3. Distinguish differences between micro and macro mechanics of FRP composites. 4. Define fiber, matrix, laminate, and lamina.5. Decide whether FRP composites fail or not using failure theories.6. Find the stress and strain relationship as well as engineering constants of laminates.7. Design FRP composite structures using safety factors. |
| **LO2** |
| **LO3** |
| **LO4** |
| **LO5** |
| **LO6** |
| **n..** |
| **PART II ( Faculty Board Approval)** |
| **Basic Outcomes (University-wide)** | **No.** | **Program Outcomes** | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** | **LO7** |
| **PO1** | **Ability** to communicate effectively and write and present a report in Turkish and English.  | LO1, LO2, LO3, LO4, LO5, LO6, LO7 |
| **PO2** | **Ability** to work individually, and in intra-disciplinary and multi-disciplinary teams. | LO5, LO6, LO7 |
| **PO3** | **Recognition** of the need for life-long learning and **ability** to access information, follow developments in science and technology, and continually reinvent oneself. | LO1, LO6, LO7 |
| **PO4** | **Knowledge** of project management, risk management, innovation and change management, entrepreneurship, and sustainable development. | LO5, LO7 |
| **PO5** | **Awareness** of sectors and **ability** to prepare a business plan. | LO2, LO7 |
| **PO6** | **Understanding** of professional and ethical responsibility and **demonstrating** ethical behavior. | LO1, LO2, LO7 |
| **Faculty Specific Outcomes** | **PO7** | Ability to develop, select and use modern techniques and tools necessary for engineering applications and ability to use information technologies effectively. | LO2, LO5, LO6, LO7 |
| **PO8** | Recognition of the effects of engineering applications on health, environment and safety in the universal and societal dimensions and the problems of the time and awareness of the legal consequences of engineering solutions. | LO5, LO7 |
| **PO9** | Ability to identify, define, formulate and solve complex engineering problems; and electing and applying appropriate analysis and modeling methods for this purpose. | LO5, LO6, LO7 |
| **Discipline Specific Outcomes (program)** | **PO10** | Sufficient knowledge in mathematics, science and civil engineering; and the ability to apply theoretical and practical knowledge in these areas to model and solve engineering problems. | LO1, LO2, LO7 |
| **PO11** | Ability to design a complex system, process, device or product to meet specific requirements under realistic constraints and conditions of economic, environmental, sustainability, manufacturability, ethics, health, safety, social and political issues; and the ability to apply modern design methods for this purpose. | LO2, LO7 |
| **PO12** | Ability to design experiments, conduct experiments, collect data, analyze and interpret results for the examination of civil engineering problems. | LO5, LO7 |
| **Specialization Specific Outcomes** | **PO N….** | **-** | **-** |
| **PART III ( Department Board Approval)** |
| **Course Subjects, Contribution of Course Subjects to Learning Outcomes, and Methods for Assessing Learning of Course Subjects** | **Subjects** | **Week** |  | **LO1** | **LO2** | **LO3** | **LO4** | **LO5** | **LO6** | **LO7** |
| **S1** | 1 | Introduction and usage of FRP composites | A1,A2  |  | A2,A7 |  |  |  |  |
| **S2** | 2 | Constituent material types and properties | A1,A2 |  |  |  |  | A2 | A2 |
| **S3** | 3 | Manufacturing process | A1 | A1 |  | A2,A3 |  |  |  |
| **S4** | 4,5 | Micromechanics and materials design |  |  | A1 |  |  |  | A2,A7 |
| **S5** | 6,7 | Classical laminate theory and analysis |  |  |  | A2 |  |  |  |
| **S6** | 8,9 | Failure theories and macromechanics |  |  |  |  | A1 | A2 |  |
| **S7** | 10 | Safety factors, determination, and responsibility |  |  |  |  | A2 | A1 | A1 |
| **S8** | 11,12 | Design case |  | A1 | A2 |  |  | A1 | A1,A3 |
| **S9** | 13,14 | Strengthening using FRP composites |  |  |  |  | A2 | A2 | A2 |
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| **Assessment Methods, Weight in Course Grade, Implementation and Make-Up Rules**  | **No.** | **Type** | **Weight** | **Implementation Rule** | **Make-Up Rule** |
| **A1** | **Exam** | *60%* | Midterm exams and final exams will take place. Exams will be in written test and all the course materials will be forbidden to use during the examination. Midterm dates are tentative and announced at the beginning of semester. | The official rules and regulations of the University apply. |
| **A2** | **Quiz** | *30%* | Quizzes will be regularly taken after announcement during the semester. | The official rules and regulations of the University apply. |
| **A3** | **Homework** | *10%* | Homework is due the following class. Late homework are not accepted. Homework is to be neat and orderly. All calculations of homework problems are to be in an orderly fashion. | There is no make up for homework. |
| **A4** | **Project** |  |  |  |
| **A5** | **Report** |  |  |  |
| **A6** | **Presentation** |  |  |  |
| **A7** | **Attendance/ Interaction** | *0%* | Attendance is strongly recommended and obligatory.  | The official rules and regulations of the University apply. |
| **A8** | **Class/Lab./****Field Work** |  |  |  |
| **A9** | **Other** |  |  |  |
| **TOTAL** | **100%** |
| **Evidence of Achievement of Learning Outcomes** | Students will demonstrate learning outcomes through midterm exams, homework/coursework and preparation and the final exam. Every topic is tested with at least one exam question. In order to pass, a student needs to accumulate certain percentage of points and this percentage is determined by the class mean. |
| **Method for Determining Letter Grade** | The method on which the letter grade is based on will be announced at the beginning of the semester, and this method may be subjected to change depending on the performance of the students.Two midterms, homework/coursework questions, attendance and a final exam are used for grading. The table shows the maximum points to be collected.

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| --- | --- | --- | --- | --- | --- |
| **Assessment** | Midterms | Homework | Quizzes | Final exam | TOTAL |
| **Points** | 30 | 10 | 30 | 30 | 100 |

Letter grade is determined using the table below:

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Total points** | 100-95 | 94-85 | 84-80 | 79-75 | 74-65 | 64-60 | 59-55 | 54-50 | 49-45 | 44-40 |
| **Letter Grade** | A | A- | B+ | B | B- | C+ | C | C- | D+ | D |

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| **Teaching Methods, Student Work Load** | **No** | **Method** | **Explanation** | **Hours** |
| ***Time applied by instructor*** |
| **1** | **Lecture** | Lecturing and utilizing chalkboard/whiteboard. Sample questions and answers. Total number of hours in semester. | 50 |
| **2** | **Interactive Lecture** |  |  |
| **3** | **Recitation** |  |  |
| **4** | **Laboratory** |  |  |
| **5** | **Practical** |  |  |
| **6** | **Field Work** |  |  |
| ***Time expected to be allocated by student*** |
| **7** | **Project** |  |  |
| **8** | **Homework** | Homework/coursework and their preparations | 10 |
| **9** | **Pre-class Learning of Course Material**  | Pre-class/ after class individual study | 18 |
| **10** | **Review of Course Material** | Quizzes, midterms and their preparations | 31 |
| **11** | **Studio** | End of semester exams, final exam and preparation | 41 |
| **12** | **Office Hour** |  |  |
| **TOTAL** | *150* |
| **IV. PART** |
| **Instructor** | **Name** | DONGKEUN LEE |
| **E-mail** | dongkeun.lee@antalya.edu.tr |
| **Phone Number** | 242 245 0325 |
| **Office Number** | A1-64 |
| **Office Hours** | It will be determined during the semester. |
| **Course Materials** | **Mandatory** |  |
| **Recommended** | A.K. Kaw, Mechanics of Composite Materials, 2nd Edition, CRP Press, 2005C.T. Herakovich, Mechanics of Fibrous Composites, 1997 |
| **Other** | **Scholastic Honesty** | Violations of scholastic honesty include, but are not limited to cheating, plagiarizing, fabricating information or citations, facilitating acts of dishonesty by others, having unauthorized possession of examinations, submitting work of another person or work previously used without informing the instructor, or tampering with the academic work of other students. Any for of scholastic dishonesty is a serious academic violation and will result in a disciplinary action. |
| **Students with Disabilities** | Reasonable accommodations will be made for students with verifiable disabilities. |
| **Safety Issues**  | The handling of the course does not require any special safety requirements. |
| **Flexibility** | Circumstances may arise during the course that prevents the instructor from fulfilling each and every component of this syllabus; therefore, the syllabus is subject to change.  Students will be notified prior to any changes.  |