**COURSE RECORD**

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| Code | **CE 486** |
| Name | **Introduction to Structural Dynamics** |
| Hour per week | 3 (3+0) |
| Credit | 3 |
| ECTS | 4 |
| Level/Year | Undergraduate/ 4 |
| Semester | Fall |
| Type | Elective |
| Prerequisites | MATH205 Differential Equations, CE 383 Structural Analysis |
| Description | Introduction to structural dynamics. Definition of static and dynamic forces. Modeling of dynamic systems. Concepts of period, frequency, damping, mode, degrees of freedom. Single degree of freedom systems. Free and forced vibration. Continuous systems. Multi degree of freedom systems. Modal analysis method. Modal mass, stiffness and damping concepts. Response spectrum concept. Introduction to earthquake behavior of structures. |
| Objectives | - To introduce dynamic approaches in structural analysis.  - To determine the dynamic properties of the systems.  - To calculate the behavior of structural systems under any dynamic loading.  -To provide preliminary information that leads to computation of the response of structural systems under earthquake loads. |
| Learning Outcomes | *By the end of this course, students will be able to:*  *LO1: classify static and dynamic loads, systems and behavior patterns and distinguishing the differences.*  *LO2: investigate the necessary modeling and parameters for a dynamic analysis.*  *LO3: determine how to obtain these parameters.*  *LO4: determine the dynamic behavior of structural systems.*  *LO5:determine the earthquake response of structural systems based on these behaviors.* |

**CONTRIBUTION TO PROGRAMME OUTCOMES\***

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | pO1 | pO2 | pO3 | pO4 | pO5 | pO6 | pO7 | pO8 | pO9 | p10 |
| LO1 | 3 | 3 | 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 |
| LO2 | 2 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| LO3 | 1 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 |
| LO4 | 0 | 4 | 4 | 2 | 0 | 0 | 0 | 2 | 0 | 0 |
| LO5 | 0 | 3 | 4 | 2 | 0 | 0 | 0 | 1 | 0 | 0 |

\* Contribution Level: 0: None, 1: Very Low, 2: Low, 3: Medium, 4: High, 5: Very High

**COURSE CONTENT DETAILS**

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| **W** | **Topic** | **Outcomes** |
| 1 | Subject of structural dynamics. Static and dynamic forces and differences in between.  Fundamental properties of dynamic systems.  Mathematical modeling techniques for dynamic analysis. | LO1, LO5 |
| 2 | Vibration properties of structural systems.  Definition of degrees of freedom. Single degree of freedom systems (SDOF), multiple degree of freedom systems (MDOF), Continuous mass systems. | LO1, LO2, LO5 |
| 3 | Classification of vibration response: Free (natural) vibrations, forced vibrations.  Damping event. Critical damping. Damping ratio. | LO2, LO5 |
| 4 | Determination of dynamic properties of undamped / damped systems.  Determination of forced vibrations of undamped / damped systems. | LO2, LO5 |
| 5 | Establishment of equations of motion of MDOF.  Solution of equations of motion. | LO3 |
| 6 | Determination of dynamic properties of undamped / damped systems. | LO3 |
| **7** | **Fall Break** |  |
| 8 | Determination of forced vibrations of undamped / damped systems. | LO3 |
| 9 | Establishment of equations of motion of SDOF. | LO3, LO4 |
| 10 | Determination of dynamic properties of undamped / damped systems. | LO3, LO4 |
| 11 | Determination of forced response of undamped / damped systems. | LO4 |
| 12 | Solution of structural systems for ground motion (earthquake). | LO4 |
| 13 | Solution of structural systems for ground motion (earthquake). | LO4, LO5 |
| 14 | Design spectrum concept. | LO5 |
| 15 | Examination of 2018 Earthquake Specifications within the scope of the course. | LO5 |

**DERS BİLGİLERİ**

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| Kodu | **CE 486** |
| İsmi | **Yapı Dinamiğine Giriş** |
| Haftalık Saati | 3(3+0) |
| Kredi | 3 |
| AKTS | 4 |
| Seviye/Yıl | Lisans / 4 |
| Dönem | Güz |
| Dersin Dili | İngilizce |
| Tip | Seçmeli |
| Ön Şart | MATH205 Differential Equations, CE 383 Structural Analysis |
| İçerik | Yapı dinamiğine giriş. Statik ve dinamik kuvvetlerin tanımı. Dinamik sistemlerin modellenmesi. Periyot, frekans, sönüm, mod, serbestlik derecesi kavramları. Tek serbestlik dereceli sistemler. Serbest ve zorlanmış titreşim. Sürekli yapı sistemleri. Çok serbestlik dereceli sistemler. Modal analiz yöntemi. Modal kütle, rijitlik ve sönüm kavramları, Davranış spektrumu kavramı. Yapıların deprem davranışına giriş. |