| **Course Description:** CE 361 Structural Analysis I  
(Required for a BSCE degree) | Types of structures, supports and loads. Idealization of structures and loads. Geometric stability and determinacy. Analysis of determinate trusses, beams, plane frames and arches; reaction computation; axial force, shear force and bending moment diagrams. Internal force releases. Load-shear-moment relationship. Differential equation of elastic curve. Deflections by integration, moment-area, conjugate-beam and virtual work methods. Influence lines of determinate structures. Introduction to computer applications. Group project.  3 (3,1,0) |
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| **Prerequisite** | GE 201 (Statics), CE 302 (Mechanics of Materials), Prerequisite by Topics:  
1. Understanding of equilibrium equations to analyze engineering problems.  
2. Determining the internal forces in beams, frames and trusses.  
3. Determining the area properties of various cross sections.  
| **Course Learning Objectives** | Students completing this course successfully will be able to  
1. Understand basic structural engineering concepts  
2. Determine magnitude of different types of loads in accordance to the related codes.  
3. Idealization of structures and loads in relation with real structures.  
4. Determine forces in truss structures using various methods.  
5. Determine the internal forces for beams, frames and arches.  
6. Formulate the related equations and draw the shear force and bending moment diagrams for beams and frames.  
7. Understand numerical methods for computing displacements and slopes for beams using double integration, moment area, and conjugate beam methods.  
8. Use Virtual work method to determine the deformations of beams, frames and trusses resulted from loads including temperature effects and fabrication errors.  
9. Understand and apply influence lines for solving civil engineering problems.  
10. Use computer software to solve determinate structures  
11. Improve the communication skills, including reading, writing, oral presentations |
| **Topics Covered** | 1. Classification of structures; loads; structural design.  
2. Analysis of statically determinate structures.  
3. Analysis of statically determinate trusses and arches.  
4. Shear and moment diagrams in beams and frames.  
5. Influence lines.  
6. Deflection and slopes.  
7. Computer applications. |
| **Class/ tutorial Schedule** | Class is held three times per week in 50-minute lecture sessions. There is also a 50-minute weekly tutorial associated with this course. |
| **Computer Applications** | Commercial and educational structural software are encouraged to be used during the course. |
| **Project** | A project for collecting information for better understanding of structural engineering systems and fundamentals is offered for students in groups during the course, to emphasize the linkage between real structures, systems and loads with the course content. A written report and oral presentation is required. |
| **Contribution of Course to Meeting the Professional** | 1. Students learn the analysis process to be involved in designing various structural components used in professional structural engineering. |
| Component | 2. Students improve their writing, communication and presentation skills.  
3. Students recognize the role of professional societies in developing codes and standards and updating current knowledge. |
| Relationship of Course to Program Outcomes | 1. Students apply algebra, elementary calculus, and principles of mechanics.  
2. Students are able to identify and formulate an engineering problem and to develop a solution.  
3. Students recognize the importance of analysis in designing structural components.  
4. Students are encouraged to submit accurate analysis in an efficient and professional way.  
5. Students recognize their role with an engineering team carrying other aspects for analyzing structures, in terms of choosing the structural systems and the interaction of decisions made by various architectural and engineering teams.  
6. Students are encouraged to recognize the different structural systems and their range of applications.  
7. Students recognize the ethical and professional responsibility in achieving accurate structural analysis for safe and economical design, and its impact on the well-being of the society.  
8. Students recognize the need for technical updating on a continuing basis, since the course emphasizes on the changing nature of software, codes and specifications.  
9. Students recognize the importance of reading and understanding technical contents in English in order to achieve life-long learning and be able to carryout their responsibilities.  
10. Students recognize the important role of computers in facilitating analysis and design of structural members and systems.  
11. Students are encouraged to improve their writing, communication and presentation skills. |
| Textbook(s) and/or Other Required Material | 1. Structural Analysis, by R.C. Hibbeler, Prentice-Hall  
| Prepared by | Dr. M. Iqbal Khan and Dr. Shehab Mourad |
| Date of Preparation | 2nd Semester 1427-1428 |

**Grade Distribution**

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Mid-term Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Lecture Quiz and Attendance</td>
<td>5%</td>
</tr>
<tr>
<td>Tutorial, Homework’s and Project</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>50%</td>
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</tbody>
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**Class Quiz:**

Quizzes will be conducted from time to time in both lecture and tutorial classes. Tutorial marks will be based on quiz, homework and attendance.

**Mid Term Exams:**

First Mid-Term - 7th Week

Second Mid-Term – 13th Week