1. Course number and name
   ENGR 235: Surveying

2. Credits and contact hours
   3 credit hours; two 50-minute lecture sessions and one 150-minute laboratory session/week

3. Instructor's or course coordinator's name
   Instructor: Ghassan Tarakji, Professor of Civil Engineering
   Course coordinator: Ghassan Tarakji, Professor of Civil Engineering

4. Text book, title, author, and year

   d. other supplemental materials

5. Specific course information
   a) brief description of the content of the course (catalog description)
      Surveying: distance, elevation, and direction measurements; traverse analysis; contours; topography; areas calculations. Introduction to GPS and GIS. The US public lands system.
   
   b) prerequisites or co-requisites
      ENGR 100: Introduction to Engineering
      MATH 226: Calculus I (Graphs. Differentiation: theory, techniques, and applications. Integration: Fundamental Theorem of Calculus and applications. Transcendental functions)

   c) indicate whether a required, elective, or selected elective course in the program
      Required for Civil Engineering

6. Specific goals for the course
   e. specific outcomes of instruction, ex. The student will be able to explain the significance of current research about a particular topic.
      
      • Students will demonstrate an understanding of the tools and applications of surveying in civil engineering and construction.
      • Students will demonstrate an understanding of gross, systematic, and random errors.
      • Students will demonstrate that they are able to perform distance measurements and to perform the necessary corrections to these measurements.
      • Students will demonstrate that they are able to perform elevation measurements and to perform the necessary corrections to these measurements.
      • Students will demonstrate that they are able to perform direction measurements and to perform the necessary corrections to these measurements.
      • Students will demonstrate the ability to calculate the area of a traverse.
      • Students will demonstrate that they can perform traverse analysis and corrections.
      • Students will demonstrate an understanding of the concepts of GPS and GIS, and the applications of these two systems in the practice of surveying.
      • Students will demonstrate an understanding of the US Public Lands System.
• Students will demonstrate their ability to complete a project that includes both surveying data collection and computations.

f. explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course.
   Course addresses ABET Student Outcome(s): [list outcomes by letter].
   N/A

7. Brief list of topics to be covered (Tentative)
   • Introduction and background
   • Distance measurement and correction
   • Differential and profile leveling
   • Angles and directions
   • Traverse analysis
   • Contours and topography
   • Area calculations
   • Introduction to GPS
   • Introduction to GIS
   • U.S. public lands system
   • Project

Brief list of laboratory experiments to be covered (Tentative)
   • Swift Measurements (pacing and rolling wheel) and referencing points
   • Stadia distance measurement
   • Precise taping
   • Leveling along a loop
   • Profile leveling
   • Closing the horizon using the theodolite
   • Measurement of interior angles using the theodolite
   • Traverse measurements using total station
   • Staking out points using total station
   • Traverse analysis