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**

   a. **other supplemental materials**

5. **Specific course information**
   a) **brief description of the content of the course (catalog description)**
      Surveying: distance, elevation, and angle measurements; contours; topography; vertical and horizontal curves; cut and fill. Layout of right-of-way for railroads, highways, streets; grading; sight distances; design requirements. Interpretation of maps in engineering.

   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**
   a. **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 and the volume of earthwork.
• 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.

b. 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): b, k

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

Brief list of laboratory experiments to be covered
• 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
• Additional experiment (TBA)
• Traverse analysis