PROFESSIONAL PARALLELS

ENGINEERING
- 4-year degree required
- Fundamentals of Eng. Exam
- 4-years of experience
- Professional Eng. Exam

SURVEYING
- 4-year degree required
- 2-years of experience
- Fundamentals of Eng. Exam
- 2-years of experience
- Professional Surveying Exam

SURVEYING FUNDAMENTALS

I. Surveying – the art and science of taking field measurements on or near the surface of the Earth.
   a. Includes horizontal and slope distances, vertical distances and horizontal and vertical angles.
   b. Also measure position using northing, easting and elevation by satellite or remote sensing.

II. Geomatics – popular term used to describe computerization and digitization of data collection, data processing, data analysis and data output.
   a. Traditional surveying is cornerstone, but geomatics reflects the broadened scope of measurement science and information technology.

III. Types of Surveying
   a. Plane survey – surface of the earth is assumed to be flat (planar) surface.
   b. Geodetic survey – reflects the curved (ellipsoidal) surface of the Earth.

IV. Engineering surveying – those activities involved in the planning and execution of surveys for the location, design, construction, maintenance, and operation of civil or other engineered projects. Does not include surveys for the retracement or creation of land boundaries.

V. Types of Surveys
   a. Control survey – establish a base for horizontal and vertical measurements
   b. Layout survey – lay out property lines
   c. Construction survey – lay out proposed improvements
   d. Preliminary survey – collect data

VI. Distance Measurement
   a. Slope distance – measured along a slope
   b. Horizontal distance – measured along horizontal plane
   c. Vertical distance – measured vertically

VII. Angle Measurement
   a. Horizontal angle
   b. Vertical angle
VIII. Units of Measurement  
   a. Distance – decimal feet  
   b. Angle – degrees, minutes, seconds  
   c. Area – square feet or acres  
   d. Volume – cubic feet or cubic yards  

IX. Stationing – measurements along a baseline in the format $0 = 0+00$, $100 = 1+00$  

X. Errors  
   a. Systematic error – quantifiable errors (temp)  
   b. Random error – human error  

XI. Accuracy and Precision  
   a. Accuracy – relationship between the measured value and “true” value  
   b. Precision – degree of refinement of measurements  

XII. Mistakes  

XIII. Field Notes  
   a. Paper – logged in field book  
   b. Electronic – logged in data collector  
   c. Name, address and phone number  
   d. Pages numbered  
   e. Date, project name/number, crew members, instrument & weather  

XIV. Typical Civil Project Sequence (Engineering / Surveying Interaction)  
   a. Proposal  
   b. Awarded Project  
   c. Preliminary Survey  
   d. Engineering Design  
   e. Construction Staking  
   f. Construction  
   g. As-built / Final Survey  

Homework – Chapter 1, Questions 1.3, 1.6, 1.8