TOTAL STATION

I. Total station – combines angle measurement (theodolite), distance measurement (EDM) and data processing/storage (microprocessor)

II. Total Station Setup
1. Place instrument over point with tripod as level as possible.
2. Check plummet to see is your are reasonably close to station mark. If not, leave one leg on the ground, left the other two legs and rotate the instrument while watching the plummet. Carefully lower the legs when the plummet if over the station mark.
3. Firmly push in the tripod legs by stepping on the tripod shoe spurs.
4. Level the circular level bubble by adjusting the tripod legs up or down.
5. Use adjustment screws to fine tune the level adjustment with the electronic level bubble.
6. Loosen tripod clamp bolt and slide the instrument until the plummet is exactly centered on the station mark.

III. Total Station Capabilities
a. Measure and record horizontal and vertical angles together with slope distance.

b. Microprocessor
   1. Averaging multiple angle measurements
   2. Averaging multiple distance measurements
   3. Determining horizontal and vertical distances
   4. Determining X (easting), Y (northing) and Z (elevation) coordinates

c. Data Collection
   1. On-board
   2. External

IV. Field Procedures for Topographic Surveys
a. Initial data entry – A new project will need to be set up (or select existing project) and existing known points (control points) values will need to be entered.

b. Station descriptions – a code list (numeric or alpha) will need to be established (most likely the company you work for already has one in place)

c. Occupied point – The point on which the total station has been set (known control point) will need to be selected so that the instrument knows where it is.

d. Orientation – A backsight point or direction will need to be sighted and the instrument told which direction it is facing. This lets the instrument know the angle based on the meridian so that it will be able to calculated your foresight points.

e. Foresight point – Any points needed to develop the map will be located with the total station.

f. Types of Mapping
   1. Planimetric – 2d mapping (x,y)
   2. Topographic – 3d mapping (x,y,z)
g. Rectangular coordinates – For surveyors, x=Easting, y = Northing, z=Elevation. Make sure to check the order. Most surveyors report N,E,E.

h. Most mapping that you deal with as an engineer will be topographic (3d).

i. First look at 2d mapping features. This will be visible improvements such as curb and gutter, sidewalks, buildings, utility features, etc.

j. Next look at changes in grade (elevation) to create 3d modeling. This will be changes in slope, top and toe locations of retaining walls, curbs, slopes, etc.

Homework – Chapter 4, Question 4.8; Chapter 5, Questions 5.1, 5.3, Chapter 6, Question 6.4, Problems 6.3, 6.4