Statics & Structures

Things you should learn:

1. Why forces at every point in a non-accelerating (e.g., stationary) structure must sum to zero
2. What constitutes a resultant force of zero
3. About forces (and vectors)
   - What constitutes a vector
   - How to add (subtract) vectors graphically
   - How to add (subtract) vectors trigonometrically
   - How to deconstruct vectors into (convenient) components
   - How forces can be applied about a pivot to produce torque
4. The concept and use of "free-body" diagrams
5. The concept of a truss and what structural problems are solved
6. Trusses within trusses (within trusses. . .) can be useful
7. Why "pin" joints are used to tie members together
8. Why trusses are made up of triangular shapes
9. How external forces are applied to trusses
10. Why there's a need for "rolling" and "fixed" supports
11. How to analyze the stresses in a truss using the "method of joints"
12. Necessary (but not sufficient) conditions for defining a statically-stable truss
13. How node analysis leads to sets of simultaneous equations
14. Why a torque equation must be included in the analysis

Things you should be able to do:

1. Decompose a force into convenient components
2. Determine whether a truss problem is over or underdetermined
3. Produce examples of an unstable truss even though the necessary conditions are met
4. Design a truss with specific properties, e.g., with short compression members
5. Calculate the stresses in a simple truss with external loads
6. Explain the assumptions and conditions under which these analyses are valid

Things you should lie awake thinking about:

1. What implications are there if the joints in a truss are not pinned, but, rather, rigid
2. What does it mean to say that a truss design is over-determined
3. Where are trusses used and why
4. Most truss analysis is carried out in two dimensions; what about the third dimension