Some Design Terminology:

1. **Design variable:** A specific, quantifiable, descriptor of some feature of a design over which the designer has "control." Specific values of a complete set of design variables define a specific instantiation of the design. There are various types of design variables:
    - Continuous - the DV can assume any number over a range
    - Discrete - the DV can assume a finite number of values in a range
    - Batch - the DV is represented by a choice of finite number of options

   If you can't specify it and know you can control it (within some reasonable tolerance), it's probably not a design variable and most likely it's a state.
2. **Design parameter:** A specific, quantifiable, number that is used to describe a feature of the design or the environment in which the design functions. Parameters are those quantities used to model the design and its environment and over which the designer does not have or does not wish to exercise control at this point in the design process. Design parameters can remain fixed or vary during a design study.
3. **Behavior or state variable:** A quantity that is the result of analysis, numerical simulation or experiment and is used to describe a characteristic, behavior or "state" of a specific instantiation of a design. You influence these by controlling design variables.
4. **Constraint:** A limit (stated as either an equality or an inequality) that is imposed on either a design variable or a state/behavior variable. Constraints are most often used to assure the satisfaction of a design requirement. Some constraints are "hard" and some are "soft" and this usually is determined by the consequences of violating the constraint.
5. **Merit:** A state or combination of states and design variables that is used to establish preference between different instantiations of a design concept. Each instantiation of a design concept will have a single value of "merit" for the merit to be useful.

Engineering Design Studies:

1. Research study - developing new knowledge or locating and evaluating existing knowledge that can be used in feasibility or trade studies.
2. Feasibility study - use analysis (i.e. formulate and solve equations), numerical simulation or experiments (or some combination of all three) to determine if an instantiation of an idea or concept will satisfy design requirements.
3. Component selection study - use analysis, numerical simulation or experiment to assist in the selection of existing component/s for a specific instantiation of an idea or concept to determine if it will satisfy design requirements. May be composed of a series of "feasibility studies."
4. Trade study - use analysis, numerical simulation or experiment to identify key design variables, parameters and constraints and to determine the behavior of a design concept/s over a range of choices. It is not limited to a specific design but can be used to identify multiple, feasible designs. Trade studies are often most useful in identifying design variables, parameters and states that are most important in a design (and often to identify those that aren't very important) - that is one of their key roles.
5. Design optimization study - systematic trade study in which design variables are selected in order to satisfy constraints but to also improve the merit of the design or locate a single design with maximum or minimum merit. To find an "optimum" you need a quantifiable measure of merit.