APPLICATION COMPONENTS:

General comments. Your application should be flawless – well organized, well written (no grammatical errors, typos), and incorporating the elements of intellectual merit and broader impacts into each of the three components as appropriate**. Iterate, iterate, iterate** with peers, faculty advisors, etc. If you really want to test your proposal, give it as a talk to advisors and peers. That is a terrific way to root out areas that are vague or tedious, find the key points and make your narrative more compelling to reviewers.

a. Two pages MAX including citations (12-point font!)
b. Any research activity can be described. The key is to describe your experiences (projects, internships, lab research, etc) in a narrative way to indicate your ability to generate new knowledge systematically and communicate your findings to peers.
c. Research or projects you have participated in: REU, UROP, honors projects, employment or work-study in labs, or other research internships or jobs are appropriate. Emphasize your emphasize your contribution. Listing a number of experiences is okay, but do this in a narrative way so reviewers understand that you grasp the research process.
d. If you do not have direct experience in a defined project, say what experiences prepared and motivated you to do research in grad school
e. Publications , presentations, posters, seminars and talks, and technical reports – may be co-authored.
f. If your previous research or project had an impact on your proposed research, say so and describe – this makes a great narrative for reviewers. With respect to broader impacts in this section, was any of your work incorporated into a class? A training manual? Did you mentor any students or do a demonstration for an outreach activity relating to your project.

3. Proposed Plan of Research

a. Two pages MAX including citations (12-point font!)
b. Research topic you intend to pursue, including how you got interested in topic. The scope of this should be appropriate in terms of time and available resources. Consult your advisor to review.
c. Concise statement of topic with summary of previous research by others (include citations)
d. Research objectives, hypothesis or questions to be answered
e. Approach – field work? Lab experiments? Computer modeling, etc? Preliminary data?
f. Expected outcomes. You can summarize intellectual merit (contributions to knowledge, new methodology, dissemination
plan) and broader impacts (integrate research and teaching, contribute to diversity in science/engineering/math, outreach to professional and civic audiences).

4. Three reference letters: academic or professional people who know you and can comment on research ability and potential

REVIEW NSF THEMES:
There are what the review panels use to consider your essays and other application materials. They should be referenced throughout your essays – especially the Personal Statement and Research Plan.

Intellectual Merit
1. **Ability to Plan and Conduct research** (coherent research plan, show knowledge of background by including citations, show institution and advisor appropriate for research by selection of recommendation letter writers). Mainly this will be addressed in your Research Statement and certainly in your Research Proposal. It includes demonstration that you know the state of knowledge in your field of research and you can identify the gaps that must be closed to make significant progress or gains.
2. Ability to **work independently and in collaboration**. This will be addressed mostly in your research experience statement – be sure to offer specific examples of how both independent and team work enhanced a project. If your work has an interdisciplinary component you can make a strong statement about how you will collaborate with people outside your specific area of knowledge. Make sure your referees comment on this in recommendation letters.
3. Ability to **interpret and communicate findings**. You can cover this in your personal statement if writing manuscripts or presenting your findings had an impact on your motivation to do graduate research, your research experience statement, listing publications, presentations, and in your research proposal – future plans to disseminate technical information to peers and submit papers to peer review. This can also contain plans for statistical analysis of data, calibration and verification
of models, etc. It is surprising how infrequently this is done, and how often it is noticed by reviewers.

Broader Impacts. Do not neglect this component. (Broader impacts do mean the importance of your topic or the passive future benefits to users and/or society. This is an ACTIVE component – what you will (or have) actually done.)
1. **Integrate research and education** – plans for using your own research results, but also describe how you will create general links that others can use: teach others, outreach to community with results. This can be addressed in your research proposal (future) and the other two components (previous experience). Examples: create classroom material – exercises, software, lab experiments and demonstrations related to your research; mentor an undergraduate or high school student researcher; write a training manual for people who will operate and maintain a new device or process from your research; prepare a module for the national "Teach Engineering Library" or other web-based educational resource.
2. **Encourage diversity**, broad opportunity for participation in STEM.
a. How will you contribute to enhanced racial, ethnic, gender, and abilities diversity as a grad student researcher – are there activities at your institution you could participate in (e.g., BOLD center, mentoring SMART interns, GK-12 outreach. Find these opportunities at CU through the Colorado Diversity Initiative and in engineering through the BOLD center.)

b. **Disseminate results broadly** in other than scientific literature: websites? Community lectures or talks? Column for popular press?
3. **Benefit society**. What are the anticipated benefits to society of your research, beyond advancing specialized knowledge or giving you an advanced degree?
4. Be specific, use personal experiences (i.e., address BI's in personal statement and research plan, especially)
5. DO NOT NEGLECT THIS THEME, AND CITE BROADER IMPACTS EXPLICITLY.