



2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- ENGINEERING CONVERTS KNOWLEDGE INTO THINGS.
- ENGINEERING HAS GIVEN US MANY INDISPENSABLE THINGS.
- WHAT IS YOUR FAVORITE ENGINEERED PRODUCT?



2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- ENGINEERING GOES THROUGH PHASES
- THE ENGINEERING PROCESS ALSO INVOLVES ITERATION



Ideate



Plan



Prototype



Test



Launch



2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- WHY DO AN ENGINEERING RESEARCH PROJECT?
- HOW DO I GET STARTED ON AN ENGINEERING PROJECT IDEA?
- HOW DO I CHOOSE A GOOD ENGINEERING RESEARCH TOPIC?
- CATEGORY vs FIELD OF STUDY.
- THE ENGINEERING PROJECT PROPOSAL.
- THE ENGINEERING PROJECT DETAILED RESEARCH PLAN TEMPLATE.
- TOP 10 REVIEW ISSUES TO FIX IN AN ENGINEERING PROJECT PROPOSAL.
- 10 TIPS FOR A COMPETITIVE ENGINEERING RESEARCH PROJECT.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- **WHY DO AN ENGINEERING RESEARCH PROJECT?**
 - Because I have an idea!
 - Because I think I can make something better.
 - Because I think there is a critical need for a solution.
 - Because engineering excites me & I want to improve my engineering skills.
 - Because...
- **HOW DO I GET STARTED ON AN ENGINEERING PROJECT IDEA?**
 - Observe a need or a problem. Sketch the need or the problem.
 - Define the need or a problem. Who? What? Where? When? Why? How?
 - Conduct research literature review on the need or problem.
- **HOW DO I CHOOSE A GOOD ENGINEERING RESEARCH TOPIC?**
 - Invest time and effort in background research.
 - Emphasize innovation.
 - Demonstrate competitive advantage.
 - Incorporate human-centric design aspects such as interactive interfaces, adaptability, adoptability, usability, feedback loops, accessibility, & user experience.
 - Discuss & refine ideas with teachers & others.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- CATEGORY vs FIELD OF STUDY

- The category is mainly based on the choice of a BIOLOGICAL vs PHYSICAL/CHEMICAL/MATHEMATICAL/COMPUTATIONAL topic.
- If research is substantially conducted outside home/school/field, select an RRI category.
- If research is substantially mentored by a person other than teacher sponsor, select an RRI category.
- Choose the field of study based on the idea or hypothesis, not the work effort.
 - Software Engineering projects require the development of new algorithms, methods, systems, libraries or other computer science research topics. Application of existing software is not considered Software Engineering research.
 - In general, the appropriate field of study for your project will be reflected in the “About” description of the primary references research journals.
 - When two fields of study may seem appropriate, choose the one most connected to your main bibliography reference.
- Which audience would be interested in this research? In what field are other researchers doing similar work?
- How can we ensure that judges with the necessary expertise are assigned to your project?

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- An ENGINEERING research project involves designing a solution to a well-defined need or problem.
- To be research, the project requires complete originality, creative thinking & innovation (new & better).
- Engineering project proposals must meet the Minimum Quality Requirements.
 - Bibliography. Justify idea with primary references from scholarly peer-reviewed research journals.
 - Design Criteria & Constraints. Minimum of 3 design criteria. All applicable science-related constraints.
 - Test plans. At least 1 test plan for each design criteria. Each test plan must state its performance success (pass/fail) criteria. Tests involving human subjects must also receive IRB approval.
- Most engineering project proposals must also include the following additional information:
 - Rationale Statement. Includes problem/need statement & reference citations to support idea & methods.
 - Materials list. Comprehensive & detailed list for quality control/quality assurance purposes.
 - Illustrations such as flowcharts, maps, photographs, drawings & schematics.
 - Detailed fabrication, assembly and/or construction methodology allowing reproducibility.
- Some engineering project proposals may need to also provide:
 - References to external data sources.
 - Other disclosure documentation for projects considered RRI or Continuation.
- Project proposals must meet applicable safety, privacy, & regulatory compliance requirements.
- Risk Assessment if (1) injury/fatality risk, (2) property damage risk, or (3) hazardous materials/equipment.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- THE ENGINEERING PROJECT DETAILED RESEARCH PLAN TEMPLATE

- Download template from SCVSEFA website using link for “Engineering Research Plan.”
- MS Word (.docx) document.
- On Google Drive, the template is editable in Google Docs as a MS Word document.
- In Google Docs, the MS Word template can be converted to Google Docs format using “Save as Google Docs” under File menu.
- Research plan submissions for SCVSEFA approval must be in PDF format. There are several PDF conversion options.
- Header (Date, Student Name & Project Title).
- Project (Engineering) Goal.
- Project Design Criteria.
- Project Constraints.
- Project Design.
- Prototype Testing.
- Bibliography. Uniformly apply format published by MLA, APA or research journal.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- TOP 10 REVIEW ISSUES TO FIX IN AN ENGINEERING PROJECT PROPOSAL.
 1. Does not meet Minimum Quality Requirements.
 2. Safety concerns. Risk Assessment may be required. SRC and/or IRB Pre-Approval may be required.
 3. Insufficient detail.
 4. Lack of scientific & scholarly merit.
 5. Formatting issues.
 6. Form 1 and/or Form 1A incorrectly filled.
 7. Start Date, End Date or other Date issues.
 8. Ethics issues including Attribution, Citations, & Plagiarism.
 9. Un-readable content.
 10. Research project is hypothesis-based and should use the Science Research Plan template.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- **SRC CRITICAL & NEED-TO-KNOW**

1. **SRC PRE-APPROVAL.** Review the guidelines on the Scientific Review Committee (SRC) process. Project proposals that require attention to safety, privacy or regulatory compliance issues must be submitted for SRC review by end-of-day Wednesday November 13, 2024. Projects whose proposals are submitted for SRC pre-approval may not have research work start before approval is granted. Project applications which do not meet the deadline will be denied acceptance. There is a flowchart diagram on the SRC web page to assist in deciding whether a project needs SRC pre-approval.
2. **SRC PRE-APPROVAL EXCEPTION.** If the project work is conducted at a Regulated Research Institution (RRI) and received the necessary RRI SRC/IRB approval for the project, then SRC pre-approval is not required. Such project applications should meet the Friday January 10, 2025 deadline for submission.
3. **ANIMAL STUDIES.** Research projects involving vertebrate animals must receive SRC pre-approval. The proposal must justify animal use and give consideration to alternative approaches.
4. **PHBA.** Research projects involving Potentially Hazardous Biological Agents (PHBA) including microorganisms, rDNA, tissue, blood, or body fluids must receive SRC pre-approval.
5. If a project proposal with SRC pre-approval needs to be substantially modified, contact the SRC reviewer for pre-approval of the modified project.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- **IRB CRITICAL & NEED-TO-KNOW**

1. **IRB PRE-APPROVAL.** The Institutional Review Board (IRB) is a sub-committee of the SRC and attends to SRC factors affecting human test subjects. If the engineering project protocol will involve recruited human participants (eg, surveys, questionnaires, trials, recordings), the IRB ensures that the researchers have satisfied the IRB requirements.
2. **IRB DOCUMENTATION.** If humans will test your engineering design, a sample Informed Consent Form (ICF) along with relevant protocols & sample test subject communication materials should be submitted with the Human Participants Form 4. After IRB approval, you will use copies of this form to obtain informed consent from each participating subject before you start testing.
3. **QUALIFIED SCIENTIST.** A qualified scientist/doctor is required for all projects involving medical/mental or environmental health/quality.
4. **BEHAVIORAL SCIENCE.** The Synopsis Championship does not accept projects in the Behavioral Science field of study. See the Synopsis Championship website for details.
5. **MEDICAL IRB.** Projects may not involve researchers diagnosing disease, administering medication, and/or performing medical procedures on human participants.

2025 SYNOPSIS CHAMPIONSHIP: ENGINEERING PROJECTS

Presented by the Santa Clara Valley Science & Engineering Fair Association

- 10 TIPS FOR A COMPETITIVE ENGINEERING RESEARCH PROJECT.
 1. Thorough testing.
 2. Detailed design documentation.
 3. Human-centered impact & focus. Empathy.
 4. Research quality project title.
 5. Research quality bibliography.
 6. Timeliness.
 7. Functionality.
 8. Data is vetted & valid.
 9. Engineering “system of systems” framework.
 10. Clear communication with audience. Valuable research & societal contribution.