

Implementing Industry Practices for an Undergraduate Engineering Senior Design Capstone Program

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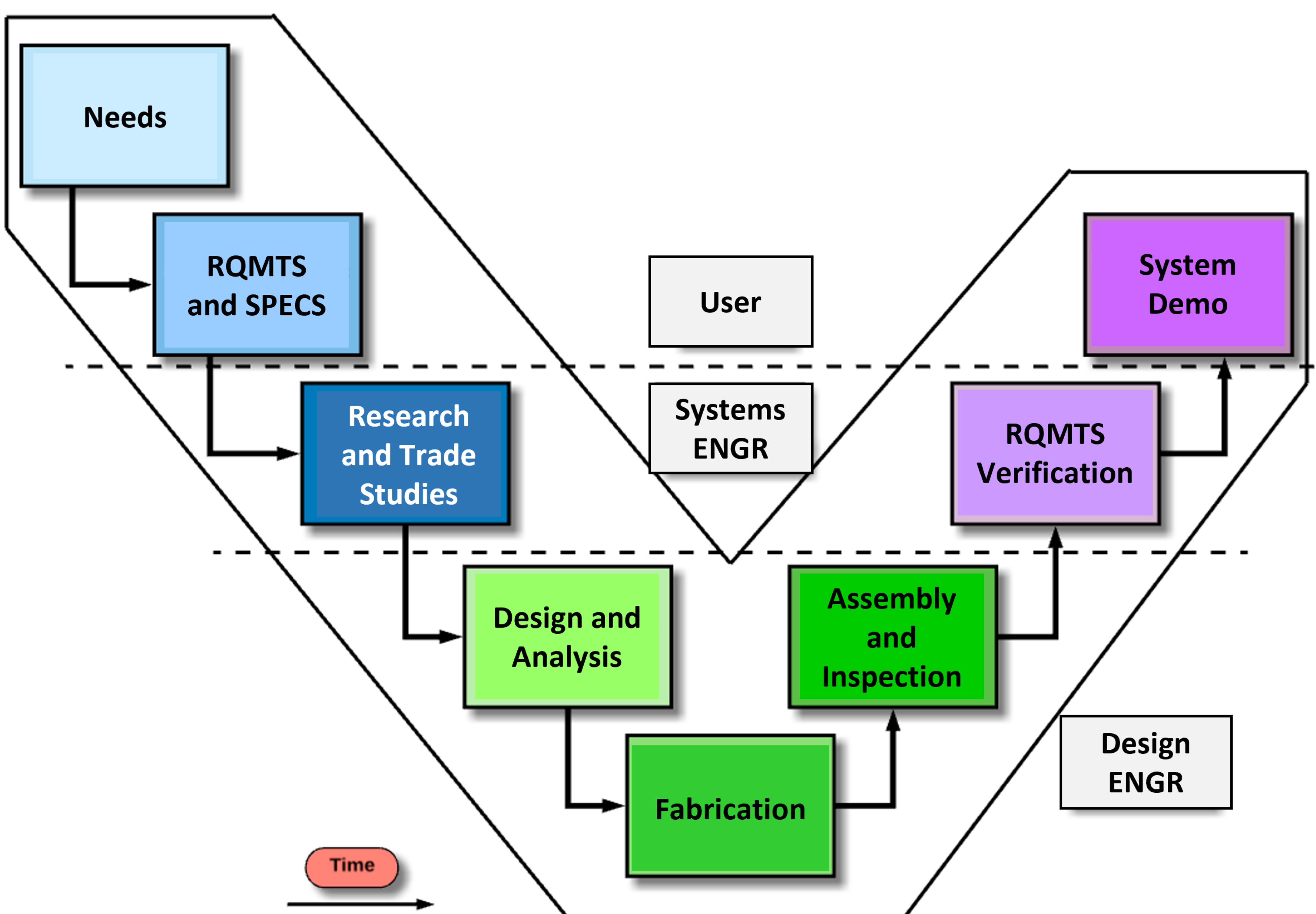
Capstone Design
CONFERENCE 2022

JUNE 6-8, 2022 ▶ DALLAS, TEXAS

Overview

Project Management and Systems Engineering are integral components of the Senior Design Capstone Program in Mechanical Engineering at San Diego State University.

Requirements management, risk management, cost, schedule and scope management, requirements verification and key program milestones including design reviews have been implemented.



**Senior Design Capstone Program
System Engineering¹ "Vee"**

Tools Implemented for Each Project Team

- Team-Maker and Peer Evaluation (CATME²)
- Schedule Management (TeamGantt³)
- Requirements and Specification Tables
- Material Budget Plan and Bill of Materials
- Work Breakdown Structure
- Team Organization Chart
- System Level Diagram
- Risk Definitions and Risk Cube

References:

1. Staff, (2016) NASA Systems Engineering Handbook, NASA/SP-2016-6105 Rev2. Worldwide web address: <https://www.nasa.gov/connect/ebooks/nasa-systems-engineering-handbook>
2. CATME Worldwide web address: <https://info.catme.org/>
3. TeamGantt Worldwide web address: <https://www.teamgantt.com/>

First Semester	Team Formation & Project Selection
	*System Definition Document
	*Project Management Plan
	Research and System Design
	*Preliminary Design Review
	Engineering Analysis
	*Critical Design Review
	*Manufacturing Review
Second Semester	Supply Chain / Procurement
	Fabrication & Assembly
	*Test & Evaluation Review
	*System Demonstration
	*Final Reports (Fall and Spring)

* Formal Project Deliverables

Senior Design Capstone Program Milestones

Student Success

- 2021 Finalist - NASA Moon to Mars Ice Prospecting Challenge
- 2021 Winner - University of Texas, Arlington 3D Printed Aircraft Competition (3DPAC)
- 2022 First Year Participant Award – NASA Robotic Mining Competition (Lunabotics)
- Two US Patent Applications

2021-2022 Class Survey

Strongly Agree or Agree Responses

- ✓ 95% "Made Me a Better Engineer"
- ✓ 94% "My Project was a Success"
- ✓ 94% "Helped Me Prepare for Industry"

Understanding requirements contributed to the success of our project.

Strongly Agree	95 respondents	65 %	✓
Agree	48 respondents	33 %	
Neither Agree nor Disagree	3 respondents	2 %	
Disagree		0 %	
Strongly Disagree		0 %	

Risk management contributed to the success of our project.

Strongly Agree	46 respondents	32 %	✓
Agree	65 respondents	45 %	
Neither Agree nor Disagree	30 respondents	21 %	
Disagree	4 respondents	3 %	
Strongly Disagree	1 respondent	1 %	