Quantitative Methods in Systems Engineering

WEEK 1: Making Early Tradeoff Decisions (5-6 hrs)

February 10 – 16, 2020

The course officially kicks off!

In the first week, you'll take a Pre-Assessment to get a baseline of your understanding of the course material. In Week 1, you will first work through quantitative methods that do not require a model, such as the Pugh method. You will spend time on generating concepts for evaluation, and get an overview of how to structure a trade study.

Pre-Assessment ★	**15 min**
Get Started	**25 min**
▪ Welcome	2 min
▪ Course Schedule	3 min
▪ Discussion Forum	5 min
▪ Course Webinars	5 min
▪ Teams	3 min
▪ Who's Teaching the Course	4 min
▪ Grading and Completion Criteria	1 min
▪ Certificate Information and CEUs	1 min
▪ Learning Objectives and Pedagogy	2 min
▪ Social Media Groups	1 min
▪ Software Requirements	1 min
Making Early Tradeoff Decisions	**5-6 hrs**
▪ Key Ideas	10 min
▪ Framing Early Decisions	55 min
▪ Concept Selection Methods	45 min
▪ Overview of Trade Studies	30 min
▪ Graded Activity ★	20 min
Due by Monday, March 9 @ 23:30 UTC	
▪ Trade Studies in Practice	20 min
▪ Project ★	2 hrs
Project Submission and Self-Assessment due by Sunday, February 16 @ 23:30 UTC	
▪ Key Takeaways	2 min

Live Event This Week

Project Tutorial Webinar with TA Daniel Adsit
Wednesday, February 12th at 17:00 UTC
Additional information in "Get Started > Course Webinars" section

WEEK 2: Value-Oriented Decision Making (5–6 hrs)

February 17 – 23, 2020

In Week 2, you will begin the process of tradespace exploration by defining value - a key metric by which designs are compared. You will work from a notion of value to a process for developing a model of value. You will learn to characterize a design using attributes and how to organize attributes in hierarchies for evaluation and summation.

Value-Oriented Decision Making	**5-6 hrs**
▪ Key Ideas	10 min
▪ Framing Decision Making and Tradeoffs	10 min
▪ Value-Focused Thinking and Value-Driven Design	20 min
▪ Developing Value Models	35 min
▪ Operationalizing Value Models	25 min
▪ Graded Activity Due by Monday, March 9 @ 23:30 UTC	20 min
▪ Project Project Submission and Self-Assessment due by Sunday, February 23 @ 23:30 UTC Peer Assessment due by Monday, February 24 @ 23:30 UTC	2 hrs
▪ Action Plan Due by Monday, March 9 @ 23:30 UTC	20 min
▪ Key Takeaways	2 min

WEEK 3: Generating and Evaluating Alternatives (5–6 hrs)

February 24 – March 1, 2020

For Week 3, you'll start by creating a variety of designs for evaluation and explore how design decisions are combinatorially paired and sampled to generate a design space. You'll then define how these designs will be evaluated in terms of value (Week 2) and other outputs, such as cost and performance. Finally, you will be introduced to tradespace visualization - how we represent the output of the search for great designs.

Generating and Evaluating Alternatives	**5-6 hrs**
▪ Key Ideas	8 min
▪ Generating Design Spaces	45 min
▪ Evaluating Design Spaces	25 min
▪ Tradespace Representations, Visualizations, and Interactions	35 min
▪ Graded Activity Due by Monday, March 9 @ 23:30 UTC	20 min
▪ Project Project Submission and Self-Assessment due by Sunday, March 1 @ 23:30 UTC Peer Assessment due by Monday, March 2 @ 23:30 UTC	2 hrs
▪ Key Takeaways	3 min

Live Event This Week
Webinar with Dr. Donna Rhodes
Wednesday, February 26th at 17:00 UTC
Additional information in "Get Started > Course Webinars" section

WEEK 4: Tradespace Exploration and Analysis (5–6 hrs)

March 2 – 9, 2020

Final week!

In Week 4, after reviewing the creation of the tradespace, you will begin the interpretation of the results by looking for patterns in the tradespace, such as clusters and the Pareto Front. You will define what sensitivity means for a design in the tradespace and reflect on how uncertainty can be captured and represented. Finally, you'll close with a review of task allocation between models and people in the design process.

Tradespace Exploration and Analysis	**5-6 hrs**
▪ Key Ideas	10 min
▪ Identifying Key Features and Patterns	50 min
▪ Determining Sensitivity and Robustness	40 min
▪ Graded Activity Due by Monday, March 2 @ 23:30 UTC	20 min
▪ Humans, Methods, and Models	10 min
▪ Project Project Submission and Self-Assessment due by Sunday, March 8 @ 23:30 UTC	2 hrs
▪ Action Plan Due by Monday, March 9 @ 23:30 UTC	20 min
▪ Key Takeaways	2 min
▪ Course and Program Wrap-Up	8 min
▪ Exit Survey	10 min
Post-Assessment Due by Monday, March 9 @ 23:30 UTC	15 min

After the course ends...

Download your certificate.

March 9

- Course ends at 23:30 UTC
- Discussion forums lock at 23:30 UTC

March 11

- Download your Course Certificate from your student dashboard