Quantitative Methods in Systems Engineering

Schedule

WEEK 1: Making Early Tradeoff Decisions (~5 hrs)

July 10 – July 16, 2017

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 ⭐
Get Started
• Welcome
• Course Schedule
• Course Collaboration Tools
• Teams
• Who’s Teaching the Course
• Grading and Completion Criteria
• Certificate Information and CEUs
• Learning Objectives and Pedagogy
• Social Media Groups
• Software Requirements

Making Early Tradeoff Decisions 5 hrs
• Key Ideas
• Framing Early Decisions
• Concept Selection Methods
• Overview of Trade Studies
• Ask the Instructor a Top 10 Question (Yellowdig Discussion Platform)
  • Due by Thurs, July 13 @ 21:00 UTC
  • Responses posted on/before Sat, July 15 @ 21:00 UTC
• RSVP for Webinar + submit a question in advance on Yellowdig (submit thru July 14; see Week 2 for additional RSVP details)
• Graded Activity ⭐
  • Due by Monday, August 7 @ 23:30 UTC
WEEK 2: Value–Oriented Decision Making (~5 hrs)

July 17 – 23, 2017

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

- Key Ideas
- Framing Decision Making and Tradeoffs
- Value–Focused Thinking and Value–Driven Design
- Developing Value Models
- Operationalizing Value Models
- Webinar with Bruce Cameron, Faculty Director, ASE Certificate:
  - Monday, July 17 @ 16:00 UTC (12 pm EST/ 9 am PST)
  - RSVP details appear in Yellowdig and in course platform under Get Started > “Course Collaboration Tools”
  - Questions can be submitted in advance (thru July 14) on Yellowdig

- Graded Activity
  - Due by Monday, August 7 @ 23:30 UTC
  - 20 min

- Project
  - Project Submission due by Sunday, July 23 @ 23:30 UTC
  - Peer and Self-Assessment due by Monday, July 24 @ 23:30 UTC
  - 2 hrs

- Action Plan
  - Due by Monday, August 7 @ 23:30 UTC
  - 20 min

- Key Takeaways
  - 2 min
WEEK 3: Generating and Evaluating Alternatives (~5 hrs)

July 24 – July 30, 2017

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
- Key Ideas
- Generating Design Spaces
- Evaluating Design Spaces
- Tradespace Representations, Visualizations, and Interactions
- Ask the Instructor a Top 10 Question (Yellowdig Discussion Platform)
  - Due by Thursday, July 27 @ 21:00 UTC
  - Responses posted on/before Saturday, July 29 @ 21:00 UTC

Graded Activity ⭐
- Due by Monday, August 7 @ 23:30 UTC

Project ⭐
- Project Submission due by Sunday, July 30 @ 23:30 UTC
- Peer and Self-Assessment due by Monday, July 31 @ 23:30 UTC

Key Takeaways
- 8 min
- 45 min
- 25 min
- 35 min
- 5 min
- 20 min
- 2 hrs
- 3 min
WEEK 4: Tradespace Exploration and Analysis (~5 hrs)

July 31 – August 7, 2017

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.

<table>
<thead>
<tr>
<th>Tradespace Exploration and Analysis</th>
<th>5 hrs</th>
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<tbody>
<tr>
<td>Key Ideas</td>
<td>10 min</td>
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<tr>
<td>Identifying Key Features and Patterns</td>
<td>50 min</td>
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<td>Determining Sensitivity and Robustness</td>
<td>40 min</td>
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<td>Due by Monday, August 7 @ 23:30 UTC</td>
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<tr>
<td>Humans, Methods, and Models</td>
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<tr>
<td>Project ★</td>
<td>2 hrs</td>
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<td>Project Submission and Self-Assessment due by Sunday, August 6 @ 23:30 UTC</td>
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<td>Action Plan ★</td>
<td>20 min</td>
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<tr>
<td>Due by Monday, August 7 @ 23:30 UTC</td>
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<tr>
<td>Key Takeaways</td>
<td>2 min</td>
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<tr>
<td>Course and Program Wrap-Up</td>
<td>8 min</td>
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<td>Exit Survey</td>
<td>10 min</td>
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<td>Post-Assessment ★</td>
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After the course ends...

August 7 – November 5, 2017

Download your certificate.

August 7

- Course ends at 23:30 UTC
- Download your Certificate of Completion from your student dashboard
- You will receive your printed certificate by mail within 30–45 days

November 5, 2017—90 days after course ends

- Course closes and all content is archived for both Course 4 and entire program