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Home Academics Graduate Program Courses ME 6102: Designing Open Engineering Systems

# ME 6102: Designing Open Engineering Systems

Offered Every Spring

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Design Sequence

Credit Hours:	3-0-3
Prerequisites:	Graduate standing in engineering or related discipline
Catalog Description:	Decision-based integrated product and process development; meta-design and decision support problems; mathematical modeling of decisions involving ambiguity and uncertainty; critical thinking and analysis; verification and validation; research issues
Textbooks:	No textbook required
Instructors:	Farrokh Mistree
References:	Articles to be specified
Goals:	To provide a scientific foundation for the development of design models (Decision-Based Design) and methods (Decision Support Problem Technique) and design support tools (Decision Support Problems). This covers two of three areas that were deemed to be crucial to reforming the practice and teaching of engineering design. <sup>1</sup> Specifically, provide an opportunity for students to learn how <ul style="list-style-type: none"><li>to negotiate solutions to open problems. Open problems are characterized as those which are open to the environment, for which there may be multiple solutions or for which no solution may exist;</li><li>to use mathematical models in design (make connection between engineering science and engineering design);</li><li>to design the specifications and configure an engineering system using available assets (existing components or modules);</li><li>identify, model, solve decision problems.</li></ul>
Desired Student Outcomes:	<ul style="list-style-type: none"><li>Learn how to negotiate design open systems from a decision-based perspective.</li><li>Develop an appreciation for the scientific foundations that are required for developing a decision-based approach for designing open engineering systems.</li><li>Develop an appreciation of the state-of-the-art in decision-based design and Concurrent Design research and practice.</li><li>Develop the ability to critically evaluate literature and use this analysis to identify research issues worth investigating.</li></ul>
Topics:	<ul style="list-style-type: none"><li>Open engineering systems</li><li>Identification, characteristics, metrics (robustness, modularity, adaptability, mutability), research issues.</li><li>Decision-Based Integrated Product and Process Development</li><li>Meta-design: Designing design processes.</li><li>Designing with decision support problems.</li><li>Design examples and open issues.</li><li>Design Support Tools</li><li>Attention Directing Tools</li><li>Planning Tools</li><li>Decision Support Problems</li><li>Selection: Structure; mathematical form; designing scales; quantifying qualitative information; personal construct theory.</li><li>Compromise: Structure; mathematical form; solution of multiobjective, real-world problems; post-solution sensitivity analysis and crafting recommendations.</li><li>Coupled: Structure; mathematical form; example.</li></ul>

- Mathematical modeling of Decision Support Problems
- Modeling the design equation for integrated product and process development.
- Modeling openness: robustness, modularity, adaptability, mutability.
- Modeling design freedom.
- Modeling quality and affordability.
- Modeling ambiguity and uncertainty.
- Nature of critical thinking and analysis
- Deep reading: Critical Thinkers.
- On critical evaluation including the posing of questions.
- Verification and validation.
- Computer tools
- Phase Event and Information
- Attention Directing
- Partitioner
- Decision Support Problems

Delivery mode (%):	Lecture	100
Grading Scheme (%):	Mini Project	10
	Assignments	10
	Project	65
	Critical evaluation of accomplishments and learning	10
	Class participation	5

1 See C.W. Hoover, J.B. Jones, et al. *Improving Engineering Design: Designing for Competitive Advantage*, National Research Council Report, National Academy Press, Washington DC, 1991.

THE GEORGE W. WOODRUFF SCHOOL OF MECHANICAL ENGINEERING

STUDENT RESOURCES

- Undergraduate Curriculum
- Undergraduate Registration
- Undergraduate FAQs
- Graduate Handbook
- Graduate FAQs
- Student Groups

FACULTY & STAFF RESOURCES

- Support Services
- Phone Directory
- Support Assignments - Under Construction
- Forms
- TechWorks
- Facilities
- CoE Dean's Office Statement on Ethics & Integrity

QUICK LINKS

- Accreditation
- College of Engineering
- Georgia Tech Visitor Information
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Employment Opportunities

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