Creative Problem Solving and Engineering Design
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This book incorporates a strong focus on innovative thinking, teamwork, and communications in engineering design. It responds to the needs of industry for engineers who have these foundational skills and to the ABET Criteria 2000 which require that students are able to work on multidisciplinary teams and understand the global context of engineering. It includes many guidelines, practical examples, and hands-on activities, so that students not only learn the theoretical knowledge but are able to apply it in concurrent engineering and innovation in the workplace. The book can be used for a broad range of courses and applications:

- First-year courses such as “Introduction to the Engineering Profession” to begin developing the skills that will form the foundation for everything that follows;
- Creative problem-solving courses for sophomore or junior level engineering students or for multidisciplinary and multi-level project teams (such as design competition projects);
- Senior capstone design courses in all engineering and technology disciplines, either taught on-campus or via distance learning. A typical syllabus is shown on the back of this flyer, with content using the extended version referenced below.
- As a valuable resource for engineers just starting to work in environments where teamwork is emphasized or where rapid technological change is occurring.

With this book, students are provided with detailed instructions, examples, and formats for preparing a complete dossier of design documentation. This not only guides their decision making as they progress through their team design projects but assures that they meet the stakeholder requirements and stay on track. The teams are encouraged to develop optimum solutions as well as a final report that they can present with pride to their project sponsors and future employers.

Benefits and Resources for Design Faculty
Faculty members can concentrate on teaching the twelve steps to “quality by design”—the process helps to prevent dysfunctional teams or substandard written and oral presentations. Also,

1. PowerPoint slides are available upon request for most chapters; contact lumsdaine@chartermi.net.
2. The course text can be customized by combining part or all of Creative Problem Solving and Engineering Design with material from other authors or the instructor’s class notes—see example below.
3. For other products, workshops, and ordering information, see www.InnovationToday.biz.

Creative Problem Solving and Engineering Design 2
Edward Lumsdaine, Monika Lumsdaine, J. William Shelnutt, and George E. Dieter
720 pages, softcover

Part 1 — Foundational Skills and Mental Models
Part 2 — The Creative Problem Solving Process
Part 3 — Application in Engineering Design
Part 4 — Selected Chapters on “Design for X”
THE 12 STEPS TO QUALITY BY DESIGN

Step 12 – Communicate results  DP-12, A, B, C
Step 11 – Evaluate/review design  DP-11
Step 10 – Testing; production design  DP-10
Step 9 – Tolerance level design  DP-9
Step 8 – Parametric/system level design  DP-8, A, B, C, D
Step 7 – Develop concepts/best options  DP-6, A, B, C
Step 6 – Plan design process  DP-5
Step 5 – Analyze problem & context  DP-4
Step 4 – Identify design specs  DP-3
Step 3 – Identify user needs  DP-2
Step 2 – Identify constraints  DP-1
Step 1 – Identify forces driving design

The DP numbers refer to the formats of the design project documentation given in the textbook.

SYLLABUS FOR A DISTANCE-LEARNING CAPSTONE DESIGN COURSE

Topics (2 Videotaped Lectures per Week)
1. Course intro, requirements; project descriptions
2. Need identification; constraints; design journal
3. HBDI; project assignments
4. Teamwork and communication
5. Creative problem solving, Part 1
6. Creative problem solving, Part 2
7. Design documentation I
8. How to give an effective oral presentation
9. Oral team presentations of project proposal
10. Innovation in the workplace
11. Project planning and scheduling
12. Overcoming mental blocks; idea generation
13. The Pugh method for optimizing concepts
14. The product design process. Steps 7 and 8
15. Oral team presentation of progress reports
16. Information sources and patent searching
17. Economic decision making
18. QFD and design specifications
19. Design documentation II
20. Exam
21. Prototyping and prototype testing
22. Product liability
23. Ethics
24. Ethics; DFX I
25. DFX II, DFM I
26. DFM II
27. Design Day: final oral team presentation, poster
28. Course evaluation; team report; design journal

Associated Documentation*  
Class schedule, logistics handouts  
DP-1, DP-2, DP-3  
HBDI results, info packet  
Assignment to projects and teams  
DP-4 (customer survey if relevant)  
DP-5, DP-6B, DP-6C  
DP-6A  
Schedule at convenience of instructor  
DP-6A  
Different design concepts (3 or more)  
DP-7, DP-7B (Round 1)  
Peer Contrib. Rating Form I, DP-8A  
DP-8, DP-8D  
DP-7, DP-7B, DP-7C (Round 2)  
DP-7B, DP-7C (revised)  
Analysis, DP-8A (updated)  
Review of main concepts in textbook  
DP-10, DP-11  
DP-8B, DP-8C (final)  
DP-9 and safety description  
DP-12, DP-12A, DP-12B, DP-12C  
Peer Contribution Rating Form II  

PowerPoint  
24/26 slides*  
21 slides  
33 slides  
39 slides  
30 slides  
30 slides  
15 slides  
33 slides  
48 slides  
24/30 slides*  
33 slides  
24 slides  
21 slides  
42 slides  
18 slides  
38 slides  
35 slides  
30 slides  
36 slides  
30 slides  
33 slides  

Text Ch.  
1  
2,13  
3  
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3,7  
8,9,10,12  
5,13,17  
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6, 8, 9  
11  
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4D**  
16  
5,14,17  
1-18  
7D  
15D  
15D  
6D,9D  
6D,9D  
9D,12D  
17  
5,17  

* Student/faculty PowerPoint slides—the student version is used to make handouts excluding answer pages.

** “D” chapter numbers refer to chapters from George E. Dieter’s book in the extended edition of the course textbook.