

# Des Moines Area Community College

## COURSE INFORMATION

Acronym/Number CADT 461

Title Design Project 1

Credit breakout 4                      2                      4                      0                      0  
(credit                      lecture                      lab                      practicum                      work experience)

**PREREQUISITE(S):** MATH 411, CADT 411, CADT 415, CADT 425

### **COURSE DESCRIPTION:**

Detailing individual parts, types of assembly drawings and parts lists will be covered on an individual basis. Design process and procedures will be discussed. The student shall conform to industry standards for their design project.

### **COURSE COMPETENCIES:**

*During this course, the student will be expected to:*

1. Discuss design project conceptions.
  - 1.1 Discuss product markets (consumer, government, etc).
  - 1.2 Examine supply and demand.
  - 1.3 Examine cost analysis.
  
2. Associate typical engineering jobs and duties as they pertain to the design project.
  - 2.1 Discuss design teams.
  - 2.2 Discuss manufacturing/engineering relationships.
  - 2.3 Discuss Product Lifecycle Management. (PLM)
  - 2.4 Examine job responsibilities.
  - 2.5 Examine 'job-shops'.
  - 2.6 Discuss company and project security.
  
3. Analyze project components.
  - 3.1 Discuss piece parts.
    - 3.1.1 Examine mechanical parts.
      - 3.1.1 Discuss structural steel mechanical parts – HVAC, etc.
    - 3.1.2 Examine electrical parts.
      - 3.1.2 Discuss electronic circuit card components (integrated circuits, etc) versus electrical parts (switches, large circuit breakers, etc.).
    - 3.1.3 Examine civil engineered parts.

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- 3.1.3.1 Discuss structural steel applications.
    - 3.1.4 Examine miscellaneous parts.
  - 3.2 Discuss assemblies.
    - 3.2.1 Examine how parts go together in an assembly.
    - 3.2.2 Discuss how the various part types (mechanical, electrical, civil, etc.) will vary in assembly methods and size.
- 4. Examine drawing types.
  - 4.1 Discuss layouts.
  - 4.2 Discuss piece part drawings.
  - 4.3 Discuss tabulated part drawings.
  - 4.4 Discuss altered item drawings.
  - 4.5 Discuss specifications.
  - 4.6 Discuss source control drawings.
  - 4.7 Discuss assembly drawings.
    - 4.7.1 Examine separable assemblies.
    - 4.7.2 Examine inseparable assemblies.
    - 4.7.3 Examine parts lists.
      - 4.7.3.1 Discuss parts list integrated into drawing.
      - 4.7.3.2 Discuss separated parts list.
  - 4.8 Discuss schematics.
  - 4.9 Discuss pictorial drawings.
  - 4.10 Discuss patent drawings.
  - 4.11 Discuss customer drawings.
  - 4.12 Discuss government drawings.
    - 4.12.1 Discuss department of defense drawing standards (DOD).
    - 4.12.2 Discuss department of transportation standards (DOT).
    - 4.12.3 Discuss miscellaneous government drawings.
- 5. Analyze how the market for a product determines engineering conception and design.
  - 5.1 Evaluate how product marketing drives engineering projects.
  - 5.2 Examine how different factors can enter into product design,
    - 5.2.1 Analyze how products are used by a variety of applications.
  - 5.3 Research how marketing could effect your design.
- 6. Discuss creating an engineering project.
  - 6.1 Discuss project sketches.
  - 6.2 Discuss project layout(s).
  - 6.3 Examine time estimates for drawings.
  - 6.4 Examine CAD/CAM/CAE considerations.
  - 6.5 Discuss material considerations.
  - 6.6 Discuss fabrication techniques.
  - 6.7 Discuss assembly techniques.
  - 6.8 Examine design reviews.
    - 6.8.1 Discuss preliminary design review (PDR).
    - 6.8.2 Discuss confirming design review (CDR).
    - 6.8.3 Discuss project milestones.

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- 6.9 Discuss 'extracting' drawings from your layout.
- 6.10 Discuss utilizing a 3D solid model for an assembly.
  - 6.10.1 Discuss 'extracting' parts from a 3D solid model assembly.
  - 6.10.2 Discuss 'bi-directional' editing within a solid.
  - 6.10.3 Discuss automatic updates to other engineers. (PLM) (See 6.2.)
- 6.11 Discuss purchased parts.
- 6.12 Discuss engineer prototype. (See 9.1.)
  
- 7. Explore the engineering release cycle.
  - 7.1 Discuss drawing release cycles.
    - 7.1.1 Examine engineering release.
    - 7.1.2 Examine release to production.
  - 7.2 Discuss the design drafter's role in the release cycle.
  - 7.3 Examine 'read-only' drawing attributes to prevent changes.
  
- 8. Examine revision cycles.
  - 8.1 Examine a revision request document.
  - 8.2 Examine implementing a change. (PLM)
  - 8.3 Discuss releasing the change back into the engineering system.
  - 8.4 Discuss the design drafter's role in the revision cycle.
  
- 9. Outline a design project.
  - 9.1 Select a design project.
    - 9.1.1 Examine related issues of the project.
    - 9.1.2 Discuss patent/copyright infringement.
    - 9.1.3 Examine community standards/codes.
    - 9.1.4 Examine environmental impact.
  - 9.2 Perform a market research for the design project.
  - 9.3 Prepare project notebook.
  - 9.4 Prepare preliminary sketches.
  - 9.5 Evaluate project with instructor.
  - 9.6 Evaluate project with engineers.
  
- 10. Discuss reverse engineering
  - 10.1 Examine reverse engineering applications.
    - 10.1.1 Discuss using reverse engineering in your design project.
  - 10.2 Discuss utilizing 'template' parts.
  - 10.3 Discuss methods of measurement for parts that are already assembled.
    - 10.3.1 Examine x-rays.
    - 10.3.2 Examine ultrasound.
  - 10.4 Discuss 'line drilling' holes.
  - 10.5 Discuss reverse engineering as a means of prototyping.
  - 10.6 Examine practical applications for reverse engineering.
  
- 11. Examine engineering prototypes.
  - 11.1 Discuss purpose of prototype.
  - 11.2 Examine prototype simulations.

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- 11.2.1 Discuss Finite Element Analysis for simulation.
- 11.2.2 Discuss 'substituting'.
  - 11.2.2.1 Examine using a weldment in place of a casting.
  - 11.2.2.2 Examine using plastics in lieu of metals in a prototype.
- 11.3 Discuss rapid-prototyping.
  - 11.3.1 Discuss using CAD solid models to rapid-prototype.
  - 11.3.2 Rapid-prototype a CAD solid part.
- 12. Create a project layout.
  - 12.1 Prepare layout conception from preliminary sketches.
  - 12.2 Create design layout of project.
    - 12.2.1 Create CAD model(s) of assembly.
      - 12.2.1.1 Determine if sub-assemblies are required.
      - 12.2.1.2 Determine number of piece parts.
    - 12.2.2 Research purchased versus fabricated parts.
      - 12.2.2.1 Examine altered item drawings.
      - 12.2.2.2 Examine specifications.
    - 12.2.3 Extract detail drawings from layout.
  - 12.3 Calculate time management.
    - 12.3.1 Prepare preliminary design review (PDR).
    - 12.3.2 Schedule a PDR with the design reviewers. (Reviewers assigned by instructor.)
  - 12.4 Prepare project to be completed in CADT463.
    - 12.4.1 Save all CAD files and retain all data of project.

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**INSTRUCTIONAL MATERIALS:**

**Textbook(s):** For each text used in this course, identify the minimum chapters to be covered in this course.

Industry standard drafting text.

Industry standard CAD text.

Machinery's Handbook.

**Study guide**

**Transparencies**

**Test banks**

**Computer hardware/software**

Industry standard computer-aided drafting software.

**Other (example: Laboratory equipment for biology/chemistry class)**

Qty as required – computer storage media.

**Computer Laboratory**

Instructor/institution assigned.

**Preparation**

date: 7/03 revised 7/04

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Competencies are reviewed annually.