

HOUSEKEEPING COVER SHEET

COLLEGE OF
DESIGN

Use this form to propose changes to courses that fall under the College of Design Policy on Routine Maintenance and Housekeeping Decisions.

UNIVERSITY OF MINNESOTA

Housekeeping

Effective Term: **Fall 2016**

Required: Academic Support Resources (ASR) Needed

Department: **DHA**

Career: Undergraduate
 Graduate

Course Designator: **PDes**

Course Number: **3706**

Program: **Product Design**

Submission Date:

Submission from:

- Libraries
- Computer Lab
- Digifab Lab
- Goldstein
- Imaging Lab
- Other Technology
- Workshop
- ASR Support not needed.

Select Changes:

- Change in Delivery Format
 - Change in Grading Method
 - Change in Prerequisite
 - Other:
 - Change in Catalog Description
 - Change in Course Number
 - Change in Course Title
 - Change in Term Offered
 - Correction of typographical or grammatical errors
 - Offering of a Topic
- Number of times this specific topic has been offered in the past five years: including this one.

I. Briefly describe proposed changes. (Executive Summary in Workflow Gen)

There is currently no prerequisite. Add prerequisites: 3704 to ensure students have appropriate skills for success in 3706; PDes Major or Minor or #.



Electronic Course Authorization System

(ECAS)

PDES 3706 - VIEW COURSE PROPOSAL

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Approvals Received:	Department on 09-25-15 by Charleen Klarquist (cklarqui@umn.edu)
Approvals Pending:	College/Dean > Provost > Catalog > PeopleSoft Manual Entry
Effective Status:	Active
Effective Term:	New: 1169 - Fall 2016 Old: 1159 - Fall 2015
Course:	PDES 3706
Institution: Campus:	UMNTC - Twin Cities/Rochester UMNTC - Twin Cities
Career:	UGRD
College:	TALA - College of Design
Department:	12114 - DHA Product Design

General

Course Title Short:	Designing for Manufacture
Course Title Long:	Designing for Manufacture
Max-Min Credits for Course:	4.0 to 4.0 credit(s)
Catalog Description:	New: Hands-on exposure to a number of common manufacturing methods and the considerations in product design. Students will be able to apply the theory of design for manufacturing (DFM) and design for assembly (DFA) to other methods that may not be taught in this course. prereq: PDes 3704 or CAD experience. Old: Hands-on exposure to a number of common manufacturing methods and the considerations in product design. Students will be able to apply the theory of design for manufacturing (DFM) and design for assembly (DFA) to other methods that may not be taught in this course. prereq: PDes 3704 or CAD experience.
Print in Catalog?:	Yes
CCE Catalog Description:	<no text provided>
Grading Basis:	A-F only
Topics Course:	No

Honors Course:	No
Online Course:	No
Instructor Contact Hours:	6.0 hours per week
Course Typically Offered:	Every Fall
Component 1:	LEC (no final exam)
Auto-Enroll Course:	No
Graded Component:	LEC
Academic Progress Units:	Not allowed to bypass limits. 4.0 credit(s)
Financial Aid Progress Units:	Not allowed to bypass limits. 4.0 credit(s)
Repetition of Course:	Repetition not allowed.
Course Prerequisites for Catalog:	New: <no text provided> Old: PDes 3704 or CAD experience.
Course Equivalency:	No course equivalencies
Add Consent Requirement:	No required consent
Drop Consent Requirement:	No required consent
Enforced Prerequisites: (course-based or non-course-based)	New: PDes Major or Minor or instructor permission Old: No prerequisites
Editor Comments:	3/26/2015: Approved by CCC (KAR)
Proposal Changes:	<no text provided>
History Information:	<no text provided>
Faculty Sponsor Name:	Barry Kudrowitz
Faculty Sponsor E-mail Address:	barryk@umn.edu

Student Learning Outcomes

Student Learning Outcomes:	<p>* Student in the course:</p> <ul style="list-style-type: none"> - Can communicate effectively <p>New:</p> <p>Please explain briefly how this outcome will be addressed in the course. Give brief examples of class work related to the outcome.</p> <p>â&#x2013; Gain a firm understanding of the most commonly used manufacturing methods â&#x2013; Be able to create engineering drawings that can be quoted by machine shops â&#x2013; Understand the limitations and trade-offs of various manufacturing methods â&#x2013; Know how to cost-reduce designs by selecting the most appropriate method, and â&#x2013; Know how to design within the limitations of those methods</p> <p>How will you assess the students' learning related to this outcome? Give brief examples</p>
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of how class work related to the outcome will be evaluated.

Assessment via Product Dissection, Product Assembly, Machining, 3D Printing + Casting, Injection Molded Component, Final Project, Final Exam

Old:

Please explain briefly how this outcome will be addressed in the course. Give brief [examples](#) of class work related to the outcome.

âž‰ Gain a firm understanding of the most commonly used manufacturing methods âž‰ Be able to create engineering drawings that can be quoted by machine shops âž‰ Understand the limitations and trade-offs of various manufacturing methods âž‰ Know how to cost-reduce designs by selecting the most appropriate method, and âž‰ Know how to design within the limitations of those methods

How will you assess the students' learning related to this outcome? Give brief [examples](#) of how class work related to the outcome will be evaluated.

Assessment via Product Dissection, Product Assembly, Machining, 3D Printing + Casting, Injection Molded Component, Final Project, Final Exam

Liberal Education

[Requirement this course fulfills:](#)

None

[Other requirement this course fulfills:](#)

None

[Criteria for Core Courses:](#)

Describe how the course meets the specific bullet points for the proposed core requirement. Give concrete and detailed examples for the course syllabus, detailed outline, laboratory material, student projects, or other instructional materials or method.

Core courses must meet the following requirements:

- They explicitly help students understand what liberal education is, how the content and the substance of this course enhance a liberal education, and what this means for them as students and as citizens.
- They employ teaching and learning strategies that engage students with doing the work of the field, not just reading about it.
- They include small group experiences (such as discussion sections or labs) and use writing as appropriate to the discipline to help students learn and reflect on their learning.
- They do not (except in rare and clearly justified cases) have prerequisites beyond the University's entrance requirements.
- They are offered on a regular schedule.
- They are taught by regular faculty or under exceptional circumstances by instructors on continuing appointments. Departments proposing instructors other than regular faculty must provide documentation of how such instructors will be trained and supervised to ensure consistency and continuity in courses.

<no text provided>

[Criteria for Theme Courses:](#)

Describe how the course meets the specific bullet points for the proposed theme requirement. Give concrete and detailed examples for the course syllabus, detailed outline, laboratory material, student projects, or other instructional materials or methods.

Theme courses have the common goal of cultivating in students a number of habits of mind:

- thinking ethically about important challenges facing our society and world;
- reflecting on the shared sense of responsibility required to build and maintain community;
- connecting knowledge and practice;

fostering a stronger sense of our roles as historical agents.

<no text provided>

[LE Recertification-Reflection Statement:](#)
(for LE courses being re-certified only)

<no text provided>

Statement of Certification:

This course is certified for a Core, effective as of
This course is certified for a Theme, effective as of

Writing Intensive

Propose this course as Writing Intensive curriculum:

No

Question 1 (see CWB Requirement 1):

How do writing assignments and writing instruction further the learning objectives of this course and how is writing integrated into the course? Note that the syllabus must reflect the critical role that writing plays in the course.

<no text provided>

Question 2 (see CWB Requirement 2):

What types of writing (e.g., research papers, problem sets, presentations, technical documents, lab reports, essays, journaling etc.) will be assigned? Explain how these assignments meet the requirement that writing be a significant part of the course work, including details about multi-authored assignments, if any. Include the required length for each writing assignment and demonstrate how the minimum word count (or its equivalent) for finished writing will be met.

<no text provided>

Question 3 (see CWB Requirement 3):

How will students' final course grade depend on their writing performance? What percentage of the course grade will depend on the quality and level of the student's writing compared to the percentage of the grade that depends on the course content? Note that this information must also be on the syllabus.

<no text provided>

Question 4 (see CWB Requirement 4):

Indicate which assignment(s) students will be required to revise and resubmit after feedback from the instructor. Indicate who will be providing the feedback. Include an example of the assignment instructions you are likely to use for this assignment or assignments.

<no text provided>

Question 5 (see CWB Requirement 5):

What types of writing instruction will be experienced by students? How much class time will be devoted to explicit writing instruction and at what points in the semester? What types of writing support and resources will be provided to students?

<no text provided>

Question 6 (see CWB Requirement 6):

If teaching assistants will participate in writing assessment and writing instruction, explain how will they be trained (e.g. in how to review, grade and respond to student writing) and how will they be supervised. If the course is taught in multiple sections with multiple faculty (e.g. a capstone directed studies course), explain how every faculty mentor will ensure that their students will receive a writing intensive experience.

<no text provided>

Statement of Certification:

This course is certified as Writing Intensive effective as of

Course Syllabus

[Course Syllabus:](#)

For new courses and courses in which changes in content and/or description and/or credits are proposed, please provide a syllabus that includes the following information: course goals and description; format; structure of the course (proposed number of instructor contact hours per week, student workload effort per week, etc.); topics to be covered; scope and nature of assigned readings (text, authors, frequency, amount per week); required course assignments; nature of any student projects; and how students will be evaluated. The University "Syllabi Policy" can be found [here](#)

The University policy on credits is found under Section 4A of "Standards for Semester Conversion" found [here](#). Course syllabus information will be retained in this system until new syllabus information is entered with the next major course modification. This course syllabus information may not correspond to the course as offered in a particular semester.

(Please limit text to about 12 pages. Text copied and pasted from other sources will not retain formatting and special characters might not copy properly.)

Designing for Manufacture

Course Designator PDES Section Number 001
 Course Number 3706/5706 Semester and Year Fall 2015

Class Meeting Days & Time Monday, Wednesday, 6:15-9:00pm
 Classroom Rapson XX
 Number of Credits 4
 Final Exam Date & Time
 (Also state if there is NO final) No Final

Instructor's Information

Name Andrew Carlson
 Office Location
 Office Phone
 Email carl2353@umn.edu
 Office Hours Before/After Class and by Appointment

Course Information and Instructor's Expectations

Description

One of the final steps in creating a marketable product is the manufacturing of the components. Throughout the design process, designers and engineers must fully understand a variety of processes in which parts can be produced and assembled. Selecting a manufacturing method and ensuring the parts are capable of production is a difficult but critical part of the product design process.

The purpose of this course is to provide hands-on exposure to a number of common manufacturing methods and the considerations in product design. This course will allow students to apply the theory of design for manufacturing (DFM) and design for assembly (DFA) to other methods that may not be taught in this course.

This course is taught through project based learning with hands-on experience in designing new products and sub-components. One day a week, the lecture will discuss many different varieties of manufacturing within a theme. The other day the students will focus specifically on one method in that theme in a hands-on learning environment. For each assignment, students will need to design, model, and draft a new component focusing on a specific manufacturing method. Assignments will be graded on the design feasibility, and most importantly, their overall design for manufacturing.

For students who have not taken PDES 3704/5704 Innovative Computer Modeling and Rendering, you must complete the specified online Solidworks tutorials before the 3rd week of class in addition to the given assignments for the first three weeks.

Student Learning Outcomes following course completion: (must identify at least one outcome and how it relates to this course how it will be addressed and how it will be assessed, <http://www.slo.umn.edu/>)

This course focuses heavily on one of the approved student learning outcomes:

Communicating effectively

- Gain a firm understanding of the most commonly used manufacturing methods
- Be able to create engineering drawings that can be quoted by machine shops
- Understand the limitations and trade-offs of various manufacturing methods

- Know how to cost-reduce designs by selecting the most appropriate method, and
- Know how to design within the limitations of those methods

Release of Work Statement:

Students understand that enrollment in this course grants consent for their work to be selected for inclusion in college or departmental publications (online or in print). Your instructor may select to use your work to represent her/his skills as an instructor in a teaching portfolio (online or in print).

Attendance:

Class participation grades are based on both attendance and quality of in-class activity. Attendance is crucial as every lecture builds on the last. Tardiness will also count against the participation grade. Only in certain circumstances as described in the Policies section will an absence or tardy not affect the grade.

Workload:

Students are expected to spend 9-12 hours outside of class time working on assignments each week.

Final Project: Graduate Level. For the final project in the course, students will be expanding on a homework product or creating something new. All students are expected to understand and communicate the details of their design in a manner that would be capable of being produced. Graduate level students will be expected to use multiple manufacturing methods in their design and include more complex parts (e.g. not simply laser-cut, or 3D-printed). Graduate students will also need to contact real vendors to have their parts quoted in reasonable quantities along with vendor-specific pricing on a complete bill of materials, tooling estimates, assembly labor, packaging, etc. The goal is for students to be able to, as detailed as possible without investment, estimate the total cost of production.

Textbook and Readings:

Design for Manufacturability Handbook, Second Edition, James Bralla

Grading Structure:

Absences will result in a grade deduction. Excused absences, however, will not affect your grade (see policy section). Tardiness will affect your class participation grade.

- 10% - Product Dissection, Assignment 1
- 10% - Product Assembly, Assignment 2
- 10% - Machining, Assignment 3
- 10% - 3D Printing + Casting, Assignment 4
- 10% - Injection Molded Component, Assignment 5
- 20% - Final Project
- 20% - Exam
- 10% - Class Participation

Students registered in PDES 5705, the graduate section, will be expected to submit a written report in addition to their final team project that documents their process and includes a detailed plan, BOM, and cost estimates for manufacturing their final design.

This extra project is not required for undergraduate students.

<http://policy.umn.edu/Policies/Education/Education/GRADINGTRANSCRIPTS.html>

Accepting and Returning Assignments:

Most assignments are due two weeks after they are assigned in lecture. Feedback and grades will be returned the week after assignments are submitted.

Grading Late Work:

Late assignments will receive a letter grade deduction for every day late.

Policy for Missed Exams:

Missed exams will be made up on the student's time.

Make Up Work for Legitimate Absences:

Students will have an extra week to complete assignments missed from legitimate absences.
<http://www.policy.umn.edu/Policies/Education/Education/MAKEUPWORK.html>

Extra Credit Options:

None

Schedule and Assignments:**Week 1: Introduction to Design for Manufacture and Class Structure**

(Assignment 1: Product Dissection and Part Identification – choose a product from a select list, do a product teardown, identify the material, cost, and manufacturing process for each component, develop an assembly drawing for the product, suggest improvements)

Week 2: Engineering Drawings and Communication / Material Identification**Week 3: Assemblies / Fasteners / Joining / Welding / Soldering**

(Assignment 2: Design for Assembly – using off-the-shelf electronics and joining components found on McMaster-Carr (and formed sheet metal?) design a light or lamp that can be easily mass produced)

Week 4: Forming / Sheet metal / Bending / Forging / Rolling / Shearing / Stamping**Week 5: Machining / Drilling / Milling / Turning**

(Assignment 3: Machining – Design a one piece 2D metal bottle opener that can be mass produced and produce 10 identical parts)

Week 6: 2D Cutting / Waterjet / Laser Cutter / Plasma Cutting / CNC Router**Week 7: Additive Manufacturing / 3D Printing / SLA / SLS / FDM /LOM**

(Assignment 4: 3D Printing + Casting – Design a simple two part mold for 3D printing to be used in casting a silicone part)

Week 8: Casting and Mold Making / Die Casting / Lost Wax / Sand Casting**Week 9: Injection Molding / Compression Molding**

(Assignment 5: Injection Molding – Design a simple part for injection molding)

Week 10: Thin and Hollow Moldings / Thermoforming / Blow Molding / Rotomolding**Week 11: Ceramic Processes / Fabric Processes****Week 12: Electronic Fabrication Processes**

(Assignment 6: Final Project – TBD)

Week 13: Finishes / Powder Coating / Deburring**Week 14: Project Workday / Final Crit****Week 15: Presentations and Critique**

University Policies

Personal Electronic Devices in Classroom:

PEDs are not permitted in lecture.

<http://policy.umn.edu/Policies/Education/Education/CLASSROOMPED.html>

Use of Class Notes and Materials:

It is not permitted to profit off of the lecture notes from this class. If you want to reference slides or notes, please give credit to the course instructor and the University of Minnesota.

<http://policy.umn.edu/Policies/Education/Education/CLASSNOTESSTUDENTS.html>

Scholastic Dishonesty and Student Conduct Code:

http://www1.umn.edu/regents/policies/academic/Student_Conduct_Code.pdf

Sexual Harassment:

<http://www1.umn.edu/regents/policies/humanresources/SexHarassment.pdf>

Statement on Climate of Inclusivity:

You are expected to be attentive during class, ask questions if you do not understand something, and to offer your opinion. You are also expected to listen respectfully to other students and to me when speaking. The University of Minnesota is committed to providing a safe climate for all students, faculty, and staff. All persons shall have equal access to its programs and facilities without regard to race, color, creed, religion, national origin, sex, age, marital status, disability, public assistance status, veteran status, or sexual orientation. Racism, sexism, homophobia, classism, ageism and other forms of bigotry are inappropriate to express in this class. Reports of harassment are taken seriously, and there are individuals and offices available for help.

(or refer to

http://www1.umn.edu/regents/policies/administrative/Equity_Diversity_EO_AA.pdf)

Academic Freedom and Responsibility:

http://www1.umn.edu/regents/policies/academic/Academic_Freedom.pdf

Availability of Disability and Mental Health Services:

The University of Minnesota is committed to providing all students equal access to learning opportunities. Disability Services (DS) is the campus office that works with students who have disabilities to provide and/or arrange reasonable accommodations.

Students who have, or think they may have, a disability (e.g. mental health, attentional, learning, vision, hearing, physical or systemic), are invited to contact DS to arrange a confidential discussion at 612- 626-1333 (V/TTY) or ds@umn.edu.

Students registered with DS, who have a letter requesting accommodations, are encouraged to contact the instructor early in the semester to discuss accommodations outlined in their letter.

As a student you may experience a range of issues that can cause barriers to learning, such as strained relationships, increased anxiety, alcohol/drug problems, feeling down, difficulty concentrating and/or lack of motivation. These mental health concerns or stressful events may lead to diminished academic performance or reduce your ability to participate in daily activities. University of Minnesota services are available to assist you with addressing these and other concerns you may be experiencing. You can learn more about the broad range of confidential mental health services available on campus via www.mentalhealth.umn.edu or contact Counseling/Consulting Services at 612-624-3323.

Academic Services:

If you would like additional help, please contact one of the offices listed below.

Center for Writing 10 Nicholson Hall, Mpls 612-626-7579

Student Academic Success Service 340 Appleby Hall, Mpls
199 Coffey Hall, St. Paul 612-624-3323

Strategic Objectives & Consultation

Name of Department Chair Approver:

Elizabeth Bye, ebye@umn.edu

Strategic Objectives - Curricular Objectives:

How does adding this course improve the overall curricular objectives of the unit?

New: F2016 change adds a prerequisite of PDes major, minor or instructor permission, anticipating approval of PDes bachelor of Science.

This course is one in a sequence of courses core to Product Design. Manufacturing is one of the last steps in bringing the ideas to fruition.

Old: This course is one in a sequence of courses core to Product Design. Manufacturing is one of the last steps in bringing the ideas to fruition.

Strategic Objectives - Core Curriculum:

Does the unit consider this course to be part of its core curriculum?

Yes, this is a core course.

Strategic Objectives - Consultation with Other Units:

In order to prevent course overlap and to inform other departments of new curriculum, circulate proposal to chairs in relevant units and follow-up with direct consultation. Please summarize response from units consulted and include correspondence. By consultation with other units, the information about a new course is more widely disseminated and can have a positive impact on enrollments. The consultation can be as simple as an email to the department chair informing them of the course and asking for any feedback from the faculty.

New: No further consultation after initial proposed course was approved.

Consultation has occurred with the following individuals: Will Durfee, Mechanical Engineering; Mac McKeen, Manufacturing Operations Management; Shuzhong Zhang, Industrial and Systems Engineering; and Chris Cramer, Associate Dean of College of Science & Engineering. None saw significant overlap.

Old: Consultation has occurred with the following individuals: Will Durfee, Mechanical Engineering; Mac McKeen, Manufacturing Operations Management; Shuzhong Zhang, Industrial and Systems Engineering; and Chris Cramer, Associate Dean of College of Science & Engineering. None saw significant overlap.

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