

Design for Manufacturing/Assembly

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Class: self-paced, asynchronous, online

Office Hours: by appointment

Prerequisites:

The student must have passed with a C or better the following courses with the following topics: machine design and manufacturing. Under limited circumstances, the student may be concurrently enrolled in a manufacturing course based upon professor discretion.

OR

Graduate student standing and based on profession discretion.

Special Accommodations:

If special accommodations are required for the student, please see the professor within the first two weeks of class so that proper arrangements may be made.

Textbooks:

Poli, C., (2001), *Design for Manufacturing: A Structured Approach*, Butterworth-Heinemann, Boston, MA: ISBN 0-7506-7341-9.

NOTE: this book should be available on-line through the library @ <https://nam02.safelinks.protection.outlook.com/?url=https%3A%2F%2Fbookcentral.proquest.com%2Flib%2Futd%2Fdetail.action%3FdocID%3D349321&data=04%7C01%7CJoshua.Summers%40UTDallas.edu%7C26d72760965d4ee89d1c08d8e5a84432%7C8d281d1d9c4d4bf7b16e032d15de9f6c%7C0%7C0%7C637511858198763332%7CUnknown%7CTWFpbGZsb3d8eyJWljoicjoiV2luMzliLCJBTiI6k1haWwiLCJXVCI6Mn0%3D%7C1000&sdata=CtgEp1v%2Fw40weeM3XZBez%2FDkZpeR32ZF2w%2BVsc4kQOY%3D&reserved=0>

Course Description:

Concepts of product and process design for automated manufacturing are considered. Topics include product design for automated manufacturing, inspection and assembly, using automation, industrial robots, knowledge-based systems and concepts of flexible product manufacture. The primary objectives of this course:

1. To show students the relationships between part design and its manufacturability.
2. To teach students methods of DMF and DFA.
3. To provide students team instruction through project experiences.

The undergraduate student learning outcomes include:

- Being able to conduct a cost analysis on a casting/molding part or assembly
- Being able to make recommendations to improve the part or assembly
- Being able to find and explain design for manufacturing guidelines

The graduate student learning outcomes include all of the above and:

- Being able to write a technical treatise on a design for manufacturing topic
- Being able to research a technical topic in the literature

Assignments:

This course is structured to build upon the student's experiences, encourage the student to discover new material independently, and foster a habit of self-critique. To do this, homework is designed to help the student understand the material, not to create "busy work".

- All work submitted should be professional quality (clear, concise, correct, and conscientious).

- The assignments should be submitted with a standard cover sheet (see website).
- No late assignments will be given credit, however late work may be submitted for corrections.
- Ethical behavior and professional standards are expected in this class. All work submitted is to be that of the individual student unless cooperative effort is authorized in specific instances. The College of Engineering and Science Honor Code will be observed. Refer to your student handbook regarding University policies on academic dishonesty.

Computer Usage

Word processing, spreadsheet, Internet, and mathematical computation utilities will be used by the students throughout the course. Out of class tutorials may be offered to augment students' existing capabilities.

Weighting for Grade:

Contract grading will be used in this course. The minimum grade earned for any of the components (Undergraduate: learning gates and guidelines; Graduate: learning gates, guidelines, and term project) will be the overall grade assigned at the end of the course.

Learning Gates (Undergraduate and Graduate)

Students are expected to submit responses to learning gates throughout the semester. Some learning gates are in direct response to recorded lectures, while others are applications of the taught tools, and others are critiques and analyses of research papers. The learning gates are submitted through the online portal and must use the provided template. A student must complete ≥ 25 learning gates at an acceptable level to be eligible for an A in the class. The ranges are below:

- A: ≥ 25 gates
- B: ≥ 20 gates
- C: ≥ 15 gates
- D: ≥ 10 gates

DFX Guidelines (Undergraduate and Graduate)

Students are expected to submit guidelines throughout the semester. The rules are to be submitted through the online portal and must follow the prescribed format. A student must complete ≥ 40 rules to be eligible to earn an A in the class. The ranges are below:

- A: ≥ 40 rules
- B: ≥ 30 rules
- C: ≥ 10 rules
- D: ≥ 5 rules

Term Project (Graduate)

Students will identify a topic within DFMA that, ideally, relates to their research theme. They will submit a proposal on the topic (term paper, review paper, experimental work, simulation work) that includes the explanation of why this is of interest to them and what the effort associated with the term project is. On approval, students can then work on their term project (generally this is individual, but a group projects that are significantly more effort can be considered). A final report and other appropriate deliverables are to be submitted by the end of the semester. Often, these term projects are at the same level as conference papers. Here are some examples of past term projects:

- Kumar, P., Summers, J., (2023), "A Categorical Approach to Define Makerspaces", ASME International Design Engineering Technical Conferences and Computer in Engineering Conference, Boston, MA, August 2023, IDETC2023-117124.
- Sutton, M., Summers, J., (2021), "Comparing Change Management Processes for Requirements and Manufacturing: An Interview Based Study", ASME International Design Engineering Technical Conferences and Computer in Engineering Conference, virtual, August 2021, IDETC2021-69694.

- Visotsky, D., Patel, A., Summers, J., (2017), "Using Design Requirements for Environmental Assessment of Products: A Historical Based Method", *24th CIRP Conference on Life Cycle Engineering*, Kamakura, Japan, March 2017, No. PROCIR-D-16-00783R1. (published as journal paper: J83).
- Phelan, K., Wilson, C., Summers, J., (2014), "Development of a Design for Manufacturing Rules Database for Use in Instruction of DFM Practices", *International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Buffalo, NY, DETC2014-34187.
- Namouz, E., Summers, J., Mocko, G., (2012), "Reasoning: Source of Variability in the Boothroyd and Dewhurst Assembly Time Estimation Method", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Chicago, IL, DETC2012-71075.
- Rayate, V., Summers, J., (2012), "Representations: Reconciling Design for Disassembly Rules with Design for Manufacturing Rules", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Chicago, IL, August 2012, DETC2012-70987.
- Peterson, M., Mocko, G., Summers, J., (2012), "Evaluating and Comparing Functional and Geometric Complexity of Product", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Chicago, IL, DETC2012-71408.
- Owensby, E., Shanthakumar, A., Namouz, E., Rayate, V., Summers, J., (2011), "Evaluation and Comparison of Two Design for Assembly Methods: Subjectivity of Information", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Washington, DC, September 2011, DETC2011-47530.
- Griese, D., Namouz, E., Shankar, P., Summers, J., Mocko, G., (2011), "Application of a Lightweight Engineering Tool: Lazy Parts Analysis and Redesign of a Remote Controlled Car", *ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference*, Washington, DC, September 2011, DETC2011-47544.
- Mathieson, J., Wallace, B., Summers, J., (2010), "Assembly Time Modelling Through Connective Complexity Metrics", *International Conference on Manufacturing Automation*, Hong Kong, Dec. 2010, no. 20.
- Smith, E., Johnston, P., Summers, J., (2007), "Applying Lean Manufacturing Principles to Revolutionize Curbside Equipment and Collection Process", *ASME-DETC2007*, DFLM-35615, Las Vegas, NV, Sept. 2007.

The projects will be evaluated in a similar manner as a traditional conference paper review, assessing the quality of the work as presented.

Academic Integrity

As members of the University of Texas at Dallas community, we have inherited a vision of advancing technical scholarship. Fundamental to this vision is a mutual commitment to truthfulness, honor, and responsibility, without which we cannot earn the trust and respect of others. Furthermore, we recognize that academic dishonesty detracts from the value of a UTD degree. Therefore, we shall not tolerate lying, cheating, or stealing in any form. Please refer to the undergraduate and graduate student manuals on the complete policies on academic integrity.

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

Academic Support Resources

The information contained in the following link lists the University's academic support resources for all students. Please go to [Academic Support Resources](#) webpage for these policies.

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus. Please go to [UT Dallas Syllabus Policies](#) webpage for these policies.

The Engineer's Creed:

As a Profession Engineer, I dedicate my professional knowledge and skill to the advancement and betterment of human welfare.

I pledge:

- to give the utmost of performance
- to participate in none but honest enterprise
- to live and work according to the highest standards of professional conduct
- to place service before profit, the honor and standing of the profession before personal advantage, and the public welfare above all other considerations

In humility, I make this pledge.

Engineering Ethics (The Canons):

Engineers, in fulfillment of their professional duties, shall:

1. hold paramount the safety, health, and welfare of the public
2. perform services only in areas of their competence
3. issue public statements only in an objective and truthful manner
4. act for each employer or client as faithful agents or trustees
5. avoid deceptive acts
6. conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

Topics of Learning Gate Modules:

- Overview (2 learning gates)
- Design for Assembly (15 learning gates)
- Design for Molding (7 learning gates)
- Design for Casting (3 learning gates)