IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

IE 448	MANUFACTURING SYSTEMS ENGINEERING	Spring 2017

Instructor: Dr. Iris V. Rivero
3021 Black Engineering
515-294-7944
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Office Hours: T 1:30pm-2:30pm
R 1:30pm-3:30pm
or by appointment

Class Times & Location: Tuesdays and Thursdays 11:00am – 12:20pm 1312 Hoover

Class Website (Blackboard): https://bb.its.iastate.edu/

Class notes and assignments will be posted on this website. Class notes will be posted by 12am (midnight) of the day of the lecture. No copies of any material from the course will be provided in class since it will be expected that students will download the materials from the website.

Required Textbooks: Branoff, Theodore J. (2016). Interpreting Engineering Drawings 8th ed. Cengage Learning, Stamford, CT.

Prerequisite: IE 248; IE 305

It is the policy of the IMSE Department to require all students enrolled in this course to have satisfied all of the course's prerequisite requirements. If it is discovered that a student has not met any applicable prerequisite requirements, he/she will be required to immediately drop the course. The failure to drop the course will result in a final course grade of 'F', regardless of course performance. Students who discover they have improperly enrolled in a course without meeting the applicable prerequisite requirements are strongly encouraged to meet with advising staff to promptly drop the course and make alternative scheduling arrangements or discuss if an official waiver of the pre-requisite requirements may be applicable.

Grading Policy:

Class Participation	20%
Exam 1	20%
Exam 2	20%
Exam 3	20%
Final Exam*	20%

Final Course Grade:

90.0-100.0	A-,A
80.0-89.9	B-,B,B+
70.0-79.9	C-,C,C+
60.0-69.9	D-, D, D+
below 60	F

The professor reserves the right to assign the final grade for the course. That is, several students may conclude the course with the same weighted average and could get different letter grades. Condition to obtain a higher or lower grade will depend upon 1) class participation and 2) attendance to class.

Educational Objectives

This course intends to introduce students to concepts of product design and manufacturing systems. With regards to product design students will learn about fixturing and tooling requirements to comply with manufacturing process planning, geometric dimensioning and tolerancing, and computer aided inspection. Manufacturing systems instruction will emphasize discussion of cellular and flexible manufacturing, along with basic concepts of facility layout. Lastly, students will be introduced to lean manufacturing and controlled flow production principles. Upon completing the course, each student will be able to determine the engineering tasks that can effectively comply with given product design specifications, establish the costs associated with production, and determine the engineering tasks that should be performed in-house or out-sourced.

Course Outcomes

This course will provide students with the following broad skills related to ABET *outcomes,* and applicable to learning how to integrate fundamental engineering principles to develop solutions to process and system engineering problems:

- (c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
- (j) A knowledge of contemporary issues.
- (k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
- (l) An ability to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy.

Homework Assignments

Homework readings and problems will be posted in Blackboard. The professor will not collect homework problems. Nevertheless, keep in mind that the type of questions appearing on examinations will be based upon assigned homework readings and/or problems (in addition to information from lectures).

Examinations

Three exams have been scheduled for this course to be administered during the scheduled class meetings of Thursday, February 23, 2017, Thursday, March 30, 2017 and Thursday, April 20, 2017. A final examination as well has been scheduled for Tuesday, May 2, 2017 from 9:45am to 11:45am. The questions on all exams will be comparable in character to those questions assigned for homework and those discussed during lectures (and/or any problems in the textbook of the studied chapters).

Conflict examinations will only be provided to those students who file for one *at least one week prior* to the scheduled examination and accompany that request with a documented excuse (e.g., interview trip). A documented excuse in writing is also required for absence from any exams without previously informing the professor (e.g., hospitalization, emergency medical treatment, university approved absences according to the catalog, etc.). Unexcused absence from any exams and/or final examination will result in a zero on the missed examination. All documented written excuses will be subjected to evaluation by the professor in order to determine whether the conflict is justifiable.

Upon approval of the conflict examination from the professor, the conflict examination will consist of the student taking the next scheduled exam and counting the grade earned on it for both examinations. In other words, the grade of the taken exam will account for 40% of the student's total semester grade in the course.

No conflict final examinations will be scheduled.

*Students with a total final grade of at least 80.0/100.0 by the end of the course are *not required* to take the final examination. Students meeting this requirement and choosing not to take the final exam will earn the grade they attained by the last day of classes.

NOTE: Students who are eligible for exemption from the final exam will be notified on the last day of classes of the university (Friday, April 28, 2017). To claim the exemption, students must sign a form electing not to take the final.

Class Participation

Your class participation grade will be based on two components, 1) attendance, and 2) contribution to lectures via participation in class discussion and classroom activities (i.e. in-class examples, group activities, etc.). Each day of attendance will be worth 0.5% of your total Class Participation grade allocation with the possibility to earn a maximum of 13.5%. The remaining percentage of the Class Participation grade will be based on your contribution to class discussion and/or classroom activities.

Grade Appeals

Appeal of the grading of exams must be done neatly word processed or typed. *E-mailed appeals are not acceptable*.

The heading of the appeal must be in the following format (Note: Any memo without this complete information will be returned without action):

From: Name

To: (Example: Professor's name)

Date: (Example: 3/9/2017)

Subject: (Example: Exam 1 - 2/23/2017)

Description of the appeal, including the problem or question number, if appropriate, must be composed in a concise, business-like memorandum. In addition, you are to solve the problem(s)/question(s) being appealed in the way that it was solved on the original exam or quiz and briefly explain why you made your original decision (this explanation is required to consider the appeal).

Memos should be provided along with the original document that contains the appealed problem(s)/question(s).

Memos may be delivered to 3021 Black Eng. or handed to Dr. Rivero at the beginning of the class period within two weeks of receiving the graded material.

NOTE: GRADE APPEAL MEMOS ARE NOT TO BE WRITTEN IN A FORMAT OF NEGOTIATION ON HOW THE STUDENT THINKS OR BELIEVES THE PROBLEM(S) SHOULD HAVE BEEN GRADED. MEMOS WRITTEN IN THIS FORMAT WILL BE RETURNED WITHOUT REVIEW

E-mail Communications

You are required to use your ISU e-mail address for the purposes of this class. The professor will not be responsible for: 1) E-mails that do not reach you because you do not check or use your ISU address; or 2) E-mails that are not received, or filtered into junk mail, because they do not come from your ISU address; or 3) E-mails that you do not receive to your ISU account because your mailbox is full.

Academic Dishonesty

All work assigned in this course (except for stated activities) *must be completed individually*. Deliberate copying of work and/or answers will not be tolerated. Academic dishonesty as refer to by section 4.2.1 of the Student Disciplinary Regulations as a statement on Iowa State University Catalog reads, "Academic dishonesty occurs when a student uses or attempts to use unauthorized information in the taking of an exam; or submits as his or her own work themes, reports, drawings, laboratory notes, or other products prepared by another person; or knowingly assists another student in such acts or plagiarism. Such behavior is abhorrent to the university, and students found responsible for academic dishonesty face expulsion, suspension, conduct probation, or reprimand. Instances of academic dishonesty ultimately affect all students and the entire university community by degrading the value of diplomas when some are obtained dishonestly, and by lowering the grades of students working honestly.

Examples of specific acts of academic dishonesty include but are not limited to:

1. Obtaining unauthorized information. Information is obtained dishonestly, for example, by copying graded homework assignments from another student, by working with another student on a take-home test or homework when not specifically permitted to do so by the instructor, or by looking at your notes or other written work during an examination when not specifically permitted to do so.
2. Tendering of information. Students may not give or sell their work to another person who plans to submit it as his or her own. This includes giving their work to another student to be copied, giving someone answers to exam questions during the exam, taking an exam and discussing its contents with students who will be taking the same exam, or giving or selling a term paper to another student.
3. Misrepresentation. Students misrepresent their work by handing in the work of someone else. The following are examples: purchasing a paper from a term paper service; reproducing another person's paper (even with modifications) and submitting it as their own; having another student do their computer program or having someone else take their exam.
4. Bribery. Offering money or any item or service to a faculty member or any other person to gain academic advantage for yourself or another is dishonest.
5. Plagiarism. Unacknowledged use of the information, ideas, or phrasing of other writers is an offense comparable with theft and fraud, and it is so recognized by the copyright and patent laws. Literary offenses of this kind are known as plagiarism.

   Plagiarism occurs when a person does not credit the sources from which they borrow ideas, whether these ideas are reproduced exactly or summarized. The method of documentation will differ depending on whether the sources are written, oral, or visual. Ethically, communicators are responsible for providing accurate, detailed information about their sources. Practically, audiences need this information to comprehend and evaluate a message's content. The Student Guide: English 150 and 250, available for purchase at the University Book Store, describes the process of documenting source materials as do many other reference guides."

Rigorous enforcement of this University Policy will be made in this class. *Academic dishonesty penalties* can range from *receiving a failing grade* in the exam/activity or the entire course through *dismissal from the University*.

General Policies

- NO cellular phones, iPods (or any other MP3 player), iPads, and/or laptops are allowed during the duration of the class period.
- Absolutely NO TEXTING during the duration of the class period.
- Absolutely NO use of SOCIAL MEDIA during the duration of the class period.
- NO food is permitted during the lectures (beverages ARE allowed to be consumed).
- Only scientific or regular calculators will be permitted on exams.
    - NO cellular phone calculators will be allowed on exams.
    - You must bring your own calculator to exams. Sharing of calculators will not be allowed.

Special Needs

Iowa State University is committed to assuring that all educational activities are free from discrimination and harassment based on disability status. All students requesting accommodations are required to meet with staff in Student Disability Resources (SDR) to establish eligibility. A Student Academic Accommodation Request (SAAR) form will be provided to eligible students. The provision of reasonable accommodations in this course will be arranged after timely delivery of the SAAR form to the instructor. Students are encouraged to deliver completed SAAR forms as early in the semester as possible. SDR, a unit in the Dean of Students Office, is located in room 1076, Student Services Building or online at www.dso.iastate.edu/dr/. Contact SDR by e-mail at disabilityresources@iastate.edu or by phone at 515-294-7220 for additional information.

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Week	Month	Mon	Tues	Wed	Thurs	Fri
1	Jan.	9	L1: 10/-Introduction -Tolerance Stackup	11	L2: 12/-Tolerance Stackup -Geometric Tolerance	13
2	Jan.	16	L3: 17/-Tolerance Zone Size	18	L4: 19/-Circularity and Cylindricity	20
3	Jan.	23	L5: 24/-Relationships between Features -Datum Reference Frames	25	L6: 26/-Datum Reference Frames -Datum Targets & Orientation Tolerances	27
4	Jan./Feb.	30	L7: 31/-Orientation Tolerances & Position Tolerance -Pattern Tolerances	1	L8: 2/-Pattern Tolerances -Aligning Surfaces & Controlling Surfaces	3
5	Feb.	6	L9: 7/-Controlling Surfaces of Revolution & Additional Specifications	8	L10: 9/-Controlling Surfaces of Revolution & Additional Specifications -Design for X	10
6	Feb.	13	L11: 14/-Design for Assembly -Process Model & Rework	15	L12: 16/-Process Model & Rework -Process Capability	17
7	Feb.	20	L13: 21/- Make vs Buy -Direct Material Costs & Direct Labor	22	L14: 23/- ***TEST #1***	24
8	Feb./Mar.	27	L15: 28/-Direct Material Costs & Direct Labor -Direct Resources	1	L16: 2/-Direct Resources -Process Planning	3
9	Mar.	6	L17: 7/-Process Planning -Material Flow	8	L18: 9/-Material Flow -CNC	10
10	Mar.	13	14/- ***SPRING BREAK***	15	16/- ***SPRING BREAK***	17
11	Mar.	20	L19: 21/-CNC Codes -Tool Path -Tool Offset	22	L20: 23/-Tooling Considerations -Path Planning	24
12	Mar.	27	L21: 28/ Fixtures -Fixture Configuration & Clamping	29	L22: 30/- ***TEST #2***	31
13	Apr.	3	L23: 4/- Hard Gaging -Gage Examples -Gage Errors	5	L24: 6/-Soft Gaging -Locating Geometry	7
14	Apr.	10	L25: 11/-Soft Gage Datum Reference Frames & Soft Gage for a Feature	12	L26: 13/- System Design & Material Handling -Group Technology	14
15	Apr.	17	L27: 18/-Group Technology -Production Flow Analysis	19	L28: 20/- ***TEST #3***	21
16	Apr.	24	L29: 25/-Assembly -Line Balancing	26	L30: 27/-System Flow	28
17	May	**2/ - (Tuesday)**	***FINAL EXAM***	**9:45am-11:45am**	**Hoover 1312**	