IME433/633: ADDITIVE MANUFACTURING

Course prefix, number(s), and title: IME 433/633: ADDITIVE MANUFACTURING
Number of credits: *3*
Term and year: Fall 2015

Instructor's name: Bashir Khoda
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BULLETIN DESCRIPTION

A synchronized approach considering functional design, analysis and manufacturing that support seamless integration of geometry with performance. The course will address additive manufacturing principles, variety and their concept; scope of additive manufacturing with application area; bio-manufacturing.

Pre-requisite: IME 330

COURSE OBJECTIVES

At the successful completion of this course, the students should be able to:

1. Use commercial software for digitizing free-form geometry.
2. Capture digital data from a difficult to design object and make a manufactured model.
3. Create the design of an object suitable for additive manufacturing processes.
4. Compare traditional versus next generation manufacturing.
5. Define and apply criterion for selecting appropriate additive manufacturing process for any given application.
6. Investigate application domain of additive manufacturing.
7. Learn important process parameters for bio-manufacturing and determine a suitable additive technique for bio-manufacturing.

TEXT BOOK

Additive Manufacturing Technologies (2010; Springer) by Brent Stucker, David Rosen, and Ian Gibson
ISBN 978-1-4419-1120-9

SUPPLEMENTAL RESOURCES (WILL BE SUPPLIED BY THE INSTRUCTOR)

1. *Computer-Integrated Design and Manufacturing (1996; Willy Pub.) by Nanua Singh*
   ISBN: 978-0-471-58517-6
2. *Recent literature and developments in the related area.*

COURSE SCHEDULE/OUTLINE/CALENDAR OF EVENTS

Week	Topic	Lab
1	Geometric model: CAD	
2	Free-form 3d model	Machine Lab Safety
3	Reverse Engineering: Introduction	CAD Lab: ProE
4	Reverse Engineering: From Scanner to Model validation	CAD Lab: ProE
5	Traditional manufacturing Vs Additive manufacturing	CAD Lab: Rhino
6	Additive Manufacturing Process Plan: Building Strategies	CAD Lab: Rhino
7	Additive Manufacturing Process Plan: Post Processing	ALA 120
8	Development of Additive Manufacturing Technology	ALA 120
9	Extrusion Based Additive Manufacturing Process	ALA 120
10	Photo-polymer vat Additive Manufacturing Process	ALA 120
11	Powder bed fusion and material jetting Additive Manufacturing Process	Project Group Meeting
12	Hybrid Additive Manufacturing Process	ALA 120
13	Issues with additive manufacturing	ALA 120
14	Additive manufacturing in medical applications	ALA 120
15	Bio-manufacturing	ALA 120
16	Exam and Project Presentations	

This is a tentative schedule; subject to change.

EVALUATION PROCEDURES AND GRADING CRITERIA

	IME 433	IME 633
Quizzes (4)	15%	15%
HW (12)	30%	30%
Lab Project	20%	20%
Exam	35%	25%
Term paper		10%
Total	100%	100%

Letter grades: ≥90% =A; 80 to <90% = B; 70 to <80% = C; 60 to <70% = D; <60% = F
Grade thresholds may be lowered at the discretion of the instructor.

Missed or late assignment Policy: Completed assignments should be turned in at the beginning of the class in which they are due. Penalty for late homework/assignments will be 10% per late day and up to a maximum of 50%.

Missed Quiz Policy: If you miss a quiz without either a certified medical excuse or prior instructor approval, you may take a makeup quiz at a designated time near the end of the semester. Only one makeup quiz will be given. It will be fair but challenging. The makeup quiz will be comprehensive.

Missed Exams: No excuses for missed exams will be accepted other than certified medical excuses or prior instructor's approval.

LAB PROJECT: The term long project is intended to provide the experience of following the individual steps in additive manufacturing process plan. The objective is identify the CAD data and their acquisition processes; show the error in CAD data; post processing of CAD data by fixing the error; and then finally selects the suitable additive manufacturing processes considering the features of the CAD data. Students will get an opportunity to use one of the additive manufacturing machines from the lab ALA 120 to build the designed part. The work will performed in groups and formal deliverables are due during the semester.

GRADUATE SCHOOL:

This is *cross-listed as* a graduate level course and is subject to the General Policies of the Graduate School, http://www.ndsu.edu/gradschool/bulletin/graduate_school_policies/general_policies/#c30343

Graduate students registered for IME 633 will prepare and present in class an additional paper addressing project management in different sectors of industry such as health care, travel and hospitality, financial services, government services, research and development, software, etc. Oral and written reports on the term paper will constitute 10% of the final grade for graduate students.

ATTENDANCE STATEMENT

According to NDSU Policy 333, attendance in classes is expected. Only the course instructor can excuse a student from course responsibilities. (The term 'course' includes class, laboratory, field trips, group exercises, and or other activities.).

AMERICAN DISABILITIES ACT FOR STUDENTS WITH SPECIAL NEEDS STATEMENT

Any students with disabilities or other special needs, who need special accommodations in this course are invited to share these concerns or requests with the instructor and contact the Disability Services Office as soon as possible.

STUDENT VETERANS AND SOLDIERS STATEMENT

Veterans and student soldiers with special circumstances or who are activated are encouraged to notify the instructor in advance.

ACADEMIC HONESTY STATEMENT

Each student is required to sign the College of Engineering Honor Code. As outlined in the Honor Code, all students are required to have a signed 'Honor Pledge' form in their CoE advising file. Students are only required to sign the form once. Link to additional information: http://www.ndsu.edu/coe/undergraduate_students/honor_code/

NDSU policy statement:

The academic community is operated on the basis of honesty, integrity, and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in which cheating, plagiarism, or other academic misconduct have occurred in an instructional context. Students found guilty of academic misconduct are subject to penalties, up to and possibly including suspension and/or expulsion. Student academic misconduct records are maintained by the Office of Registration and Records. Informational resources about academic honesty for students and instructional staff members can be found at www.ndsu.edu/academichonesty.

CLASSROOM CONDUCT

Expectations:

1. *Complete engagement:* No cell phones, laptops, or any other electronic device is welcome in the classroom. The same goes for newspapers, books or any object which might interfere with your participation and understanding of the material. No talking/whispering when someone else is speaking.
2. *Courtesy:* A guiding principle in this course will be courtesy and respect for all students, all speakers, and all instructors.
3. *Diversity:* Participants in this course are expected to welcome, respect, and appreciate diversity as well as seek opportunities to learn from diversity as it manifests itself in this course. This is basic human decency.