University of Colorado **Boulder**

MCEN 5228-016: Nanotechnology for Environmental Sustainability

Spring 2018

M W 4:00 – 5:15 PM in ECCR 116

Instructor: Marina E. Vance **Contact**: marina.vance@colorado.edu
Office: 132 ECME
Office Hours: Tue / Wed 1 - 2pm and by appointment (email me to schedule it).

Course Description: Explore applications of nanotechnology for environmental sustainability in a team-based learning setting. Learn the definitions of nanomaterials and nanoscale phenomena. Discuss the multi-faceted concept of sustainability and apply this concept to environmental and engineering contexts. Become familiar with the ongoing research on the environmental implications of nanotechnology. Open to both graduate and undergraduate students, with graduate level expectations set for both groups. **Requisites:** Undergraduate students should have senior standing and should have completed both MCEN2024 and MCEN3047.

Course Structure

1. Intro to Nanotechnology (with a focus on material characterization for nano/environmental samples)
2. Intro to Environmental Sustainability
3. Environmental Implications of Nanotechnology
4. Applications of Nanotechnology for Sustainability

Course Materials:
No required textbook. Required readings will be provided throughout the semester through Google Drive.

Recommended Books:

Nanotechnology and Functional Materials for Engineers (PDF available at CU library) – *primary book for this course*
by Yaser Dahman. Paperback ISBN: 9780323512565. eBook ISBN: 9780323524667

Pursuing Sustainability: A Guide to the Science and Practice – *secondary book for this course*
by Pamela Matson, William C. Clark, Krister Andersson. ISBN: 0691157618

Introduction to Nanoscience and Nanotechnology – *recommended for future additional reading*
by Gabor L. Hornyak, H.F. Tibbals, Joydeep Dutta, John J. Moore. ISBN: 1420047795

Learning Objectives:
Upon successful completion of this course, students should be able to:

- Describe the basic concepts of sustainability science and have the ability to convey those concepts to the general public.
- Understand the near term and future applications of nanomaterials and nanoscience, as well as the benefits and pitfalls of widespread use of these materials in society.
- Apply their learning to how nanotechnology can be harnessed to address emerging threats such as water scarcity, antibiotic resistance, energy production, and climate change.

Team Work

- You will collaborate within your balanced and diverse team of 4-5 members throughout the entire semester. Team tests and assignments will determine the team performance component of your final grade.
- At least one member per team must bring to class a laptop or tablet computer.
- You will provide qualitative and quantitative feedback for each of your teammates three times during the semester, which will determine the peer evaluation grades.
- Provide at least 24-hour advance notice to your team and professor if you will be late or absent from class.

Grading Structure

5%	Class participation and professionalism
5%	Peer evaluations
20%	Individual tests and quizzes (e.g., iRAT)*
20%	Team readiness assurance tests (tRAT)
20%	Mid-term presentations
30%	Final project (individual)

+ Extra monthly 0.25pt for *Science Communication* effort.

Grading Scale

A	*95 - 100*	C	74 - 76
A-	*90 - 94*	C-	70 - 73
B+	*87 - 89*	D+	67 - 69
B	84 - 86	D	64 - 66
B-	80 - 83	D-	60 - 63
C+	*77 - 79*	F	< 59

**If any iRAT/tRAT classes are missed, you will receive your team's tRAT grade and a zero iRAT grade. Your lowest iRAT grade of the semester gets dropped.*

Scoring tRATs:
5 points - first choice
3 points - second choice
2 points - third choice
1 point - fourth choice
0 points - fifth choice

Written assignment grades will be deducted by 10% for each late day.

Tips for success
You will maximize your enjoyment of this course and your grade by using the following strategies:
• Attend all classes
• Read all the material described in the "read me" files and take notes during your readings.
• Participate in your team's discussion, and allow for all team members to also be included in the discussions.
There will be many readings assigned throughout the semester. Look at these tips on reading scientific papers:
http://www.sciencemag.org/careers/2016/03/how-seriously-read-scientific-paper

MCEN 5228-016
Common Syllabus Material

A primary objective of the Mechanical Engineering Department is to prepare each of our students for careers in the engineering profession. As professionals, engineers must meet high standards of technical competence and ethical behavior. According to the Accreditation Board of Engineering and Technology (ABET) code of ethics, engineers uphold and advance the integrity, honor and dignity of the engineering profession by:

1. Using their knowledge and skill for the enhancement of human welfare;
2. Being honest and impartial, and serving with fidelity the public, their employers and clients;
3. Striving to increase the competence and prestige of the engineering profession.

The Department of Mechanical Engineering (ME) believes that it is essential for each of you to learn the professional behavior that will prepare you for your career after college. Therefore, in each mechanical engineering course you will be required to practice the professional behavior that will be expected by your future employers. This syllabus clearly outlines the ME policy regarding academic integrity and academic climate. These policies will be upheld in each of your courses throughout the mechanical engineering curriculum. However, we also expect that this culture of professionalism will pervade all of your University of Colorado experiences.

Academic Integrity

You will be asked to complete individual homework assignments in this course. Though you may work in groups to discuss and solve problems, it is expected that you will abide by the University of Colorado at Boulder honor code at all times. Therefore, you may not plagiarize a problem set or allow another student to plagiarize your answers to a problem set. Examples of plagiarism include: copying from a solution manual, copying from Internet sites, copying from previous academic year homework sets, and copying directly from classmates. If you have any doubt that you are using sanctioned materials to assist with your homework solution, please ask your current instructor/professor. On assignments that require you to use supplemental materials, it is also essential that you properly document the sources of information you use.

Any instances of dishonesty on homework or tests will result in a minimum sanction for your first violation of the honor code of a zero score and an entry in your department file. Additional sanctions will be imposed by

the ME Department for subsequent violations, possibly including expulsion from the ME program. You may contest any accusation according the campus honor code system.

University of Colorado at Boulder Honor Code Policy:

All students of the University of Colorado at Boulder are responsible for knowing and adhering to the academic integrity policy of this institution. Violations of this policy may include: cheating, plagiarism, aid of academic dishonesty, fabrication, lying, bribery, and threatening behavior. All incidents of academic misconduct shall be reported to the Honor Code Council (honor@colorado.edu; 303-725-2273). Students who are found to be in violation of the academic integrity policy will be subject to both academic sanctions from the faculty member and non-academic sanctions (including but not limited to university probation, suspension, or expulsion). Other information on the Honor Code can be found at http://www.colorado.edu/policies/honor.html and at http://www.colorado.edu/academics/honorcode/

Academic Climate

In Class Expectations:

It is our expectation that each of you will be respectful to your fellow classmates and instructors at all times. In an effort to create a professional atmosphere within the classroom, it is requested that you:

- Arrive to class on time
- Turn off your cell phone
- Limit use of your laptop computer to class purposes
- Put away newspapers and magazines
- Refrain from having disruptive conversations during class
- Remain for the whole class, or if you must leave early do so without disrupting others
- Display professional courtesy and respect in all interactions related to this class

Compliance with these expectations will assist us with the creation of a learning community and a high quality educational experience. The University of Colorado Classroom behavior policy will compliment the outlined classroom expectations.

University of Colorado Classroom Behavior Policy:

Students and faculty each have responsibility for maintaining an appropriate learning environment. Those who fail to adhere to such behavioral standards may be subject to discipline. Professional courtesy and sensitivity are especially important with respect to individuals and topics dealing with differences of race, culture, religion, politics, sexual orientation, gender, gender variance, and nationalities. Class rosters are provided to the instructor with the student's legal name. I will gladly honor your request to address you by an alternate name or gender pronoun. Please advise me of this preference early in the semester so that I may make appropriate changes to my records. See polices at
http://www.colorado.edu/policies/classbehavior.html and at
http://www.colorado.edu/studentaffairs/judicialaffairs/code.html#student_code

Discrimination and Harassment:

Discriminatory and harassing behavior will not be tolerated in the Department of Mechanical Engineering. A safe and inclusive environment will be created and maintained by the students and instructing faculty member. Students with concerns about discrimination or harassment actions should immediately contact the instructor, the Department Chair or their academic advisor, or contact the Office of Discrimination and Harassment (below).

Examples that may be considered harassment:

A teaching assistant or instructor asking a student for a date.
Displaying sexually explicit material in an academic setting (including laptop wallpaper).

Persisting in asking a classmate for a date after being turned down.
Using degrading terminology in referring to others, including peers.

University of Colorado Discrimination and Harassment Policy:

The University of Colorado at Boulder policy on Discrimination and Harassment, the University of Colorado policy on Sexual Harassment and the University of Colorado policy on Amorous Relationships apply to all students, staff and faculty. Any student, staff or faculty member who believes s/he has been the subject of discrimination or harassment based upon race, color, national origin, sex, age, disability, religion, sexual orientation, or veteran status should contact the Office of Discrimination and Harassment (ODH) at 303-492-2127 or the Office of Judicial Affairs at 303-492-5550. Information about the ODH, the above referenced policies and the campus resources available to assist individuals regarding discrimination or harassment can be obtained at http://www.colorado.edu/odh

Out of Class Expectations:

Though many of the above stated policies address academic climate within the classroom, these policies should also be upheld outside of the classroom. As a member of the ME community you are expected to consistently demonstrate integrity and honor through your everyday actions. Furthermore, faculty and staff members are very willing to assist with your academic and personal needs. However, multiple professional obligations make it necessary for us to schedule our availability. Suggestions specific to interactions with faculty and staff include:

- Respect posted office hours. Plan your weekly schedule to align with scheduled office hours
- Avoid disrupting ongoing meetings within faculty and staff offices. Please wait until the meeting concludes before seeking assistance. Respect faculty and staff policies regarding use of email and note that staff and faculty are not expected to respond to email outside of business hours. Send emails to faculty and staff using a professional format. Tips for a professional email include:
    - Always fill in the subject line with a topic that indicates the reason for your email to your reader.
    - Respectfully address the individual to whom you are sending the email (e.g., Dear Professor Smith).
    - Avoid email, chat room or text message abbreviations.
    - Be brief and polite.
    - Add a signature block with appropriate contact information.
    - Reply to emails with the previously sent message. This will allow your reader to quickly recall the questions and previous conversation.

Accommodation of Disabilities or Religious Commitments

If you qualify for accommodations because of a disability, please submit to me a letter from Disability Services in a timely manner so that your needs can be addressed. Disability Services determines accommodations based on documented disabilities. Contact: 303-492-8671, Willard 322, and http://www.Colorado.EDU/disabilityservices

If you have a temporary medical condition or injury, see guidelines at http://www.colorado.edu/disabilityservices/go.cgi?select=temporary.html

Campus policy regarding religious observances requires that faculty make every effort to deal reasonably and fairly with all students who, because of religious obligations, have conflicts with scheduled exams, assignments or required attendance. In this class, you must inform Dr. Vance by email as early as possible in the semester (at least 1 week before any scheduled exams or assignments) about any religious observance conflicts.

Policy on Privacy of Graded Work

Federal law requires that your grades be communicated to you privately. You have been assigned a unique, private ME ID number for this purpose, and it will be the same for all your ME courses. Put this number on all work that you hand in, instead of your name. You can pick up your graded work filed under this number.

Team Meetings

During your academic career, you will be asked to attend or lead meetings. These meetings can be project team meetings, club meetings, or other organization meetings. Meetings are an important aspect of your academic life and will be an even more important part of your life after graduation. Here are some important points relative to having a successful meeting.

1. Every meeting should have a purpose, and every meeting attendee should know this purpose. For example; Status and actions for a team project, developing a team report for a course, etc.
2. The outcome of every meeting should be, at the very least, a documented action plan. An action plan typically says who will do what by when.
3. The meeting should have someone who conducts the meeting and someone who takes minutes of the meeting.
4. The person who runs the meeting should distribute an agenda prior to the start of the meeting. For example; Agenda items could include; (a) progress, (b) new problems, (c) defining future tasks for each team member, etc.
5. The meeting leader should make sure that all opinions are heard during the meeting, and should seek input from meeting attendees who are 'quiet'. Additionally, the leader should keep the meeting on task, and on schedule.
6. Approximately ten minutes before the meeting end time, the meeting leader should start to review and list the action items resulting from the meeting, thus, creating an action plan. Finally, at the end of the meeting, the leader needs to get the commitment from meeting attendees to execute their action items on time.
7. The person taking the minutes of the meeting should typically distribute the minutes of the meeting within 6 hours of the meeting completion. The minutes should be distributed to all meeting attendees and other interested parties. The minutes should include the action items, progress made, problem areas, etc. This document should be as brief as possible, but contain the pertinent information.
8. All meeting members should show up on time, be respectful of the opinions of others, not interrupt others, etc.
9. ALL meeting attendees MUST execute the actions to which they have committed.

Completing assigned tasks in a timely and quality manner shows a high sense of commitment to the team (group), to the project, and to others interested in the successful outcome of the project. This sense of commitment may, indeed, be the most important characteristic one can have in order to achieve success.

SIGNATURE PAGE

I, the undersigned, agree that I have read and understood the policies described in the syllabus for **MCEN 5228-019**. I hereby agree to comply with these policies.

PRINT NAME_____

SIGNATURE_____

DATE_____