ENVIRONMENTAL NANOSCIENCE (GEOL5315/CRN14144)

INSTRUCTOR: Jie Xu, Ph.D.
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LECTURES: MW 9:00 am -10:20 am, Geological Sciences 302

OFFICE HOURS: By appointment. (You are welcome to stop in if my door is open.)

COURSE REFERENCES:
Nature's Nanostructures, (Eds.) A. S. Barnard, H. Guo (ISBN 9789814316828)
Introduction to Nanoscience, S.M. Lindsay (ISBN 9780199544219)
Environmental Nanotechnology: Applications and Impacts of Nanomaterials, 2nd edition, (the link to the e-book is attached below)
https://www.accessengineeringlibrary.com/browse/environmental-nanotechnology-applications-and-impacts-of-nanomaterials-second-edition
Nanoscience and Nanotechnology: Environmental and Health Impacts, (Ed.) by W.H. Grassian (ISBN 9780470081037)
Reading materials for in-class discussion will also be posted on *Blackboard*. Please sign in to check them as well as other announcements.

COURSE DESCRIPTION:
Nanoscience is a rapidly growing frontier area of research that has been contributing to a revamping of all sciences. Currently, the Earth and environmental sciences are under-represented in their participation in this revolutionary field of study. This graduate-level course aims to introduce the Earth and environmental sciences community into the field of nanoscience and connect them with the latest information on environmental nanoscience research. There are four major modules for this course: (1) fundamental principles of nanoscience: what makes nanoscale materials so special and why these tiny structures can be formed, especially in nature?; (2) the distribution and behavior of natural and anthropogenic nanomaterials in the environment (including the atmosphere, the hydrosphere, the pedosphere, and the biosphere); (3) instrumentation and facilities for characterization of nanomaterials in the environment; and (4) applications of nanotechnology in the contexts of energy, agriculture, environments, and ecosystems.

LEARNING GOALS:
Environmental nanoscience is a relatively new field, and the references we use are mostly publications within the past decade. Thus, I would encourage the enrolled students to adopt an open attitude: which means be ready to challenge the status quo and add new questions, insights etc. to the field once you have learnt about it.

Knowledge-wise

● Obtain an overview of nanoscience and how size-reduction can lead to dramatic changes in the material's physicochemical properties
● Stay current about data, tools, services, and research related to nanoscience
● Understand the "big science questions" related to environmental nanoscience: e.g., nanomaterials in the environment, and impacts of nanomaterials (natural and incidental) on biogeochemical cycles, ecosystems and human health

Skill-wise
● Be familiar with the resources and where to obtain up-to-date information on the topic
● Be able to extract information quickly from a scientific journal or other equivalents
● Understand how to collaborate with peers productively to complete a shared task
● Be efficient in communicating scientific information to the lay audience in both oral and written forms

GRADING POLICIES:
The final grade will be composed of multiple in-class projects and one term paper. The weight of each component is described as below:

In-class projects (10% × 4)
Term Paper (60**%**)

> 90% - A; 89-80% - B; 79-70% - C, 69-60% - D; < 60% - F.

● **Term paper**: the students can choose a topic relevant to their research to work on. The length of the final paper is no longer than 8 pages (single spaced). Instructions on how to write the term paper will be given in class at least six weeks ahead of the due date.
● **Honor codes**: academic integrity is the fundament principle for all UTEP students, staff and faculty. Refer to the UTEP Student Handbook where scholastic dishonesty is defined (http://sa.utep.edu/osccr/academic-integrity/). Proven violations of these detailed regulations may result in any of the consequences outlined in the Handbook.

DROP DATE:
The UTEP Fall 2017 drop deadline is November 3, 2017. Any drop requests after this date will not be approved by the College of Science.

STUDENTS WITH DISABILITIES:
If you have a disability and may need accommodations in this class, you are encouraged to contact the Center for Accommodations and Support Services (CASS) at 915-747-5148 or cass@utep.edu within the first two weeks of class. Here is the link to the resources available to students with disabilities http://admin.utep.edu/Default.aspx?tabid=61021&submenuheader=2.

Week	*Date*	*Topics*
1	Aug 28 Aug 30	Logistics, self-introduction, overview Introduction to nanoscience
2	Sept 4 Sept 6	No Class – Labor Day Why physics of small systems is different?- Basics of quantum mechanics I
3	Sept 11 Sept 13	Basics of quantum mechanics II In-class project I
4	Sept 18 Sept 20	Thermodynamics of small systems Kinetics of small systems
5	Sept 25 Sept 27	Overview of the principles for nanostructure formation In-class project II
6	Oct 2 Oct 4	Natural occurrence of nanomaterials
7	Oct 9 Oct 11	Anthropogenic nanomaterials that diffused into the environment
8	Oct 16 Oct 18	Analytical tools – FFF separation systems Analytical tools – dynamic light scattering-based technique
9	Oct 23 Oct 25	Analytical tools - electron microscopy Analytical tools – X-ray/neutron based techniques
10	Oct 30 Nov 1	Analytical tools - fluorescence-based techniques etc. Overview of analytical tools
11	Nov 6 Nov 8	In-class project III
12	Nov 13 Nov 15	Nanomaterial transport and retention in porous media Application of nanotechnology in oil recovery
13	Nov 20 Nov 22	Application of Nanotechnology in water treatment and environmental remediation processes
14	Nov 27 Nov 29	Toxicological impacts of nanomaterials on associated ecosystems
15	Dec 4 Dec 6	In-class project IV Review and discussion of the challenges in the field
16	Dec 11 Dec 13	No Class - Final Exam Week

The actual schedule is subject to modifications.