FORMAT 1

Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL
(Attach copy of syllabus)

SUBMITTED BY:

Department	Mechanical Engineering	College/School	CEM
Prepared by	Lei Zhang	Phone	907-474-6135
Email Contact	lzhang14@alaska.edu	Faculty Contact	Lei Zhang

1. ACTION DESIRED (CHECK ONE): Trial Course [x] New Course [ ]

2. COURSE IDENTIFICATION:	Dept	ME	Course #	494	No. of Credits	3

Justify upper/lower division status & number of credits: Upper division course, 3 credits

3. PROPOSED COURSE TITLE: Introduction to Nanomaterials

4. To be CROSS LISTED? *YES/NO*	NO	If yes, Dept:		Course #	

NOTE: Cross-listing requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.

5. To be STACKED?* *YES/NO*	NO	If yes, Dept.		Course #	

How will the two course levels differ from each other? How will each be taught at the appropriate level?:

* Use only one Format 1 form for the stacked course (not one for each level of the course!) and attach syllabi. Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two different syllabi (undergraduate and graduate versions) will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online - see URL at top of this page.

6. FREQUENCY OF OFFERING: Every Spring

Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING (Effective AY2015-16 if approved by 3/31/2015; otherwise AY2016-17): Spring 2017

8. COURSE FORMAT:

NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, **any core course compressed to less than six weeks must be approved by the Core Review Committee.**

COURSE FORMAT: (check all that apply)	[ ] *1*	[ ] *2*	[ ] *3*	[ ] *4*	[ ] *5*	[x] *6 weeks to full semester*

OTHER FORMAT (specify)	
Mode of delivery (specify lecture, field trips, labs, etc)	Lecture

9. CONTACT HOURS PER WEEK:	3	LECTURE hours/weeks		LAB hours /week		PRACTICUM hours /week

Note: # of credits are based on contact hours. 800 minutes of lecture=1 credit. 2400 minutes of lab in a science course=1 credit. 1600 minutes in non-science lab=1 credit. 2400-4800 minutes of practicum=1 credit. 2400-8000 minutes of internship=1 credit. This must match with the syllabus. See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/guidelines-for-computing-/ for more information on number of credits.

OTHER HOURS (specify type)	

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management
3 Credits Offered Spring
Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. *Prerequisites: COMM F131X or COMM F141X; ENGL F111X; ENGL F211X or ENGL F213X; ENGL F414; FISH F425; or permission of instructor.* Cross-listed with NRM F487. (3+0)

ME 494 Introduction to Nanomaterials
3 credits Offered Spring
This course aims to provide a comprehensive overview of nanomaterials in terms of the synthesis, characterization, properties, and applications. It will cover the fundamental scientific principles for the different synthesis techniques, assembly of nanostructured materials, and new physical and chemical properties at the nanoscale. Existing and emerging applications will also be discussed. *Prerequisites: ME 334; or permission of instructor.* (3+0)

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities		S = Social Sciences	

Will this course be used to fulfill a requirement for the baccalaureate core? **If YES, attach form.**	**YES:**		**NO:**	x

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, **Format 6**		W = Writing Intensive, **Format 7**		X = Baccalaureate Core	

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES		**NO**	x

12. COURSE REPEATABILITY:

Is this course repeatable for credit?	**YES**		**NO**	x

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).	

How many times may the course be repeated for credit?		**TIMES**
If the course can be repeated for credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**
If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?		**CREDITS**

13. GRADING SYSTEM: Specify only one. Note: Changing the grading system for a course later on constitutes a Major Course Change - Format 2 form.

LETTER:	x	**PASS/FAIL:**	

RESTRICTIONS ON ENROLLMENT (if any)

14. PREREQUISITES	ME 334

These will be *required* before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS	n/a
16. PROPOSED COURSE FEES	$0

Has a memo been submitted through your dean to the Provost for fee approval? **Yes/No**

17. PREVIOUS HISTORY

Has the course been offered as special topics or trial course previously? **Yes/No** — No

If yes, give semester, year, course #, etc.:

18. ESTIMATED IMPACT

WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.

n/a

19. LIBRARY COLLECTIONS

Have you contacted the library collection development officer (kljensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.

No	x	Yes		**Microsoft Powerpoint and Blackboard will be used for the proposed course.**

20. IMPACTS ON PROGRAMS/DEPTS

What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

n/a

21. POSITIVE AND NEGATIVE IMPACTS

Please specify ***positive and negative*** *impacts on other courses, programs and departments resulting from the proposed action.*

This course will introduce the properties and applications of newly emerged nanomaterials, which will be a good complement to ME 334 *Elements of Material Science/Engineering* that introduces the fundamentals of traditional engineering materials. I do not see any negative impact of this course.

JUSTIFICATION FOR ACTION REQUESTED

The purpose of the department and campus-wide curriculum committees is to scrutinize course change and new course applications to make sure that the quality of UAF education is not lowered as a result of the proposed change. Please address this in your response. This section needs to be self-explanatory. Use as much space as needed to fully justify the proposed course.

Nanomaterials outperform their conventional counterparts because of their superior chemical, physical, and mechanical properties and of their exceptional formability. Nanotechnology will determine the direction and future of our life. It is thus imperative that we expand our awareness and understanding of the applications and capabilities of this exciting and cutting-edge technology. This course is an interdisciplinary introduction to structure, properties, and applications of nanomaterials. It will cover the fundamental scientific principles for the different synthesis techniques, assembly of nanostructured materials, and new physical and chemical properties at the nanoscale. Existing and emerging applications will also be discussed through case studies. At the end of the course, the student will understand the general physics and chemistry of nanomaterials, processing techniques for nanomaterials – both chemical and physical approaches, and the important applications and properties of nanomaterials. This course benefits students who desire to learn the basics and fundamentals of nanomaterials and its influence on our

environment and future life as well as those interested in learning and understanding more specific applications of nanomaterials.

APPROVALS: Add additional signature lines as needed.

	Date	9/26/16
Signature, Chair, Program/Department of:	Mechanical Engineering	
	Date	9-27-16
Signature, Chair, College/School Curriculum Council for:	CEM	
	Date	9/27/16
Signature, Dean, College/School of:	CEM	

Offerings above the level of approved programs must be approved in advance by the Provost.

	Date	
Signature of Provost (if above level of approved programs)		

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

	Date	

Signature, Chair
Faculty Senate Review Committee: ___Curriculum Review ___GAAC

___Core Review ___SADAC

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

	Date	
Signature, Chair, Program/Department of:		
	Date	
Signature, Chair, College/School Curriculum Council for:		
	Date	
Signature, Dean, College/School of:		

ATTACH COMPLETE SYLLABUS (as part of this application). This list is online at:
http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures-/uaf-syllabus-requirements/
The Faculty Senate curriculum committees will review the syllabus to ensure that each of the items listed below are included. If items are missing or unclear, the proposed course (or changes to it) may be denied.

SYLLABUS CHECKLIST FOR ALL UAF COURSES
During the first week of class, instructors will distribute a course syllabus. Although modifications may be made throughout the semester, this document will contain the following information (as applicable to the discipline):

1. Course information:
❑Title, ❑ number, ❑credits, ❑prerequisites, ❑ location, ❑ meeting time (make sure that contact hours are in line with credits).

2. Instructor (and if applicable, Teaching Assistant) information:
❑ Name, ❑ office location, ❑ office hours, ❑ telephone, ❑ email address.

3. Course readings/materials:
❑ Course textbook title, ❑ author, ❑ edition/publisher.
❑ Supplementary readings (indicate whether ❑ required or ❑ recommended) and
❑ any supplies required.

4. Course description:
❑ Content of the course and how it fits into the broader curriculum;
❑ Expected proficiencies required to undertake the course, if applicable.
❑ Inclusion of catalog description is *strongly* recommended, and
❑ Description in syllabus must be consistent with catalog course description.

5. ❑ Course Goals (general), and (see #6)

6. ❑ Student Learning Outcomes (more specific)

7. Instructional methods:
❑ Describe the teaching techniques (eg: lecture, case study, small group discussion, private instruction, studio instruction, values clarification, games, journal writing, use of Blackboard, audio/video conferencing, etc.).

8. Course calendar:
❑ A schedule of class topics and assignments must be included. Be specific so that it is clear that the instructor has thought this through and will not be making it up on the fly (e.g. it is not adequate to say "lab". Instead, give each lab a title that describes its content). You may call the outline Tentative or Work in Progress to allow for modifications during the semester.

9. Course policies:
❑ Specify course rules, including your policies on attendance, tardiness, class participation, make-up exams, and plagiarism/academic integrity.

10. Evaluation:
❑ Specify how students will be evaluated, ❑ what factors will be included, ❑ their relative value, and ❑ how they will be tabulated into grades (on a curve, absolute scores, etc.) ❑ Publicize UAF regulations with regard to the grades of "C" and below as applicable to this course. (Not required in the syllabus, but is a convenient way to publicize this.) Link to PDF summary of grading policy for "C":
http://www.uaf.edu/files/uafgov/Info-to-Publicize-C_Grading-Policy-UPDATED-May-2013.pdf

11. Support Services:
❑ Describe the student support services such as tutoring (local and/or regional) appropriate for the course.

12. Disabilities Services: Note that the phone# and location have been **updated.**
http://www.uaf.edu/disability/ The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials.

❑ State that you will work with the Office of Disabilities Services (208 WHITAKER BLDG, 474-5655)to provide reasonable accommodation to students with disabilities.

Instructor Dr. Lei Zhang
Assistant Professor
Department of Mechanical Engineering
Duckering 337A
(907) 474-6135
lzhang14@alaska.edu

Time/Place: Tuesday, Thursday 9:45-11:15 a.m., Duckering 333

Pre-requisites: ME 334

Course Materials

Textbook:

1. Nanostructures and Nanomaterials –Synthesis, Properties and Applications, Cao Guozhong and Wang Ying, World Scientific Publishing, 2nd edition, 2011, ISBN: 978-981-4322-50-8

2. Lecture notes.

3. Assigned papers.

Reference book:

Nanomaterials: An Introduction to Synthesis, Properties and Applications, Dieter Vollath, Wiley, 2008

Nanoscale Materials in Chemistry, edited by Kenneth J. Klabunde & Ryan Richards, John Wiley & Sons, 2nd edition, 2009.

References Journals:

ACS Nano and TBA.

Course Description

This course is aimed to introducing students to the concepts and the associated relevant physics and materials science of what makes nanoscale materials so unique. This course provides a comprehensive overview of nanomaterials in terms of the synthesis, characterization, properties, and applications. It will cover the fundamental scientific principles for the different synthesis techniques, assembly of nanostructured materials, and new physical and chemical properties at the nanoscale. Existing and emerging applications will also be discussed through case studies. The 3-credit course is designed for students who are ME-majored undergraduate and/or non ME-majored graduate standing (both of the groups must meet the co-requisite requirement). The course constitutes three parts. The first part is on the structures, properties, and characterization techniques of nanomaterials; the second part is on the introduction of some special nanomaterials including carbon fullerenes and nanotubes, micro and mesoporous materials, and core-shell-structure nanomaterials. The last part focuses on the applications of nanomaterials, including biological applications, energy applications, and environmental applications. Since this course is to prepare students to further explore the nanomaterials related topics, the course subjects will also broadly include contemporary relevant topics such that each student may be exposed to the topic(s) of their own interests.

Course Goals

To foster a detailed understanding of various types of nanomaterials by composition, physical properties, and applications.

Student Learning Outcomes

Upon completion, students will have a basic understanding of nanomaterials. Specifically, students will be able to:

- Characterize physical properties (mechanical, thermal, electrical, magnetic, optical etc.) of nanomaterials Explain typical synthesis method of nanomaterials

- Apply the concept of microstructure-processing-property relationship to analyze nanomaterials.
- Apply nanomaterials for energy, environment, and biomedical applications

Instructional methods:

Instructional methods of this course include lecture (*via* Microsoft Powerpoint), essay writing, and student oral presentation.

This class will be using Blackboard as an aid to communication.

Student Assignments

Homework

No plagiarism! Assignments about the structures and properties of nanomaterials will be distributed and collected for grading.

Essay Writing

One peer-reviewed journal article will be assigned to student about the properties of nanomaterials in week 10. Each student needs to read through the paper assigned and perform the following task:

Each student writes a 3-page essay to at least address the following questions:

1. A summary of the paper content—**use your own words** to address what the problem is and why it is important, the method used, and to what degree the authors solve the problem, and how.
2. Your comments on this paper—what problem(s) did the authors not solve or address, and in your opinion what else of the problems would be needed to solve. Bonus points will be given if you could suggest one approach or two to study the unsolved problems.

Oral Presentation

Each student will give three 10-15 minute oral presentations on the following topics:

(1) Nanomaterials for biological applications

(2) Nanomaterials for energy applications

(3) Nanomaterials for environmental applications

Student may choose one or more peer-reviewed paper(s) relating the presentation topics. Student will submit or email his/her presentation paper(s) he/she presents to the instructor 2 weeks before the presentation date. The oral presentation should address the significance of the paper (what is the problem and why it is important), the method (to what degree the authors solve the problem, and how), and the conclusion to this paper.

Final Exam

One final exam (open notes) will be given in class. The exam date will follow the final exam schedule posted in the book *Class Schedule.* As a UAF student, you are subject to UAF's Honor Code:

> *"Students will not collaborate on any quizzes, in-class exams, or take-home exams that will contribute to their grade in a course, unless permission is granted by the instructor of the course. Only those materials permitted by the instructor may be used to assist in quizzes and examinations.*
>
> *Students will not represent the work of others as their own. A student will attribute the source of information not original with himself or herself (direct quotes or paraphrases) in compositions, theses and other reports.*
>
> *No work submitted for one course may be submitted for credit in another course without the explicit approval of both instructors.*

Violations of the Honor Code will result in a failing grade for the assignment and, ordinarily, for the course in which the violation occurred. Moreover, violation of the Honor Code may result in suspension or expulsion."

Grading

The performance of each student will be evaluated by:

		total
In Class 3 Presentations	5 points each	15 points
Written Essay	15 points	15 points
HW Assignments	10 points each	50 points
Final Exam	20 points	20 points
	Total	100 points

A+ (96-100) **A (90-95)** **A- (87-89)** **B+ (83-86)** **B (80-82)** **B- (77-79)** **C+ (73-76)**
C (70-72) **C- (67-69)** **D+ (65-66)** **D (63-64)** **D- (60-62)** **F (<60)**

Oral presentation and written essay evaluation forms are attached at the end.

Course Calendar

Week	Class topics	Reading Assignment**	Homework*
1	Emergence and challenges of nanotechnology	Chapter 1	
2	Physical Chemistry of Solid Surfaces I	Chapter 2	#1
3	Physical Chemistry of Solid Surfaces II	Chapter 2	
4	Zero-Dimensional Nanostructures: Nanoparticles I	Chapter 3	
5	Zero-Dimensional Nanostructures: Nanoparticles II	Chapter 3	#2
6	One-Dimensional Nanostructures: Nanowires and Nanorods	Chapter 4	#3
7	Two-Dimensional Nanostructures: Thin Films	Chapter 5	#4
8	Special Nanomaterials: Carbon Fullerenes and Nanotubes	Chapter 6	#5
9	Special Nanomaterials: Micro and Mesoporous Materials, Core–Shell Structures	Chapter 6	
10	Nanostructures Fabricated by Physical Techniques	Chapter 7 + journal article#	
11	Characterization and Properties of Nanomaterials	Chapter 8	
12	Nanomaterials for biological applications	Chapter 9	
	Student presentations #1 = biological applications		
13	Nanomaterials for energy applications	Chapter 9	
	Student presentations #2 = energy applications		
14	Nanomaterials for environmental applications	Chapter 9	**Essay**

	Student presentations #3 = environmental applications		
15	**Final Exam** (in-class. date: TBA)		

*Homework exercises are given out at the end of the indicated week and are due the end of the following week
** All chapters are from "Nanostructures and Nanomaterials –Synthesis, Properties and Applications, Cao Guozhong and Wang Ying, World Scientific Publishing, 2nd edition, 2011".
#A peer-reviewed journal article will be assigned week 10; a 3-page essay on the article will be due at the end of week 14.

Course policies:

Make-up homework assignments and exams are possible only by prior approval by the instructor. Plagiarism will result in a failing grade.

Disabilities Services:

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. The instructor will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

Oral Presentation Evaluation Form (5 points in total for each presentation)

Delivery	Excellent (point)	Good (point)	Needs Improvement (point)
Introduction clear and interesting	0.5	0.3	0.2
Related topic to audience	0.5	0.3	0.2
Communicated sincerity & enthusiasm	0.5	0.3	0.2
Maintained strong eye-contact	0.5	0.3	0.2
Avoided distracting mannerisms	0.5	0.3	0.2
Seemed knowledgeable & confident	0.5	0.3	0.2
Presented visual aids well	0.5	0.3	0.2
Completed speech within time limit	0.5	0.3	0.2
Content			
Main points well-organized, used supporting evidence & examples	0.5	0.3	0.2
Bibliography included in proper format	0.5	0.3	0.2

Essay Evaluation Form (15 points in total)

	Excellent (point)	Good (point)	Needs Improvement (point)
Importance of the work well addressed	2	1	0.5
Experimental methods used well addressed	2	1	0.5
Clearly identified problem	2	1	0.5
Clearly identified to what degree and how the authors solve the problem	2	1	0.5
Main points well-organized, used supporting evidence	2	1	0.5
Clear conclusion	2	1	0.5
Bibliography included in proper format	1	0.5	0.2
Clear, concise language	1	0.5	0.2
Submit on time	1	n/a	0
Bonus points (max 4 points in total)			
Clearly identified what problem(s) did the authors did not solve or address	1	0.5	n/a
What else of the problems would be needed to solve in your opinion?	1	0.5	n/a
Suggest one approach or two to study the unsolved problems	2	1	n/a