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APR 2 5 2007

OFFICE OF THE SENATE COUNCIL

APPLICATION FOR NEW COURSE

1. Submitted by College of Graduate School Date January 2, 2007

   Department/Division offering course Center for Biomedical Engineering

2. Proposed designation and Bulletin description of this course

   a. Prefix and Number BME 599 b. Title* Topics in Biomedical Engineering (subtitle required)

   *NOTE: If the title is longer than 24 characters (including spaces), write A sensible title (not exceeding 24 characters) for use on transcripts Topics in Biomed Engr

   c. Lecture/Discussion hours per week 3 d. Laboratory hours per week _____

   e. Studio hours per week _____ f. Credits 3

   g. Course description

   An interdisciplinary course devoted to detailed study of a topic of current significance in biomedical engineering, such as cellular mechanotransduction, systems biology, and tissue engineering.

   h. Prerequisites (if any)

   Consent of instructor.

   i. May be repeated to a maximum of 6 credits (if applicable)

4. To be cross-listed as

   _____ Prefix and Number _____ Signature, Chairman, cross-listing department

5. Effective Date Fall 2007 (semester and year)

6. Course to be offered ☑ Fall ☑ Spring ☑ Summer

7. Will the course be offered each year? ☑ Yes ☐ No
   (Explain if not annually)

8. Why is this course needed?

   To provide junior graduate and senior undergraduate students a focused and specialized exposure to select topics in biomedical engineering.

9. a. By whom will the course be taught? Faculty within the Center for Biomedical Engineering

   b. Are facilities for teaching the course now available? ☒ Yes ☐ No
   If not, what plans have been made for providing them?

APPLICATION FOR NEW COURSE

10. What enrollment may be reasonably anticipated? 12-14 students/year

11. Will this course serve students in the Department primarily? ☐ Yes ☑ No

Will it be of service to a significant number of students outside the Department? ☑ Yes ☐ No
If so, explain.

This course will permit students from other engineering departments exposure to focused study of a topic in biomedical engineering.

Will the course serve as a University Studies Program course? ☐ Yes ☑ No

If yes, under what Area? _____

12. Check the category most applicable to this course

☑ traditional; offered in corresponding departments elsewhere;

☐ relatively new, now being widely established

☐ not yet to be found in many (or any) other universities

13. Is this course applicable to the requirements for at least one degree or certificate at the University of Kentucky? ☑ Yes ☑ No

14. Is this course part of a proposed new program: ☐ Yes ☑ No
If yes, which?

15. Will adding this course change the degree requirements in one or more programs? ☐ Yes ☑ No
If yes, explain the change(s) below (NOTE – If "yes," a program change form must also be submitted.)

16. Attach a list of the major teaching objectives of the proposed course and outline and/or reference list to be used.

18. If the course is 400G or 500 level, include syllabi or course statement showing differentiation for undergraduate and graduate students in assignments, grading criteria, and grading scales. ☑ Check here if 400G-500.

19. Within the Department, who should be contacted for further information about the proposed course?

Name Patwardhan Abhijit Phone Extension 7 2728

APPLICATION FOR NEW COURSE

Signatures of Approval:

1/8/07 Date of Approval by Department Faculty	Reported by Department Chair
1/23/07 Date of Approval by College Faculty	Reported by College Dean
4-24-07 *Date of Approval by Undergraduate Council	Reported by Undergraduate Council Chair
*Date of Approval by Graduate Council	2/21/07 Reported by Graduate Council Chair
*Date of Approval by Health Care Colleges Council (HCCC)	Reported by HCCC Chair
*Date of Approval by Senate Council	Reported by Senate Council Office
*Date of Approval by University Senate	Reported by Senate Council Office

*If applicable, as provided by the Rules of the University Senate

Rev 7/06

Nikou, Roshan

From: Graduate.Council.Web.Site@www.uky.edu
Sent: Wednesday, February 07, 2007 9:42 AM
To: Nikou, Roshan
Cc: Price, Cleo
Subject: Investigator Report

AnyForm User: www.uky.edu
AnyForm Document: http://www.research.uky.edu/gs/GCInvestigatorReport.html
AnyForm Server: www.uky.edu (/www/htdocs/AnyFormTurbo/AnyForm.php)

College/Department/Unit: = BME 599
Category:_ = New
Date_for_Council_Review: = February 15, 2007
Recommendation_is:_ = Approve
Investigator: = Brill
E-mail_Address = jwbrill@uky.edu
1__Modifications: = 1) Question 13 should be \"yes\" (both boxes were checked by mistake)
2) Two sample syllabi were included. In the second (\"Future of Fracture Fixation\"), 5 points were to be awarded to undergrads for no particular reason. This is being changed to a different grading criterion for undergrads and grads, as described in the first syllabus.
2__Considerations: = Other topical courses are offered in BME at other levels (481G, 699). I questioned the need for this course, especially since the enrollment in 481G has been very small (typically 1 student/year).

The dept. feels the need for a 500-level topical course, so that their own grad students can take it for credit. In addition, if the senate approves BME\'s inclusion in University Scholars program, it is hoped that engineering undergrads might take this to see if they like BME and, if so, use it for graduate credit if they transfer into BME.

The listed expected enrollment is 2-4 students/year, but they hope it will be greater once included in University Scholars.
3__Contacts: = Professor Abhijit Patwardhan -- considerations listed above.
4__Additional_Information: =

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UNIVERSITY OF KENTUCKY
CENTER FOR BIOMEDICAL ENGINEERING
Wenner-Gren Research Laboratory

FALL 2007

Course Name:	Bone and Mechanical Loading (Special Topics)
Course Prefix:	BME 599, 3 credit hours
Prerequisite:	BME 501
Course Objective:	This course will introduce the student to the areas of biology and engineering that apply to the mechanical loading of bone. An introduction to the theories, analytical tools and experimental techniques used to assess the effects of mechanical loading on bone will be provided.
Course Description:	Theory of mechanical testing, testing machine development and operation, bone, bone biology, bone mechanotransduction modeling including in vitro, in vivo and ex vivo systems, basic cell culture, bone harvesting, structural testing, growth analysis, organ culture maintenance.
Time:	1Hr per week (classroom lecture) 1 ½ Hr per week (laboratory)
Place:	Center for Biomedical Engineering, Wenner-Gren Research Laboratory Lectures: Room 116 Labs: Room 10
Instructor:	Dr. Marnie Saunders
Office:	205 Wenner-Gren Research Lab
Contact:	(859) 323-1568; marnie.saunders@uky.edu
Office Hours:	Mondays, 8:00 AM -12:00 PM, or appointment as needed Fridays, 8:00 AM – 12:00 PM, or appointment as needed
Format:	This will be a Special Topics Course in Bone and Mechanical Loading. As such, the flexible format will consist of lectures and laboratory work. Formal times will be established for the lectures and lab and the students may request additional assistance in lab operation as needed. It is estimated that each participant will invest 9 hours per week outside of class completing lab assignments, experiments and required reading.
Textbook:	In lieu of a formal textbook, assigned reading will incorporate appropriate book chapters, as well as, review and research journal articles. The reading list will be distributed in class along with the reading materials.
Course Policy:	Attendance is mandatory. Final grades will be determined as follows: Attendance/Participation (5%); 4 Quizzes (15%); Homework 1 (5%); Homework 2 (5%); Project 1 (15%); Project 2 (15%); Final Research Project (40%). There will be no exams. Class size will determine if homework and projects will be individual assignments or group projects. Points in each category will be totaled and weighted as described above to arrive at a final grade using the standard grading scale (A=90-100%; B=80-89%; C=70-79%; D=60-69%; E=0-59%). Although unlikely, a curve based upon the distribution of final scores may be applied to adjust final grades. If used, the curve will make only small adjustments based upon the statistical distribution of overall scores. Scores grouped near the top will get A's, the next major grouping

gets B's, etc. If anything, the curve will only raise your grade; a curve will never lower a grade. For example, the lowest grade an 89% overall score can get is B, but if there is a curve, it might be worth an A.

The University's accreditation association and policy of the Graduate School require different assignments and/or grading criteria for undergraduate and graduate students in 400G- and 500-level courses. For that reason, assessment criteria for graduate students in this class will be more stringent. This means that graduate students will be held to a higher standard of performance and will earn less partial credit for inaccuracies, incomplete and superficial discussion of experimental results, etc.

Plagiarism:

Students must avoid plagiarism, even if unintentional. Plagiarism includes not only verbatim copying of whole sentences or paragraphs, but also using someone's sentences after making minor changes, such as substituting words or rearranging phrases. Any text or sequence of ideas taken from another source must be clearly and specifically cited. The University of Kentucky's guidelines regarding academic dishonesty will be strictly enforced.

http://www.uky.edu/Ombud/Plagiarism.pdf

UNIVERSITY OF KENTUCKY
CENTER FOR BIOMEDICAL ENGINEERING
Wenner-Gren Research Laboratory

FALL 2007
BME 599 - Bone and Mechanical Loading (Special Topics) – Weekly Schedule

Week		
1	Lecture	Introduction to Bone Biology
	Lab	Long Bone Anatomy and Dissection
2	Lecture	Bone Growth and Development
	Lab	Long Bone Anatomy and Dissection
3	Lecture	Bone Repair and Regeneration
	Lab	Components and Demo of Testing Machine
4	Lecture	Review of Basic Mechanics (Quiz 1 on Bone)
	Lab	Student Operation of Testing Machine
5	Lecture	Materials/Mechanical Testing Machines
	Lab	Mechanical Testing – Homework 1
6	Lecture	Machine and Fixture Fabrication
	Lab	Mechanical Testing – Homework 2
7	Lecture	Testing Models and Issues (Synthetic/Animal/Human)
	Lab	Mechanical Testing – Project 1
8	Lecture	Cell Biology – the Osteocyte (Quiz 2 on Mechanics)
	Lab	Demo of Basic Cell Culture Techniques
9	Lecture	Cell Biology – the Osteoblast
	Lab	Cell Culture – Student Experience
10	Lecture	Cell Biology – the Osteoclast
	Lab	Demo – In Vitro Mechanotransduction
11	Lecture	Mechanotransduction (Quiz 3 on Cell Biology)
	Lab	Demo – Ex Vivo Mechanotransduction
12	Lecture	In Vitro Mechanotransduction and Analysis
	Lab	Mechanotransduction – Project 2
13	Lecture	In Vivo Mechanotransduction and Analysis

	Lab	Mechanotransduction – Project 2
14	Lecture	Ex Vivo Mechanotransduction and Analysis – Final Research Project Assigned
	Lab	Work on Final Research Project
15	Lecture	Work on Final Research Project (Quiz 4 on Mechanotransduction)
	Lab	Work on Final Research Project
16	Lecture	Work on Final Research Project
	Lab	Final Research Project Report Due

UNIVERSITY OF KENTUCKY
CENTER FOR BIOMEDICAL ENGINEERING
BME 599 Challenges in Musculoskeletal Fracture Management
"The Future of Fracture Fixation"
COURSE SYLLABUS

Fall, 200X
Classroom K439 KY Clinic
Time: Tuesdays: 8:30 – 11
3 credit hours
email
Participating Lecturers/Instructors:
William Adkisson, PA-C
William Rosenblum, MD
Sam Smith, JD
Elaine Duncan, MS

Instructor: David Pienkowski, Ph.D.
Office: K401 KY Clinic
Telephone: 323-5533 ext. 240
Hours: by appointment
pienkow@uky.edu

Course Description

The course is designed to help students understand the factors governing technological change in biomedical engineering. The course consists of a series of lectures, reading assignments (including case studies), clinical visitation experiences, and group work endeavors that will develop the skills needed to understand how biomedical technologies develop and change. The course will also confer the student with some ability to make technological forecasts regarding future biomedical technologies. For the purposes stated, the course will be based upon biomedical technologies for fracture management as the basis for the academic exercise. The capstone project of the course consists of a student-created technological forecast of mid-shaft long bone lower extremity fracture management technology in the year 2026. This forecast will be delivered as a written report, one which may be suitable for publication in the Journal of Orthopaedic Trauma, as well as two oral presentations: one to Biomedical Engineers, the other to Orthopaedic physicians (and residents in training).

Course Background:

Based upon the structure of conventional educational programs, students commonly believe that medical device design is primarily the result of technical, and possibly economic, considerations. Other factors, some unique to the domestic biomedical product and clinical practice environment, also effect the rate and direction of biomedical technological change. The influence of these other factors, however, often goes unappreciated until after graduation when on-the-job demands require biomedical engineers to determine what new product fields to direct their company to enter (and which fields to abandon) as well as how many resources should be committed and when. Such engineers in essence become managers of biomedical technology rather than bench-top engineers. In the former role, they are required to develop a stream of new product innovations in the face of limited resources and controlled risk. The skills needed to perform these important tasks are almost never

taught in traditional engineering courses, and when students reach the "real world," they often founder when confronted with these essential tasks.

Course Objective:
This course seeks to remedy deficiencies in graduate engineering education by enabling students to gain experiences that will enable them to clearly identify, understand, and incorporate into their analyses all of the factors that guide medical product development through active participation in a particular biomedical technological forecasting endeavor. The specific aims of this course are to help students gain new skills that will enable them to:

1. determine the clinical needs for a particular technology and how that technology is driven by market forces,

2. understand the myriad of factors that limit or motivate medical device development,

3. evaluate the extent and rate of technological change (including lifecycle analyses) in this particular industry,

4. make a technological forecast that leads to specific product (or product line) recommendations, or to advise a group of investors whether, when, and how much, to invest in this new technology or product,

5. obtain group work experience in an environment that is reflective of that existing in industry, i.e., one oriented towards a single biomedical technology-related objective,

6. to develop the ability to communicate the same technological forecast information to varying (technical, i.e. engineers, and non-technical, i.e., physicians) audiences.

Outline of Course Content

1. Introduction

2. Bone Fractures: Types and Prevalence

3. Biology & Principles of Fracture healing

4. Past and Present Technologies for Fracture Treatment

5. Fundamentals of Technological Innovation

6. Technology and Product Lifecycle Analyses

8. Technological Change

9. Fundamentals of Technological Forecasting

10. Economics of Bone Fracture and Fracture Treatment

11. Government Regulation of Medical Devices:

12. Patents, Intellectual Property, and Reverse Engineering

13. 3rd Party payers – the role of health insurance and insurance payments

14. Ethics of Human Research/Implications for Technological Change

15. Preliminary Presentation of Technological Forecast

16. Final Presentations:

Biomedical Engineering Seminar Series
"The Future of Fracture Fixation"
December X, 200X, 3 PM, Wenner-Gren, Room 19

Orthopaedic Grand Rounds
"The Future of Fracture Fixation"
December Y, 200X
7 AM, 312 CTW

Grading

attendance	5%
participation	10%
group grading	15%
written project	35%
oral presentation	35%
total	100%

Note: the above is the instructors "guide" for quantitative determination of grades. This grading scale will be modified for senior undergraduate students; while they will be expected to perform as a team member, they will also be awarded an additional 5 basis points towards the final grade. Consideration will also be given for attendance records for undergraduate students who have considerable class attendance requirements at other remote sites on campus.

Grading Scale for Graduate Students

100 – 90% = A
89.9 – 80% = B
79.9 – 70% = C
< 69.9% = E

APPLICATION FOR NEW COURSE

Signatures of Approval:

1/8/07 Date of Approval by Department Faculty	Reported by Department Chair
1/23/07 Date of Approval by College Faculty	Reported by College Dean
April 24, 2007 *Date of Approval by Undergraduate Council	Reported by Undergraduate Council Chair
*Date of Approval by Graduate Council	2/21/07 Reported by Graduate Council Chair
*Date of Approval by Health Care Colleges Council (HCCC)	Reported by HCCC Chair
*Date of Approval by Senate Council	Reported by Senate Council Office
*Date of Approval by University Senate	Reported by Senate Council Office

*If applicable, as provided by the Rules of the University Senate

Rev 7/06