Office of the Registrar
FORM 40 REV. 5/11

PURDUE UNIVERSITY

REQUEST FOR ADDITION, EXPIRATION,
OR REVISION OF AN UNDERGRADUATE COURSE
(10000-40000 LEVEL)

Print Form

DEPARTMENT Biomedical Engineering

EFFECTIVE SESSION Spring 2017

INSTRUCTIONS: Please check the items below which describe the purpose of this request.

- [ ] 1. New course with supporting documents
- [ ] 2. Add existing course offered at another campus
- [ ] 3. Expiration of a course
- [ ] 4. Change in course number
- [ ] 5. Change in course title
- [x] 6. Change in course credit/type
- [ ] 7. Change in course attributes (department head signature only)
- [x] 8. Change in instructional hours
- [ ] 9. Change in course description
- [ ] 10. Change in course requisites
- [ ] 11. Change in semesters offered (department head signature only)
- [ ] 12. Transfer from one department to another

PROPOSED:	EXISTING:
Subject Abbreviation	Subject Abbreviation BME
Course Number	Course Number 39000
Long Title Professional Development and Design in Biomedical Engineering	
Short Title	

Abbreviated title will be entered by the Office of the Registrar if omitted. (30 CHARACTERS ONLY)

TERMS OFFERED
Check All That Apply:
[ ] Fall [x] Spring [ ] Summer

CAMPUS(ES) INVOLVED
[ ] Calumet [ ] N. Central
[ ] Cont Ed [ ] Tech Statewide
[ ] Ft. Wayne [x] W. Lafayette
[ ] Indianapolis

CREDIT TYPE
1.Fixed Credit: Cr. Hrs. 2
2.Variable Credit Range:
Minimum Cr. Hrs
(Check One) To [ ] Or [ ]
Maximum Cr. Hrs.
3.Equivalent Credit: Yes [ ] No [ ]

COURSE ATTRIBUTES: Check All That Apply
1. Pass/Not Pass Only [ ]
2. Satisfactory/Unsatisfactory Only [ ]
3. Repeatable [ ]
Maximum Repeatable Credit: [ ]
4. Credit by Examination [ ]
5. Fees: [ ] Coop [ ] Lab [ ] Rate Request
Include comment to explain fee
6. Registration Approval Type
Department [ ] Instructor [ ]
7. Variable Title [ ]
8. Honors [ ]
9. Full Time Privilege [ ]
10. Off Campus Experience [ ]

ScheduleType	Minutes Per Mtg	Meetings Per Week	Weeks Offered	% of Credit Allocated
Lecture				
Recitation				
Presentation				
Laboratory				
Lab Prep				
Studio	100	2	16	
Distance				
Clinic				
Experiential				
Research				
Ind. Study				
Pract/Observ				

Cross-Listed Courses

COURSE DESCRIPTION (INCLUDE REQUISITES/RESTRICTIONS):

*COURSE LEARNING OUTCOMES:

Calumet Department Head	Date	Calumet School Dean	Date
Fort Wayne Department Head	Date	Fort Wayne School Dean	Date
Indianapolis Department Head	Date	Indianapolis School Dean	Date
North Central Faculty Senate Chair	Date	Vice Chancellor for Academic Affairs	Date
George R. Wodicka 1/28/16 West Lafayette Department Head	Date	West Lafayette College/School Dean	Date
		West Lafayette Registrar	Date

OFFICE OF THE REGISTRAR

January 22, 2016

TO: The Faculty of the College of Engineering

FROM: The Faculty of the Weldon School of Biomedical Engineering

RE: Changes in credit hours and schedule type for the Undergraduate-Level Course, BME 39000 Professional Development and Design in Biomedical Engineering

The Faculty of the School of Biomedical Engineering has approved the following changes to an existing course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

From: **BME 39000 Professional Development and Design in Biomedical Engineering**
Term offered: Spring, Lecture 1, Cr. 1

To: **BME 39000 Professional Development and Design in Biomedical Engineering**
Term offered: Spring, Studio 4, Cr. 2

Reason: The content and assignments in BME 39000 now reflect a developmental step in the design pedagogy and includes elements that were previously part of Senior Design, including problem formulation, innovation and concept generation. The change in course type to studio mirrors the active-learning format of the Senior Design Projects courses. The increase in credit hours reflects the addition and restructuring of early phase design elements into the course content and assignments. The additional required 1 credit hour is balanced in the curriculum by the reduction in unrestricted elective credits from 4 to 3.

George R. Wodicka

George R. Wodicka, Professor and Head
Weldon School of Biomedical Engineering

Approved for the faculty of the Schools of Engineering by the Engineering Curriculum Committee
ECC Minutes 16 Date 4-5-16
Chairman ECC

BME 39500: Professional Developments and Design in Biomedical Engineering
2016 Course Syllabus
Mon, Wed 9:30-11:20am, HICKS B853

Course Instructors	Email	Office Hours	Office
Professor Hugh Lee	hwlee@purdue.edu	Scheduled by email	MJIS 2084
Professor Joseph Rispoli	jrispoli@purdue.edu	Scheduled by email	MJIS 3035
Professor Andrew Brightman	aob@purdue.edu	Scheduled by email	MJIS 1021F
Course Support			
Mr. Asem Aboelzahab	aboelzahab@purdue.edu	Scheduled by email	
Dr. Lester Smith	smith425@purdue.edu	Scheduled by email	
GTA			
Matt Pharris	mpharris@purdue.edu	Scheduled by email	TBD
Hyunsu Park	park755@purdue.edu	Scheduled by email	TBD
Qi Yang	yang320@purdue.edu	Scheduled by email	TBD
Course Consultants			
Professor Matthew Lynall	mlynall@purdue.edu	Scheduled by email	RAWL 4066
Professor Ann Rundell	rundell@purdue.edu	Scheduled by email	MJIS 3029

Course Description: Introduction to a diverse spectrum of current topics relevant to the technical, professional, and career aspects of Biomedical Engineers. The course is taught in a studio style where students work in teams to develop and support persuasive arguments defining the opportunity space associated with a medical or healthcare need. The skills acquired address the early stages of the design process (e.g., need identification, problem formulation, innovation and concept generation), professional communication skills (e.g., written and oral reporting and documentation), and ethics of biomedical design and research (e.g., ethical codes and decision making, social and environmental impact of design).

Prerequisite: BME 29000 Frontiers in Biomedical Engineering

	Learning Outcomes
I	Apply established techniques to **discover and define an unmet need** in medical therapy or healthcare delivery that could be solved with a biomedical engineering solution
II	Using information and statistics acquired from online databases and technical articles, **synthesize, define, and defend an opportunity space** in an oral presentation and the written format of a Need Specification.
III	**Construct and articulate a clear, logical, and persuasive proposal** in an oral presentation and the written format of a Product Development Proposal that considers at a minimum the ethical, social, environmental, economic, and technical aspects of a proposed solution to a medical need

Required Supplies:

- Referencing Software (e.g., EndNote, Mendeley Desktop, etc.)
- Textbook: P.G. Yock, S.A. Zenios, J. Makower, et al. Biodesign: The Process of Innovating Medical Technologies, 2nd Edition, 2015, Cambridge, UK; New York: Cambridge University Press. xxxv, 742 p.

Please bring laptop with wireless capabilities for all class sessions.

Instructional Format: This is a studio style class. Before you attend class, there are required reading assignments and short videos to watch that convey key concepts you will explore in class. This pre-class preparation is essential as portions of this class (weeks 4-7) are delivered asynchronously, meaning that you and other students will be working on developing different skills and knowledge at the same time in the room. In some class periods, the instructors will present a brief lecture at the start of class followed by the students working on a related in-class assignment. During the in-class work sessions, course instructors will circulate to provide real-time assistance. The culmination of this course is the creation of a Product Development Proposal (PDP) and a persuasive technical oral presentation. Peer reviews on both oral and written work will be used extensively for feedback. Rubrics will be provided to help evaluate the content and provide meaningful feedback for continuous improvement. It is anticipated that finalizing the PDP (the final written document and the oral presentation) into a cohesive document will require work conducted outside of the scheduled time period.

Pre-class Preparation: Before the start of class time, students must have done the assigned reading, viewed the required videos, and completed any peer feedback rubrics (when assigned). Individual knowledge and skill mastery will be partially assessed by online quizzes.

Blackboard Learn: Blackboard Learn (https://mycourses.purdue.edu) will be used to disseminate presentations, supporting documents, videos, assignments, and grades. All completed assignments must be submitted via Blackboard Learn. Peer and instructor feedback will be provided on assignments with suggestions for improvement and will be pushed back through Blackboard. The team will use the feedback to improve their PDP.

Development Teams: Students will work in teams for all of the in-class activities. Teams will consist of 3 – 4 students and are assigned using CATME.

Removal from a Team: If an individual is consistently unproductive or lacks adequate participation, the team may elect to remove the individual from that team. To do so, the team, as a group, must submit a formal written complaint to the course instructor. The course instructor will hold a meeting with the aggrieved parties to establish fair and specific goals for the unproductive team member to meet in a timely manner. If the team member fails to meet these requirements, the course instructor has the right to remove a member from a team. In the event a student is removed from a team, a failing grade may be awarded for the course.

Course Schedule

- Required video links and supplemental reading material will be posted on Blackboard Learn at least one week before they are to be completed.

- Typically, team assignments are due Wednesday at 11:30 AM immediately after the indicated class period.
- Peer feedback on team assignments is generally due on Thursday at 5 PM before the next class period.
- All oral presentations must be uploaded to Blackboard at least 1 hour before the first scheduled class period of oral presentations sessions as indicated on the schedule.
- The asynchronous learning periods are highlighted in the weekly schedule by light green.

DRAFT Schedule Dates	**Topic and Associated PDP section(s) (Asynchronous cycles are indicated with green shading and numbered with superscripts following the topic)**	**Pre-class required reading, power point slides, and videos**	**Related Assignments/Activities with due dates**
1/11	• Course Introduction • What makes a good senior design project? • Review of potential suggested senior design projects		• Pre-course CATME survey due in class
1/13	• Review of potential suggested senior design projects • Arrange clinic visits		
1/18	• Martin Luther King, Jr. Day		
1/20	• Identifying stakeholder, their needs; interviewing techniques	• Blackboard (BB) Videos • Biodesign Section 1.2 • Supplemental Material	• Clinic visits • Stakeholders interviews
1/25	• Brainstorming techniques	• BB Videos Biodesign Section 1.3	• Problem Identification Worksheet due 1/24 @ 8:30 AM
1/27	• Market analysis I • Business model canvas intro		
2/1	• How to give an effective elevator pitch[2]		

2/3	• Technical article reading[1] • PDP II-VI • Peer review process	Team members cycle through four topics. See required videos and Biodesign for each topic after syllabus.	• Sections II and III for instructor feedback due 2/3 @ 11:30 AM • Peer Review Calibration due 2/7 @ 11:30 AM
2/8	• PDP II-VI continued	Team members cycle through four topics.	• Sections II and III for peer review feedback due 2/8 @ 11:30 AM • Peer review of Sections II and III due 2/12 @ 11:30 AM
2/10	• ***Problem/need statement presentations***	Team members cycle through four topics.	• ***Problem/need statement presentations due 2/10 @ 8:30 AM*** • CATME due 2/10 @ 5 PM
2/15	• Technical writing[3] • PDP II-VI		• Response to reviewer comments due 2/15 @ 11:30 AM • Sections II-V due for instructor review 2/15 @ 11:30 AM
2/17	• Gap and Pugh analysis[4]	Team members cycle through four topics.	
2/22	• PDP II-VI	Team members cycle through four topics.	
2/24	• PDP II - VII	• BB Videos • Supplemental reading	
2/29	• Root cause and SWOT • PDP II - VII	• BB Videos Biodesign Section 2.5	• Sections II-VII due for instructor review 2/29 @ 11:30 AM
3/2	• Technical presentation preparation • Effective engineering images and drawings	• BB Videos Supplemental reading	
3/7	• Oral Presentations		• CATME due 3/7 @ 5 PM • ***Oral presentations due 3/7 @ 8:30 AM***

3/9	• Oral Presentations		• ***Online Quiz I due by 3/9 @ 8:30 AM***
3/14-3/18	Spring Break		
3/21	• Stakeholder update		
3/23	• Business model canvas update		• In class business model canvas check
3/28	• Market analysis update		
3/30	• Ethics I: stakeholder needs • PDP VIII, IX	• BB Videos • Supplemental reading • Biodesign Section 2.3	
4/4	• Ethics II • PDP VIII	• BB Videos • Supplemental reading	• Section VIII for instructor review on 4/4 @ 11:30 AM • Ethics assignment due 4/4 @ 5 PM
4/6	• Design specifications	• BB Videos • Biodesign Section 3.1	• CATME due 4/6 @ 5 PM
4/11	• Solution path and ideation		
4/13	• Risk assessment		
4/18	• Idea generation/ organization • Concept screening	• BB Videos • Biodesign Section 3.2	
4/20	• PDP I, X-XII		• Sections IX-XI for peer and instructor review on 4/20 @ 11:30 AM • Peer review of Sections IX-XI due by 4/24 @ 11:30 AM
4/25	• PDP all sections		• Response to reviewer comments due 4/25 @ 11:30 AM
4/27	• PDP all sections • Finalize Business Model Canvas		• ***QUIZ II TBD*** • In class business model canvas check

TBD	• Finals week		• Complete PDP and response to reviews due 5/2 @ 5 PM • Business model canvas due 5/2 @ 5 PM • CATME due 5/2 at 5 PM • ***Oral Presentations due TBD*** • Peer review of presentations due TBD

Asynchronous Topics

Videos and required reading are listed under each topic. Each week you will prepare for one of the following topics as planned by your team.

1. Disease pathology or healthcare problem description
    - BB Videos
    - Biodesign Section 2.1
2. Current Solution Landscape
    - BB Videos
    - Biodesign Section 2.2
3. Emerging Solution Landscape
    - BB Videos
    - Biodesign Section 4.1
4. Market Analysis
    - BB videos
    - Biodesign Section 2.4

BME 395 Grading Scheme

Assessment	Value (individual)	Due dates
Peer reviews, team participation (CATME[#]) and attendance	(10%)	Peer Reviews at 11:30 AM on 2/12 and 4/24. CATME on 5 PM on 2/10, 3/7, 4/4, 5/2. Attendance – random spot check
On-line quizzes[*]	(10%)	8:30 AM on 3/9 and TBD
Medical and Healthcare Problem Identification Worksheet	(5%)	8:30 AM on 1/24
Ethics assignment(s)	5%	11:30 AM on 4/14
Mid-semester team presentation(s)	15%	8:30 AM on 2/10 and 3/7-9
Final team presentation	20%	TBD
Response to reviewers	10%	11:30 AM on 2/15 and 4/25
Business model canvas & customer feedback	5%	In class (3/23, 4/27), 5PM on 5/2
Final PDP	20%	5 PM on 5/4

[#] CATME will be used for evaluation of team participation. The grade penalty for poor performance on a team may result in a letter grade reduction or even failure of the course depending upon its severity.

*Students that fail to demonstrate completion of end of course evaluations will receive a zero for their last quiz grade. Providing an electronic or hard copy of the web browser showing completion of the BME 395 course evaluation are the only accepted methods to demonstrate proof of completing end of course evaluations.

Grading Scale:

100-97 pts = A+	96-93 pts = A	92-90 pts = A-
89-87 pts = B+	86-83 pts = B	82-80 pts = B-
79-77 pts = C+	76-73 pts = C	72-70 pts = C-
69-67 pts = D+	66-63 pts = D	62-60 pts = D-
Below 60 pts = F		

Re-grade policy

Students have the right to contest grades throughout the semester. In the event that a student feels an assignment has been inappropriately graded, the student must submit a one page typed document indicating the nature of the problem and an explanation for the re-grade submission. Along with this document, the original assignment must be returned to the instructor. Students have one week after the return of a graded assignment to protest a grade; after this time, grade disputes will not be accepted. Papers submitted for a re-grade will be completely reevaluated (i.e., the entire paper will be re-graded, not only the portion under protest), which means that students may lose additional points for mistakes missed during the first grading process.

Late assignments
Assignments are due on time. Except in extenuating circumstances, students will receive a zero for assignments not turned in by the deadline.

Problem Identification Worksheet
Each student must identify two medical and/or healthcare problems that might be relevant as topics for senior design. This document describes the medical and/or healthcare problems identified by you after interviewing and observing people associated with medical and healthcare professions and patients or person with a medical condition.

Product Development Proposal (PDP) Template
A template is provided on Blackboard Learn for the Product Development Proposal (PDP). All assignments are uploaded as a pdf generated from this template. In the course schedule, the sections that should be focused on during that class period for development and peer/instructor feedback are indicated. Teams are responsible for submitting a single pdf of their PDP document via Blackboard Learn by the designated due date for peer and instructor feedback or grade evaluation. For references purposes, the section titles of the PDP are:

Section I: Executive Summary
Section II: Problem Statement
Section III: Needs Statement
Section IV: Summary of Problem
Section V: Market Description
Section VI: Existing and Emerging Solutions
Section VII: Defining the Gaps in Healthcare
Section VIII: Ethical Considerations
Section IX: Design Specifications
Section X: Solution Identification and Selection
Section XI: Solution Statement
Section XII: Concluding Remarks
Section XIII: References

Oral Presentations
Short persuasive presentations are developed and given throughout the semester as the project evolves. The presentations cover your problem and need statement and are used to persuade the audience that you have identified an opportunity space. These presentations will vary in length from 3 to 10 minutes. Feedback will be provided on content and delivery by the course instructors and your peers.

Peer Reviews
Most of the PDP sections and oral presentations will be subjected to peer review. Although the entire PDP template will be made available, only the assigned sections will undergo the peer review cycle in a given week. As a peer reviewer you are expected to critically analyze student work and provide constructive feedback that will enhance the final product. Failure to constructively contribute to peer reviews will result in the loss of points assigned to peer reviews. Typically, you will need to complete and submit your critical analysis to course instructors through Qualtrics.

Response to Reviews
A Response to Reviews will be prepared over the course of the semester to document how the PDP evolved with feedback from the peers and instructors. This document is limited to two pages. It summarizes the nature of the criticisms your team received and the changes you made in response to feedback.

Online Quizzes

Two online quizzes will be administered and cover the material in the required videos, PowerPoint slides, and reading assignments. These quizzes will be administered through Blackboard Learn and Respondus. Quizzes are open book and note. Students must complete the quizzes on their own. As these quizzes are designed to test each individual's knowledge of course material, sharing information or discussing the quiz is prohibited.

Class Attendance Policy

On-time attendance is required in this course. In cases of excused absences due to extenuating circumstances (e.g., death in family, illness, job interview), the course instructor should be contacted immediately (preferably prior to the class) and written documentation will be required.

Academic Conduct

You are expected to conduct yourself in a professional and ethical manner in all aspects of BME 39500. Plagiarism, cheating, or other acts of academic dishonesty will not be tolerated. Any infractions whatsoever will result in a failing grade. Instances of plagiarism or cheating will also be reported to the Dean of Students Office to be recorded on your permanent academic record. If an individual behaves in a manner that is unprofessional or unethical during the semester, the course instructor(s) reserves the right to fail the student. For more information see: http://www.purdue.edu/studentregulations/student_conduct/index.html.

Campus Emergency Response Procedures

- The Hicks Library employs a public address (PA) system to provide instructions in case of an emergency. Listen carefully to any announcements.
- Fire Alarm – Follow the exit signs to evacuate the building. Only gather personal items if it does not jeopardize your safety. Assist those who need help, if possible. Proceed to the west entrance of Stewart. Report to a course instructor your name before leaving the emergency assembly area.
- All hazards warning - (examples of hazards: tornado (severe weather)/hazardous materials release/civil unrest/directed by police personnel) – When you hear the all hazards alarm immediately seek shelter/shelter-in-place.

Campus Emergency Policy

In the event of a campus wide emergency, the course outline and requirements may be subject to change. The course instructor will provide information in regards to changes in the course requirements or course schedule as a result of a campus wide emergency. Check Blackboard and your Purdue email accounts for information.

Original documentation

1. Level: Undergraduate – junior year

2. Course Instructor: Andrew Brightman

3. Course Outline:

Presentations by week
– *Invited Speaker on Current Status of BME* - **Selection of Teams and BME Areas**
– *Convincing Technical Reports* – **Assignment of Written Report**
– *Effective Visual Aids in Professional Presentations*
– *Dynamic Oral Presentations* – **Assignment of Oral Presentation**
– *Invited Speaker on Special Topic in Biomedical Engineering*
– *Professional Portfolios – Traditional and Electronic Media*– **Portfolio Assignment**
– *Graduate School Preview / BME Graduate Student Panel*
– *Student Presentations* – **Written Reports Due**
– *Student Presentations*
– *Student Presentations*
– *Student Presentations*
– *Student Presentations*
– *Student Presentations*
– *Student Presentations* – **Portfolios Due**
– *Invited Industry Speaker – Opportunities in BME Corporations*
– *Finals Week – Awards for Best Report and Presentation*

4. Required text: *The MIT Guide to Science and Engineering Communication* by J.G. Paradis and M. Zimmerman, 1997, MIT Press.

5. Assessment: based on attendance, individual written report, professional portfolios, and participation in group presentation.