Engineering Faculty Document No. 78-18
September 13, 2018

TO: The Faculty of the College of Engineering

FROM: The Faculty of the Weldon School of Biomedical Engineering

RE: New Graduate Course, BME 55600, Introduction to Clinical Medicine for Engineering Solutions

The faculty of the Weldon School of Biomedical Engineering have approved the following new course. This action is now submitted to the Engineering Faculty with a recommendation for approval.

BME 55600 Introduction to Clinical Medicine for Engineering Solutions
Term Offered: Fall or Spring, Lecture 3, Cr. 3
Prerequisite: None

Description: This course introduces students to the physiology and medicine underlying major human diseases likely to become research targets in biomedical engineering and medical device development. It encourages students to upgrade research target selection to include projects that promise to improve patient care, with a major emphasis on pathophysiology and disease mechanisms. The information and intellectual approach offered will help students recognize needs for engineering solutions to current challenges in medicine.

Reason: This course will have students understanding how to "think like a doctor" in approaching patients and research that is translational in nature. It will highlight the generic clinical care path through prevention, diagnosis, treatment and follow-up. This course will also highlight potential clinical needs, problem areas, research opportunities for selected important human diseases in the fields of cancer, women's health, gastrointestinal and lung diseases. It has been taught as BME 59500 for three terms in 2015, 2016, and 2017 with 30, 26, and 23 students respectively. It was also offered as an online course in 2017 with 15 distance students enrolled. It has also recently been approved to meet the Life Science competency area for our graduate degree for the BME PhD and Master's programs and will be an important course for our Professional Master's students as this course will allow them to take it via distance while they are on internship.

George R. Wodicka

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

Detailed Graduate Course Proposal for Academic Review

To: Purdue University Graduate Council

From: Faculty Member: Charles F. Babbs MD, PhD
Department: Weldon School of Biomedical Engineering
Campus: West Lafayette

Date: September 13, 2018

Subject: Proposal for New Graduate Course BME 55600

Contact for information if questions arise:
Name: Charles F. Babbs
Phone: 494-2995
Email: babbs@purdue.edu
Address: MJIS Building, 206 S. Martin Jischke Drive, West Lafayette, IN 47907-2032

Course Number: BME 55600
Course Title: Introduction to Clinical Medicine for Engineering Solutions
Short Title: Intro to Clinical Medicine

Course Description:

This course introduces students to the physiology and medicine underlying major human diseases likely to become research targets in biomedical engineering and medical device development. It encourages students to upgrade research target selection to include projects that promise to improve patient care, with a major emphasis on pathophysiology and disease mechanisms. The information and intellectual approach offered will help students recognize needs for engineering solutions to current challenges in medicine.

The course also previews the intellectual content of medical school, including rigor and level of detail, for engineering students considering designing medical solutions or translational engineering research as a career, emphasizing the key "11-points" necessary for practical understanding of any disease: definition of the condition, causes, functional abnormalities, structural abnormalities, early signs, history and physical findings, differential diagnosis, special studies (lab, imaging, etc.), treatment strategy, specific steps of treatment, and follow up, as well as current clinical needs for innovation and research opportunities for the future.

To avoid possible redundancy with the Weldon School undergraduate curriculum, focal areas of the course include topics and body systems not covered in BME 25600, including infectious diseases, cardiopulmonary diseases, hematology-oncology, and gastrointestinal diseases.

A. Justification for the Course

Justification of the need for the course

- Key background knowledge for students planning research careers dealing with human disease
- Understanding of how to "think like a doctor" in approaching patients, the generic clinical care path through prevention, diagnosis, treatment, and follow-up
- Highlighting of potential clinical needs, problem areas, research opportunities for selected important human diseases in the fields of cancer, women's' health, gastrointestinal and lung diseases

Justification that course will be taught at a graduate level

- Medical school style and detail in lectures (from an instructor with > 30 years' experience teaching medical students and IU School of Medicine)
- Up-to-date, Web-based sources from National Library of Medicine, Harvard Medical School, Mayo Clinic.
- National board style exams requiring synthesis of concepts and applications to patient care, similar to those in clinical medicine courses for second year medical students at Indiana University School of Medicine
- Continual updating of lecture material using sources such as E-medicine and UpToDate.
- Emphasis on current research and research opportunities in pathophysiology, diagnosis, and treatment of selected diseases

Justification of the demand for the course

- Anticipated enrollment
  - Undergraduate 10
  - Graduate 15

Justification for online delivery

This course has been successfully offered online through Engineering Professional Education (EPE) in the fall semester of 2017. Student feedback was very favorable.

B. Learning Outcomes and Methods of Assessment

Learning Outcomes	Assessment Methods
Describe the pathogenesis of selected diseases, including causes, abnormal anatomy, and abnormal physiology	• National board style, multiple choice exams, administered online for both distance and on-campus students
Describe the diagnosis of selected diseases, including the history, physical findings, laboratory workup, imaging, and special procedures	• National board style, multiple choice exams, administered online for both distance and on-campus students
Describe the treatment for selected diseases, including strategy, specific steps, drugs, surgery, and follow-up	• National board style, multiple choice exams, administered online for both distance and on-campus students

- National board style, multiple choice exams, will be administered online for both distance and on-campus students. These exams are similar to those given in medical school and on national exams taken by medical students for licensing purposes. Unlike typical multiple choice tests given to undergraduate students, these graduate level, objective tests require synthesis of ideas and concepts and practical applications to patient care. Similar exams must be passed by physicians during and after medical school in the United States. They are not trivial and not just memorization of facts. However, this type of assessment tool is ideal for distance and online courses, and proved effective for distance students in the year 2017.

Final Grading Criteria

Describing the criteria that will be used to assess students and how the final grade will be determined. Add and delete rows as needed.

Assessment Methods (should match method types in the previous table)	Weight Toward Final Course Grade
Exams and Quizzes	100 %

Methods of Instruction

Class Hrs/Week	Method of Instruction	Contribution to Outcomes
	Lecture	These lectures simulate medical school content in both style and substance.

C. Prerequisite(s)

- Graduate student status, preferably working on research related to human diseases
- Pre-medical undergraduate students, on considering medical school with genuine interest in learning both the subject matter, the degree of detail, and the rigor of medical school courses relating to human disease.

D. Course Instructor(s)

Name	Rank	School, dept., or center	Graduate Faculty or expected date
Charles F. Babbs, MD, PhD	Continuing Lecturer	BME	Yes

Dr. Babbs holds the M.D. (with honor) and M.S. (anatomy) degrees from Baylor College of Medicine, the Ph.D. in pharmacology from Purdue University, and the B.S. in experimental psychology from Yale University. He has received an NIH Research Career Development Award, and has written over 200 refereed articles and 10 chapters in scholarly journals and textbooks. His works have been cited over 10,000 times according to Google Scholar. His research on interposed abdominal compression CPR (IAC-CPR) has led to a clinically proven, life-saving advance in medical care, which has been incorporated into national and international guidelines for CPR and advanced cardiac life support. As an award winning faculty member at Purdue University from 1975 to the present day and Indiana University School of Medicine, Lafayette from 1978 to 2013 he taught a wide variety of classes including anatomy and physiology, biomedical instrumentation, introduction to clinical medicine, physical diagnosis, biostatistics, histology, pharmacology, pathology, gross anatomy, microbiology, and small group, problem-based learning sessions for medical students and for engineering students. He has been twice selected by graduating seniors as the outstanding professor in basic sciences at Indiana University School of Medicine, Lafayette and has been inducted into Purdue University's Book of Great Teachers.

E. Course Schedule or Outline

Date	Topic
	Infectious diseases
Tues Aug 22	Course introduction and Rocky Mountain Spotted Fever
Thurs Aug 24	Systemic staphylococcal infections
Tues Aug 29	Malaria
Thurs Aug 31	Influenza
Tues Sept 5	Infectious diarrhea (cholera and others)
Thurs Sept 7	Hepatitis
Tues Sept 12	Meningitis
Thurs Sept 14	In class review
Fri Sept 15 to Sun Sept 17	Online Exam 1 (covers infectious diseases) Fri Sept 15, 8 a.m. to Sun Sept 17, 12 p.m. US Eastern time
	Cardiopulmonary diseases
Tues Sept 19	Heart failure
Thurs Sept 21	Pulmonary hypertension
Tues Sept 26	Atrial septal defects
Thurs Sept 28	Respiratory distress syndrome of the newborn
Tues Oct 3	Pneumonias
Thurs Oct 5	In class review
Fri Oct 6 to Sun Oct 8	Online Exam 2 (covers cardiopulmonary diseases) Fri Oct 6, 8 a.m. to Sun Oct 8, 12 p.m. US Eastern time
Tues Oct 10	OCTOBER BREAK
	Cancer
Thurs Oct 12	Skin cancer: basal cell, squamous cell, melanomas
Tues Oct 17	Lymphomas

Thurs Oct 19	Cancer of the urinary tract
Tues Oct 24	Breast cancer
Thurs Oct 26	Cervical cancer
Tues Oct 31	Fibroids
Thurs Nov 2	In class review
Fri Nov 3 to Sun Nov 5	Online Exam 3 (covers cancer) Fri Nov 3, 8 a.m. to Sun Nov 5, 12 p.m. US Eastern time
	Gastrointestinal diseases
Tues Nov 7	Esophageal disease
Thurs Nov 9	Peptic ulcer disease
Tues Nov 14	Cancer of the stomach
Thurs Nov 16	Crohn's disease and ulcerative colitis
Tues Nov 21	Cancer of the colon
Thurs Nov 23	THANKSGIVING
Tues Nov 28	Liver physiology
Thurs Nov 30	Chronic liver disease
Fri Dec 8 to Sun Dec 10	Online Final exam (50% GI, 50% comprehensive) Fri Dec 8, 8 a.m. to Sun Dec 10, 12 p.m. US Eastern time

F. Reading List (including course text)

Primary Reading List

National Library of Medicine medical encyclopedia and dictionary online:

www.nlm.nih.gov/medlineplus/encyclopedia

www.nlm.nih.gov/medlineplus/mplusdictionary

Secondary Reading List

emedicine.medscape.com/

Harvard Medical School Patient Education Center: www.patienteducationcenter.org

Boron WF and Boulpaep EL, Medical Physiology, Elsevier Sanders, 2012 edition available online through Purdue Libraries.

G. Library Resources

Name of journal, proceedings, book, video, or other acquisition	Already in Libraries?
Boron WF and Boulpaep EL, Medical Physiology, Elsevier Sanders, 2012 edition	yes

H. Course Syllabus (now required)

Purdue University

Weldon School of Biomedical Engineering

BME 59500: Introduction to Clinical Medicine

(3 credits, two 1.5 hour classes each week)

Instructor:

Charles F. Babbs, MD, PhD

MJIS 1021G

babbs@purdue.edu

Office Hours: by arrangement, please E-mail

Assistant: Cindy Ferguson, fergusoc@purdue.edu

Class meeting time: Tuesdays, Thursdays 10:30 p.m. – 11:45 a.m.

Meeting Place: MJIS 1083 and online

Objectives:

(1) To introduce students to the physiology and medicine underlying major human diseases likely to become research targets in biomedical engineering and medical device development and to encourage students to upgrade research target selection to projects that promise to improve patient care, with a major emphasis on pathophysiology and disease mechanisms. The information and intellectual approach offered will help students recognize needs for engineering solutions to current challenges in medicine.

(2) To preview the intellectual content of medical school, including rigor and level of detail, for engineering students considering designing medical solutions or translational engineering research as a career, emphasizing the key "11-points" necessary for practical understanding of any disease: definition of the condition, causes, functional abnormalities, structural abnormalities, early signs, history and physical findings, differential diagnosis, special studies (lab, imaging, etc.), treatment strategy, specific steps of treatment, and follow up, as well as current clinical needs for innovation and research opportunities for the future.

Focus: topics and body systems not covered in BME 256, including infectious diseases, cardiopulmonary diseases, hematology-oncology, and gastrointestinal diseases.

Prerequisites: Junior, senior or graduate standing, BME 256 or equivalent course in systems physiology.

Background of instructor: Charles F. Babbs, MD, PhD, combined > 35 years of teaching, research and industrial experience in medicine, applied physiology, and biomedical engineering.

Course climate:

The instructor supports Purdue's commitment to diversity, and welcome individuals of all ages, backgrounds, citizenships, disabilities, education, ethnicities, family statuses, genders, gender identities, geographical locations, languages, military experience, political views, races, religions, sexual orientations, socioeconomic statuses, and work experiences.

Course requirements and assignments:

- Lectures and whole class discussion
- Reading and Web study
- Exams (3 unit examinations plus one final)

Textbooks and Web sources:

National Library of Medicine medical encyclopedia and dictionary online:

www.nlm.nih.gov/medlineplus/encyclopedia

www.nlm.nih.gov/medlineplus/mplusdictionary

emedicine.medscape.com/

Harvard Medical School Patient Education Center: www.patienteducationcenter.org

Boron WF and Boulpaep EL, Medical Physiology, Elsevier Sanders, 2012 edition available online through Purdue Libraries.

Grade composition (subject to change with notice):

- 3 take home, open-book online section exams, 50 points each
- Final take home, open-book exam: 50 points GI, 50 points comprehensive

Grading scale:

90-100% A
80-90% B
70-80% C
60-70% D
0--60% F

Make-up exams:

Given at the discretion of the instructor; format may be different from regular exams. Advance notice, when possible, is highly recommended. Students must adhere to Purdue policy as outlined:
http://www.purdue.edu/usp/acad_policies/attendance.shtml

Attendance policy:
Students are expected to be present for every meeting of the class. Lecture material is unique. Only the instructor can excuse a student from a course requirement or responsibility. When conflicts or absences can be anticipated, such as for many University sponsored activities and religious observations, the student should inform the instructor of the situation as far in advance as possible. For unanticipated or emergency absences when advance notification to an instructor is not possible, the student should contact the instructor as soon as possible by email.

Policy on academic honesty:

Purdue honor pledge. "As a boilermaker pursuing academic excellence, I pledge to be honest and true in all that I do. Accountable together - we are Purdue."
The commitment of the acts of cheating, lying, stealing, and deceit in any of their diverse forms (such as the use of ghostwritten papers, the use of substitutes for taking examinations, the use of illegal cribs, plagiarism, and copying during examinations) is dishonest and must not be tolerated. Moreover, knowingly to aid and abet, directly or indirectly, other parties in committing dishonest acts is in itself dishonest. Note that although exams are open book, online exams, they are individual exams, intended to assess knowledge of each individual student; collaboration on exams is not allowed and is considered cheating.

If an individual behaves in any other manner that is unprofessional or unethical during the semester, the course instructor(s) reserves the right to fail the student for that as well. For more information, see the Purdue University Student Conduct Code at:

http://www.purdue.edu/odos/adminstration/codeconduct.htm.

Emergency statement:

In the event of a major campus emergency, course requirements, deadlines and grading percentages are subject to changes that may be necessitated by a revised semester calendar or other circumstances.

Campus Emergency Response Procedures:

- Fire Alarm – Evacuate the building using the exits on the east side of RM 1087 or 1083 MJIS. Only gather personal items if it does not jeopardize your safety. Assist those who need help, if possible. Proceed to the front lawn of the Burton Morgan Building. 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. Continue to a safe location (typically the lowest level of the building in an area without windows).
- To report an emergency, call 911. To obtain updates regarding an ongoing emergency, sign up for Purdue Alert text messages, view www.purdue.edu/ea.
- There are nearly 300 Emergency Telephones outdoors across campus and in parking garages that connect directly to the PUPD. If you feel threatened or need help, push the button and you will be connected immediately.
- If we hear a fire alarm during class we will immediately suspend class, evacuate the building, and proceed outdoors. Do not use the elevator.
- If we are notified during class of a Shelter in Place requirement for a tornado warning, we will suspend class and shelter in the basement.
- If we are notified during class of a Shelter in Place requirement for a hazardous materials release, or a civil disturbance, including a shooting or other use of weapons, we will suspend class and shelter in the classroom, shutting the door and turning off the lights.
- Please review the Emergency Preparedness website for additional information. http://www.purdue.edu/ehps/emergency_preparedness/index.html

Adaptive programs statement:

Students with disabilities must be registered with Adaptive Programs in the Office of the Dean of Students before classroom accommodations can be provided. If you are eligible for academic accommodations because you have a documented disability that will impact your work in this class, please schedule an appointment with the instructor as soon as possible to discuss your needs.

Tentative calendar for BME 595, Fall 2017

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