RECEIVED
FEB 28 2015
OFFICE OF THE SENATE COUNCIL

1. General Information

1a. Submitted by the College of: ENGINEERING

Date Submitted: 2/25/2014

1b. Department/Division: Department of Biomedical Engineering

1c. Contact Person

Name: Sridhar Sunderam

Email: ssu223@uky.edu

Phone: 859-257-5796

Responsible Faculty ID (if different from Contact)

Name:

Email:

Phone:

1d. Requested Effective Date: Specific Term/Year [1] Fall 2015

1e. Should this course be a UK Core Course? No

2. Designation and Description of Proposed Course

2a. Will this course also be offered through Distance Learning?: No

2b. Prefix and Number: BME 515

2c. Full Title: Modeling of Physiological Systems

2d. Transcript Title: Modeling of Physiological Systems

2e. Cross-listing:

2f. Meeting Patterns

LECTURE: 3

2g. Grading System: Letter (A, B, C, etc.)

2h. Number of credit hours: 3

2i. Is this course repeatable for additional credit? No

If Yes: Maximum number of credit hours:

If Yes: Will this course allow multiple registrations during the same semester?

2j. Course Description for Bulletin: This introductory course in mathematical modeling will teach students how to construct simple and elegant models of biological and physiological processes -- for instance the absorption and elimination of drugs in the human body or the kinetics of tumour growth in tissue -- and to analyze or predict the dynamics of these events by solving the models.

2k. Prerequisites, if any: MA 113, 114, 213, 214, or consent of instructor; familiarity with computer programming

2l. Supplementary Teaching Component:

3. Will this course taught off campus? No

If YES, enter the off campus address:

4. Frequency of Course Offering: Fall,

Will the course be offered every year?: Yes

If No, explain:

5. Are facilities and personnel necessary for the proposed new course available?: Yes

If No, explain:

6. What enrollment (per section per semester) may reasonably be expected?: 20

7. Anticipated Student Demand

Will this course serve students primarily within the degree program?: No

Will it be of interest to a significant number of students outside the degree pgm?: Yes

If Yes, explain: This course will be of interest to students in other engineering disciplines. It may serve as a free or technical elective.

8. Check the category most applicable to this course: Traditional – Offered in Corresponding Departments at Universities Elsewhere,

If No, explain:

9. Course Relationship to Program(s).

a. Is this course part of a proposed new program?: Yes

If YES, name the proposed new program: Minor in Biomedical Engineering

b. Will this course be a new requirement for ANY program?: No

If YES, list affected programs:

10. Information to be Placed on Syllabus.

a. Is the course 400G or 500?: Yes

b. The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if applicable, from **10.a** above) are attached: Yes

Distance Learning Form

Instructor Name:

Instructor Email:

Internet/Web-based: No

Interactive Video: No

Hybrid: No

1.How does this course provide for timely and appropriate interaction between students and faculty and among students? Does the course syllabus conform to University Senate Syllabus Guidelines, specifically the Distance Learning Considerations?

2.How do you ensure that the experience for a DL student is comparable to that of a classroom-based student's experience? Aspects to explore: textbooks, course goals, assessment of student learning outcomes, etc.

3.How is the integrity of student work ensured? Please speak to aspects such as password-protected course portals, proctors for exams at interactive video sites; academic offense policy; etc.

4.Will offering this course via DL result in at least 25% or at least 50% (based on total credit hours required for completion) of a degree program being offered via any form of DL, as defined above?

If yes, which percentage, and which program(s)?

5.How are students taking the course via DL assured of equivalent access to student services, similar to that of a student taking the class in a traditional classroom setting?

6.How do course requirements ensure that students make appropriate use of learning resources?

7.Please explain specifically how access is provided to laboratories, facilities, and equipment appropriate to the course or program.

8.How are students informed of procedures for resolving technical complaints? Does the syllabus list the entities available to offer technical help with the delivery and/or receipt of the course, such as the Information Technology Customer Service Center (http://www.uky.edu/UKIT/)?

9.Will the course be delivered via services available through the Distance Learning Program (DLP) and the Academic Technology Group (ATL)? NO

If no, explain how student enrolled in DL courses are able to use the technology employed, as well as how students will be provided with assistance in using said technology.

10.Does the syllabus contain all the required components? NO

11.I, the instructor of record, have read and understood all of the university-level statements regarding DL.

Instructor Name:

SIGNATURE|PULEO|David A Puleo|BME 515 NEW Dept Review|20140212

SIGNATURE|CHE202|Kimberly W Anderson|BME 515 NEW College Review|20140213

SIGNATURE|PULEO|David A Puleo|BME 515 ZCOURSE_NEW Approval Returned to Dept|20140225

SIGNATURE|PULEO|David A Puleo|BME 515 NEW Dept Review|20140225

SIGNATURE|BJSTOK0|Barbara J Brandenburg|BME 515 NEW College Review|20140909

SIGNATURE|JMETT2|Joanie Ett-Mims|BME 515 NEW Undergrad Council Review|20150203

SIGNATURE|ZNNIKO0|Roshan Nikou|BME 515 NEW Graduate Council Review|20150226

Courses | Request Tracking

New Course Form

https://myuk.uky.edu/sap/bc/soap/rfc?services=

Generate R

Open in full window to print or save

Attachments:

Browse... Upload File

	ID	Attachment
Delete	4357	BME 515 Modeling of Physiological Systems syllabus

First 1 Last

Select saved project to retrieve... Get New

(*denotes required fields)

1. General Information

a. * Submitted by the College of: ENGINEERING Submission Date: 2/25/2014

b. * Department/Division: Department of Biomedical Engineering

c.

* Contact Person Name: Sridhar Sunderam Email: ssu223@uky.edu Phone: 859-257-5796

* Responsible Faculty ID (if different from Contact) Email: Phone:

d. * Requested Effective Date: ○ Semester following approval OR ◉ Specific Term/Year [1] Fall 2015

e.

Should this course be a UK Core Course? ○ Yes ◉ No

If YES, check the areas that apply:

☐ Inquiry - Arts & Creativity	☐ Composition & Communications - II
☐ Inquiry - Humanities	☐ Quantitative Foundations
☐ Inquiry - Nat/Math/Phys Sci	☐ Statistical Inferential Reasoning
☐ Inquiry - Social Sciences	☐ U.S. Citizenship, Community, Diversity
☐ Composition & Communications - I	☐ Global Dynamics

2. Designation and Description of Proposed Course.

a. * Will this course also be offered through Distance Learning? ○ Yes [4] ◉ No

b. * Prefix and Number: BME 515

c. * Full Title: Modeling of Physiological Systems

d. Transcript Title (if full title is more than 40 characters): Modeling of Physiological Systems

e. To be Cross-Listed [2] with (Prefix and Number):

f. * Courses must be described by at least one of the meeting patterns below. Include number of actual contact hours[3] for each meeting pattern type.

3 Lecture	Laboratory[1]	Recitation	Discussion
Indep. Study	Clinical	Colloquium	Practicum
Research	Residency	Seminar	Studio
Other	If Other, Please explain:		

g. * Identify a grading system:

◉ Letter (A, B, C, etc.)
○ Pass/Fail
○ Medicine Numeric Grade (Non-medical students will receive a letter grade)
○ Graduate School Grade Scale

h. * Number of credits: 3

i. * Is this course repeatable for additional credit? ○ Yes ◉ No

If YES: Maximum number of credit hours:

If YES: Will this course allow multiple registrations during the same semester? ○ Yes ○ No

j. * Course Description for Bulletin:

This introductory course in mathematical modeling will teach students how to construct simple and elegant models of biological and physiological processes -- for instance the absorption and elimination of drugs in the human body or the kinetics of tumour growth in tissue -- and to analyze or predict the dynamics of these events by solving the models.

k. Prerequisites, if any:

MA 113, 114, 213, 214, or consent of instructor; familiarity with computer programming

l. Supplementary teaching component, if any: ○ Community-Based Experience ○ Service Learning ○ Both

3. * **Will this course be taught off campus?** ○ Yes ◉ No

If YES, enter the off campus address:

4. **Frequency of Course Offering.**

a. * Course will be offered (check all that apply): ☑ Fall ☐ Spring ☐ Summer ☐ Winter

b. * Will the course be offered every year? ◉ Yes ○ No

If No, explain:

5. * **Are facilities and personnel necessary for the proposed new course available?** ◉ Yes ○ No

If No, explain:

6. * **What enrollment (per section per semester) may reasonably be expected?** 20

7. **Anticipated Student Demand.**

a. * Will this course serve students primarily within the degree program? ○ Yes ◉ No

b. * Will it be of interest to a significant number of students outside the degree pgm? ◉ Yes ○ No

If YES, explain:

This course will be of interest to students in other engineering disciplines. It may serve as a free or technical elective.

8. * **Check the category most applicable to this course:**

☑ Traditional – Offered in Corresponding Departments at Universities Elsewhere
☐ Relatively New – Now Being Widely Established
☐ Not Yet Found in Many (or Any) Other Universities

9. **Course Relationship to Program(s).**

a. * Is this course part of a proposed new program? ◉ Yes ○ No

If YES, name the proposed new program:

Minor in Biomedical Engineering

b. * Will this course be a new requirement [5] for ANY program? ○ Yes ◉ No

If YES [5], list affected programs::

10. **Information to be Placed on Syllabus.**

a. * Is the course 400G or 500? ◉ Yes ○ No
If YES, the *differentiation for undergraduate and graduate students must be included* in the information required in **10.b**. You must include: (i) ident additional assignments by the graduate students; and/or (ii) establishment of different grading criteria in the course for graduate students. (See SR

b. ☑ * The syllabus, including course description, student learning outcomes, and grading policies (and 400G-/500-level grading differentiation if appl **10.a** above) are attached.

[1] Courses are typically made effective for the semester following approval. No course will be made effective until all approvals are received.
[2] The chair of the cross-listing department must sign off on the Signature Routing Log.

[12] In general, undergraduate courses are developed on the principle that one semester hour of credit represents one hour of classroom meeting per week for a semester, exclusive of any laboratory meeting. Laboratory meeting, generally, re two hours per week for a semester for one credit hour. (from SR 5.2.1)
[13] You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.
[14] In order to change a program, a program change form must also be submitted.

Rev 8/09

Submit as New Proposal Save Current Changes

BME 515

Modeling of Physiological Systems

Fall 2015, University of Kentucky

Course Description:

This introductory course in mathematical modeling will teach students how to construct simple and elegant models of biological and physiological processes -- for instance the absorption and elimination of drugs in the human body or the kinetics of tumour growth in tissue -- and to analyze or predict the dynamics of these events by solving the models.

Curriculum:

Birth and death processes in biology, continuous processes, ordinary differential equations, first and second order systems, kinetic models, physiological transport processes, compartmental models, nonlinear systems, analysis of equilibria and stability using linearization and phase plane techniques, dynamics of excitable tissue.

Prerequisites:

Proficiency in calculus as demonstrated by a calculus sequence MA 113, 114, 213, 214, or consent of the instructor. Some familiarity with computer programming (MATLAB in particular) which is typically acquired in any undergraduate science or engineering curriculum, is desirable.

Learning Outcomes:

After completion of this course, students will be able to:

1. Formulate compartmental models of basic physiological systems using balance equations.

2. Explain the difference between linear and nonlinear systems.

3. Analyze model dynamics in terms of their equilibria, stability, and eigenvalues.

4. Simulate and predict the behavior of simple nonlinear second order systems on a phase plane.

5. Describe the dynamics of excitable tissue and explain why oscillatory behavior is observed in neurons and muscle fibers.

Required Materials:

Textbook: Mathematical Models in Biology by Leah Edelstein-Keshet, SIAM 2005.

Suggested reference: Introduction to Biomedical Engineering by Enderle and Bronzino, 3rd Ed, 2013. Instructor may provide links to other relevant material on Blackboard or the public domain as needed.

Class Meetings:

Aug-Dec, 2015

TR 9:30 - 10:45 a.m.

Classroom: TBD

Office hours: TR 11 a.m.-12 or by appointment

Instructor:

Sridhar Sunderam, Ph.D.

514B Robotics & Mfg. Building,

E-mail: ssu223@uky.edu (preferred)

Phone: (859) 257-5796

Course Policies:

Professional behavior is expected in the classroom. ***Class attendance is strongly encouraged.***

Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/Registrar/AcademicCalendar.htm). One exam will be given during the semester and one (comprehensive) during finals week.

If needed, one comprehensive make-up exam will be given to students with excused absences. The instructor must be notified of anticipated absences well in advance. The make-up exam time will be scheduled as needed.

The relative value of various course assessments in the final grade will be: Mid-term = 30%; Final = 25%; Project = 25%; Homework = 20%. **For all students, an in-class project presentation is required and will constitute 25% of the project grade for undergraduates; graduate students are expected to perform at a higher level and their oral presentation will count for 40% of the project grade). Likewise, some advanced topics/problems in the homework will be required for graduate students only.** Assessment scores will be totaled to arrive at the final grade using the standard grading scale: A=90-100%; B=80-89%; C=70-79%; D=60-69%; E=below 60% for undergaduate students, and A=90-100%; B=80-89%; C=70-79%; E=below 70% for graduate students. If warranted, a curve based on the distribution of final scores may be applied to adjust final grades, **separately for undergraduate and graduate students**. If used, the curve will make only small adjustments based on the statistical distribution of overall scores. Scores grouped near the top will get As, the next major grouping gets Bs, etc. If anything, the curve will only raise a 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.

Excused Absences and Verification:

Students need to notify the professor of absences prior to class when possible. S.R. 5.2.4.2 defines the following as acceptable reasons for excused absences: (a) serious illness, (b) illness or death of family member, (c) University-related trips, (d) major religious holidays, and (e) other circumstances found to fit "reasonable cause for nonattendance" by the professor.

Students anticipating an absence for a major religious holiday are responsible for notifying the instructor in writing of anticipated absences due to their observance of such holidays no later than the last day in the semester to add a class. Information regarding dates of major religious holidays may be obtained through the religious liaison, Mr. Jake Karnes (859-257-2754).

Students are expected to withdraw from the class if more than 20% of the classes scheduled for the semester are missed (excused or unexcused) per university policy.

Students may be asked to verify their absences in order for them to be considered excused. Senate Rule 5.2.4.2 states that faculty have the right to request "appropriate verification" when students claim an excused absence because of illness or death in the family. Appropriate notification of absences due to university-related trips is required prior to the absence.

Academic Integrity, Cheating, and Plagiarism:

Per university policy, students shall not plagiarize, cheat, or falsify or misuse academic records. Students are expected to adhere to University policy on cheating and plagiarism in all courses. The minimum penalty for a first offense is a zero on the assignment on which the offense occurred. If the offense is considered severe or the student has other academic offenses on their

record, more serious penalties, up to suspension from the university may be imposed.

Plagiarism and cheating are serious breaches of academic conduct. Each student is advised to become familiar with the various forms of academic dishonesty as explained in the Code of Student Rights and Responsibilities. Complete information can be found at the following website: http://www.uky.edu/Ombud. A plea of ignorance is not acceptable as a defense against the charge of academic dishonesty. It is important that you review this information as all ideas borrowed from others need to be properly credited. Part II of *Student Rights and Responsibilities* (available online http://www.uky.edu/StudentAffairs/Code/part2.html) states that all academic work, written or otherwise, submitted by students to their instructors or other academic supervisors, is expected to be the result of their own thought, research, or self-expression. In cases where students feel unsure about the question of plagiarism involving their own work, they are obliged to consult their instructors on the matter before submission.

When students submit work purporting to be their own, but which in any way borrows ideas, organization, wording or anything else from another source without appropriate acknowledgement of the fact, the students are guilty of plagiarism. Plagiarism includes reproducing someone else's work, whether it be a published article, chapter of a book, a paper from a friend or some file, or something similar to this. Plagiarism also includes the practice of employing or allowing another person to alter or revise the work which a student submits as his/her own, whoever that other person may be.

Students may discuss assignments among themselves or with an instructor or tutor, but when the actual work is done, it must be done by the student, and the student alone. When a student's assignment involves research in outside sources of information, the student must carefully acknowledge exactly what, where and how he/she employed them. If the words of someone else are used, the student must put quotation marks around the passage in question and add an appropriate indication of its origin. Making simple changes while leaving the organization, content and phraseology intact is plagiaristic. However, nothing in these Rules shall apply to those ideas which are so generally and freely circulated as to be a part of the public domain (Section 6.3.1). **Please note:** Any assignment you turn in may be submitted to an electronic database to check for plagiarism.

Accommodations due to disability:

If you have a documented disability that requires academic accommodations, please see me as soon as possible. In order to receive accommodations in this course, you must provide me with a Letter of Accommodation from the Disability Resource Center (Room 2, Alumni Gym, 257-2754, email address: jkarnes@email.uky.edu) for coordination of campus disability services available to students with disabilities. We can then collaborate on the best solution.

Classroom Behavior, Decorum, and Civility:

Please be respectful to others in the class and engage in civil discourse when we discuss topics that have a diversity of perspectives. Please minimize distractions by not reading newspapers or carrying on conversations. Turn mobile phones off during class. Please help me maintain the most courteous environment by using a little peer pressure if necessary. Thank you.

Tentative Course Schedule:

DATE	TOPIC	DATE	TOPIC
Aug 27	0. Overview	Oct 22	6. Nonlinear systems and stability
Sep 1	1. Birth/death processes in biology	Oct 27	""
Sep 3	""	Oct 29	""
Sep 8	2. Ordinary differential equations	Nov 3	""
Sep 10	""	Nov 5	""
Sep 15	""	Nov 10	7. Dynamics of excitable tissue
Sep 17	3. Kinetic models	Nov 12	""
Sep 22	""	Nov 17	""
Sep 24	4. Physiological transport processes	Nov 19	[Term projects due]
Sep 29	""	Nov 24	[Students present]
Oct 1	5. Compartmental models	Nov 26	[Thanksgiving Break]
Oct 6	""	Dec 1	[Students present]
Oct 8	""	Dec 3	""
Oct 13	""	Dec 8	""
Oct 15	[Pre-exam, assign term project]	Dec 10	Recap, course evaluation
Oct 20	[Mid-term exam]	Dec 15	Final exam: 8-10 a.m.