UNIVERSITY OF KENTUCKY

New Course Report

4/27/2015 12:40:58 PM

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OFFICE OF THE SENATE COUNCIL

1. General Information

1a. Submitted by the College of: ENGINEERING

Date Submitted: 4/27/2015

1b. Department/Division: Department of Biomedical Engineering

1c. Contact Person

Name: Abhijit Patwardhan

Email: abhijit@uky.edu

Phone: 859-257-2728

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 405

2c. Full Title: Introduction to Biomedical Signal Processing

2d. Transcript Title: Introduction to Biomedical Signal Processing

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: Study of continuous and discrete signal concepts, sampling of analog signals, domain transformation (Fourier, LaPlace, Z- Transforms), and introduction to correlation and power spectrum. Characteristics and design of analog and digital filters. Features of biological signals and systems and biomedical applications. Introduction to non-linear systems.

2k. Prerequisites, if any: EE 305 or equivalent and MA 214; or consent of instructor

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?: 8-10

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 engineer disciplines. It may be able to 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?: No

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 405 NEW Dept Review|20140212

SIGNATURE|PULEO|David A Puleo|BME 405 NEW Dept Review|20140212

SIGNATURE|BJSTOK0|Barbara J Brandenburg|BME 405 NEW College Review|20140909

SIGNATURE|JMETT2|Joanie Ett-Mims|BME 405 NEW Undergrad Council Review|20150427

New Course Form

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

Open in full window to print or save

Generate R

Attachments:

Browse... Upload File

	ID	Attachment
Delete	3694	BME 405 UGC Review Checklist.docx
Delete	4930	sylabus BME 405 April 2015 modification.pdf

First 1 Last

(*denotes required fields)

1. General Information

a. * Submitted by the College of: ENGINEERING Submission Date: 4/27/2015

b. * Department/Division: Department of Biomedical Engineering

c.

* Contact Person Name: Abhijit Patwardhan Email: abhijit@uky.edu Phone: 859-257-2728

* 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 405

c. * Full Title: Introduction to Biomedical Signal Processing

d. Transcript Title (if full title is more than 40 characters): Introduction to Biomedical Signal Processing

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:

Study of continuous and discrete signal concepts, sampling of analog signals, domain transformation (Fourier, LaPlace, Z- Transforms), and introduction to correlation and power spectrum. Characteristics and design of analog and digital filters. Features of biological signals and systems and biomedical applications. Introduction to non-linear systems.

k. Prerequisites, if any:

EE 305 or equivalent and MA 214; or consent of instructor

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?** 8-10

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 engineer disciplines. It may be able to 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) identi 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.

[4] 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)
[5] You must also submit the Distance Learning Form in order for the proposed course to be considered for DL delivery.
[6] In order to change a program, a program change form must also be submitted.

Rev 8/09

Course: BME 405 **University Senate Syllabi Guidelines Review Checklist**

General Course Information

- ☒ Full and accurate title of the course
- ☐ Departmental and college prefix
- ☒ Course prefix, number and section number
- ☒ Scheduled meeting day(s), time and place

Instructor Contact Information (if specific details are unknown, "TBA" is acceptable for one or more fields)

- ☒ Instructor name
- ☐ Contact information for teaching/graduate assistant, etc.
- ☐ Preferred method for reaching instructor
- ☒ Office phone number
- ☒ Office address
- ☒ UK email address
- ☒ Times of regularly scheduled office hours and if prior appointment is required

Course Description

- ☒ Reasonably detailed overview of the course
- ☒ Student learning outcomes
- ☒ Course goals/objectives
- ☒ Required materials (textbook, lab materials, etc.)
- ☐ Outline of the content, which must conform to the Bulletin description
- ☒ Summary description of the components that contribute to the determination of course grade
- ☐ Tentative course schedule that clarifies topics, specifies assignment due dates, examination date(s)
- ☒ Final examination information: date, time, duration and location
- ☐ For 100-, 200-, 300-, 400-, 400G- and 500-level courses, numerical grading scale and relationship to letter grades for undergraduate students
- ☐ For 400G-, 500-, 600- and 700-level courses, numerical grading scale and relationship to letter grades for graduate students. (Graduate students cannot receive a "D" grade.)
- ☒ Relative value given to each activity in the calculation of course grades (Midterm=30%; Term Project=20%, etc.)
- ☒ Note that undergraduate students will be provided with a Midterm Evaluation (by the midterm date) of course performance based on criteria in syllabus
- ☒ Policy on academic accommodations due to disability. Standard language is below:

  If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. 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.

Course Policies

- ☒ Attendance
- ☒ Excused absences
- ☒ Make-up opportunities
- ☒ Verification of absences
- ☐ Submission of assignments
- ☒ Academic integrity, cheating & plagiarism
- ☒ Classroom behavior, decorum and civility
- ☐ Professional preparations
- ☐ Group work & student collaboration

UGE Review (9/15/14)

- Revise course schedule to include tentative assignments and due dates.

Committee Review ( )

Comments

BME 405 Introduction to Biomedical Signal Processing
Syllabus
Fall 2014

Time: Tuesday, Thursday 2:00 P.M. - 3:15 P.M.
Location: Wenner-Gren Research Laboratory (WGRL) # 19.

Instructor: Abhijit Patwardhan. Professor, Department of Biomedical Engineering.
WGRL # 2. Tel: 859 257 2728. e-mail: abhijit@uky.edu

Office hours: Monday, Wednesday 1:00 p.m. - 2:15 p.m., or by appointment. WGRL # 2

Course description

Study of continuous and discrete signal concepts, sampling of analog signals, domain transformation (Fourier, LaPlace, Z- Transforms), and introduction to correlation and power spectrum. Characteristics and design of analog and digital filters. Features of biological signals and systems and biomedical applications. Introduction to non-linear systems.

Prerequisites: EE 305 or equivalent and MA 214; or consent of instructor.

Learning Outcomes

After completing this course successfully, a student should be able to:

1) Describe and explain the advantages of transforming signals using orthogonal basis functions.
2) Interpret a signal in the frequency domain.
3) Describe and explain the link between time and frequency domain for discrete signals.
4) Describe the sources and characteristics of commonly encountered biomedical signals.
5) Apply all of the items above in designing filters to selectively modify signals.
6) Describe and explain the use of the items above in biomedical applications.

Grading

Homework	10 %
Quizzes	35 %
First examination	25 %
Final examination	30 %

Points in each category will be totaled and weighted as described above to arrive at a final grade using the standard grading scale as follows.

Grading Scale

90-100% A
80-89% B
70-79% C
60-69% D
50-59% E

If warranted, a curve based on the distribution of final scores may be applied to adjust final grades. If used, the curve will make adjustments based on the statistical distribution of overall scores. Scores grouped near the top will receive As, the next major grouping gets Bs, etc. If a curve is applied it will be such that the cutoffs will be lowered and not raised, e.g. the lower cutoff for letter grade A may be lower than 90% but will not be higher.

Examinations:

Two closed book examinations will be given. The first exam will be on October 22, 2015 at 2 pm and the final exam will be scheduled at the time given in the academic calendar.

Quizzes:
There will be several quizzes in class. The quizzes will be un-announced. Only for those quizzes missed due to excused absences a makeup quiz will be provided. Please refer to the university policy to determine what constitutes an excused absence.

Homework Assignments:
A limited number of homework assignments will be used to supplement content covered during class. They are an opportunity for students to assess their understanding of basic concepts at relatively little risk to their final grade. Although discussion of homework questions is permissible, students are required to independently write their solutions. Assignments are due at the beginning of class. Late assignments will be penalized 10%/day.

Textbook
Recommended:
Eugene Bruce. Biomedical Signal Processing and Signal Modeling. John Wiley & Sons, 2001.

Mid-term Grade
Mid-term grades will be posted in myUK by the deadline established in the Academic Calendar (http://www.uky.edu/Registrar/AcademicCalendar.htm).

Attendance Policy
Regular attendance at class meetings is strongly encouraged, because students will be held responsible for all material presented in class (in addition to the text readings, any handouts, etc.). The instructor reserves the right to record the class roll if attendance becomes an issue. If one or more classes are missed by a student for non-excused absence then the instructor will not provide to the student notes/handouts for the missed classes. Class attendance will not factor in the final grade.

Make-up Policy
If needed, make-up exams will be given to students with excused absences. The instructor must be notified of anticipated absences in advance. The make-up exam time will be scheduled as needed. Makeup quizzes will be provided and late homework assignments will be accepted when there is an excused absence.

Excused Absences
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.

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.

Verification of Absences
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

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 (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 plagiarism.

Written assignments you turn in may be submitted to SafeAssign via Blackboard for comparison with a collection of other previously submitted works and those available on public web sites.

Accommodations Due to Disability

If you have a documented disability that requires academic accommodations, please see me as soon as possible during scheduled office hours. 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.

Classroom Behavior

Please assist in creating a good learning environment free of distractions. Use of cell phones, including text messaging, is not permitted during class.

Course outline and approximate timeline ***approximate emphasis***

Week 1: Objective in signal processing 5 %
What are we looking for? Is the signal informative?
Features of biomedical signals, perception of "frequency"

Week 2-3: Sources of observed signals Systems that generate signals, proportional response Linear and non-linear systems, convolution, impulse response	10 %
Week 4-6: Change of domain Transformation of domain, orthogonal decomposition, Fourier and LaPlace transforms.	20 %
Week 7-10: Discrete time and digital signals Recovering information from digital samples Sampling theorem, digital Fourier transform, Z transform.	25 %
Week 11-14: Input-Output relationship Separation and modification of signals, e.g. EMG and ECG Transfer functions and frequency response, filter design.	20 %
Week 15: Correlation and spectrum Applications in areas of cardiovascular regulation and bio-photonics.	10 %
Week 16: Time-frequency analysis Tracking changes in signals. Short time Fourier transform, complex demodulation.	10 %