College Curriculum Proposal Approval and Routing Form

TITLE OF PROPOSAL: Biomechanics & Neural Control

Originating Faculty: Tirthabir Biswas

Department/College: Physics/CAS Chairperson: Armin Kargol

Contact Phone/Email: tbiswas@loyno.edu

Type of Proposal (Check all that apply):

New Major[1]_____ New Minor___ New Concentration _____ Revise Existing Program_____

New Course____x___ Change to Existing Course _____ Discontinue Program

Undergraduate __x_ Graduate ___ Online ___ Professional & Cont. Studies ___ Other _____

1. **Resources and Fees:**
   If this is a proposed revision, are there existing fees? No___x___ Yes_____ $_____
   Will course or program fees be required for this course/program? No___x___ Yes_____ $_____
   Are new resources needed for implementing this proposal? No___x___ Yes_____
   If yes, include complete description and dollar amount in proposal.

2. **College Review and Approvals:**

   a. Department/School_____ (Chair) Date: _____
      Approved _____ Not Approved _____

   b. College Curriculum Committee_____(Chair) Date: _____
      Approved _____ Not Approved _____

   c. College Dean _____Date: _____
      Supported _____ Not Supported _____

3. **Intercollegiate Review and Recommendations Required as applicable to proposal:**

   a. Online Education Committee_____(Chair) Date:_____

      Recommended _____ Not Recommended _____

   b. Professional and Continuing Studies Committee_____ (Chair) Date:_____
      Recommended _____ Not Recommended _____

   c. Graduate Council _____(Chair) Date: _____
      Recommended _____ Not Recommended _____

4. **University[2] Recommendations Required as applicable to proposal:**

   a. University Courses & Curriculum Committee_____(Chair) Date: _____

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[1] New Degree to be Offered---**Requires SACS Notification 6 Months Prior to Start**

2 Approval by the Strategic Planning Team, University Budget Committee, and/or Board of Trustees may be required for proposals that have significant impact on resources or mission. Proposals to establish or discontinue degree programs require approval by Board of Trustees and SACS.

Recommended _____ Not Recommended _____

b. Standing Council for Academic Planning _____(Chair) Date: _____
Recommended _____ Not Recommended _____

COLLEGE COURSE PROPOSAL FORM

Instructions: Use this form for new college course proposals and substantial course revisions.

Department/College: Physics/CAS

Chairperson: Armin Kargol

Course Title: Biomechanics and Neural Control
Course Number: P H Y S - A 3 6 5

Term: x Fall x Spring ___ Summer Credit Hours: 3 Major ___ Required x Elective

Effective Term S'17 Course I.D. (SUBJ-LEVL) PHYS A365 Contact Hours 3

Grade Type (Normal or Pass/Fail) Maximum Capacity 30

Activity Type (LEC, STU, LAB, LLB...)

Inter-disciplinary Classification (s) _____

Common Curriculum Classification (s) _____

Pre-requisites/Registration Controls:

PHYSA102, MATHA258

New Resources and Fees

c. If this is a revised course, was there a course fee? Yes_____ $_____
   No___x___

d. Will a course fee be required for this course? Yes_____ $_____
   No___x___

e. Are new resources needed for implementing this course? Yes_____ No_____
   If yes, provide descriptions and dollar amounts in Section V.

Course Description: (maximum 350 spaces)

This course will introduce students to biomechanics and the underlying neuromuscular control. The course will start by introducing the students to Mechanics and theoretical and numerical techniques needed to analyze biomechanical system. The student will then learn some basic

anatomical concepts and muscle properties to enable modeling biomechanical system. The course will discuss terrestrial locomotion in some details before moving to neural control. The students will learn basics of neural circuitry and how periodic neural activation can facilitate locomotion. The course will end with a numerical project.

Complete the following sections:

I. Justification for the course: provide a clear and compelling rationale for any proposed curriculum modification, including additions and deletions to the course inventory, changes in degree/program requirement, new degree programs, and other major curriculum revisions. The justification should state explicitly and clearly how the changes relate to the college and department plans.

Physics program offers five different tracks requiring a number (1-3) of Advanced Physics Elective (APE) courses. These are courses that introduce students to more advanced topics in specific areas of physics and complement the more foundational required courses in the physics curriculum. In the Department we have developed a number of APE courses which are currently offered one a semester on a rotating basis in 2-3 year cycle. The proposed course will add a new choice to our selection of Advanced Electives. It will give students an in-depth introduction to biomechanics and its neuromuscular control. This is a new and rapidly growing area of basic and applied research and will help students in careers in medical physics and biomedical engineering. This course is also a part of the proposed program change converting the existing Pre-Health Physics (PHYP) major into a Biophysics/Pre-Health major. For Biophysics/Pre-Health students the course will be one of the required advanced biophysics courses. According to the program proposal the students will be required to take at least two out of three advanced biophysics courses: Cellular Biophysics (PHYS A436 – existing), Biomechanics and Neural Control (proposed), and Artificial Intelligence (proposed). These three courses will have an interesting synergy exposing students to physical basis of biological control systems at different levels, from molecular level through complex systems. The courses are also closely related to the research programs of our faculty members (Dr. Kargol in Cell Biophysics, Dr. Biswas in Biomechanics, and Dr. Rousseau in Robotics and Artificial Intelligence) and will prepare students for collaborative research which is one of the cornerstones of Loyola's QEP.

II. Impact on the Curriculum:
   A. Review your current course offerings and requirements in light of the proposed change. How will the proposed change or changes improve your program and enhance the educational outcomes you seek to accomplish?

This course impacts our curriculum in two areas. For students in existing PHYS or PHYL tracks it will add to the inventory of Advanced Physics Elective courses and improve the choice of courses offered to our students. It will expose the students to a new, rapidly developing field in physics and biomedical engineering.
This course is also important to the proposed programmatic change. For the students in the proposed Biophysics/Pre-Health track (which will replace the existing PHYP track) it will be part of the selection of advanced biophysics courses. Student will elect two out of three courses, as explained in sec. I

   B. How will proposed change impact the major/adjunct/elective hour distribution

requirement for the major or program?

The course will not change any requirements for the existing PHYS, PHYL, PHYE or PHYT tracks. It will add to our inventory of advanced physics electives offered to students one a semester on a rotating basis. This course is a part of the proposed conversion of the PHYP track into Biophysics/Pre-Health and the hour distribution for the new major is described in the Program Proposal.

III. Impact of a new course on frequency of course offerings:

A. Specify whether or not the offering of the new course will increase the number of courses or sections offered by the department during the semester in which this course is offered or during the following year;

The advanced physics elective courses are taught on a rotating basis. The frequency that they are offered depends on the demand and interest of the students and the availability and interest of the faculty. The addition of this course will have no impact on the frequency of offerings of required major courses, adjunct courses or common curriculum courses in the physics department. This course will not increase the number of courses or sections offered by the department during any given semester.

B. Specify, if there is no increase in the number of courses offered, which course(s) or section(s) will be dropped in a given semester to accommodate the frequency with which this course will be offered;

This elective course will be offered on a rotating basis with other elective courses in the department, typically in a 3-year cycle.

C. Specify what effect the new course will have on enrollments in other courses or sections within the department and whether or not offering this course will prevent an important or required course from being offered in a given semester.

This course will have no effect on enrollments in other courses or sections within the department and will not prevent any important or required course from being offered in a given semester.

D. Is there a service learning component? If yes, please attach a memo from the director of service learning describing this component.

There is no service learning component to this course.

E. Explain how this proposal does or does not impact other departments, especially those serviced by your department or program and those that provide adjunct service to your department or program.

Students in other science majors who are completing a minor in physics will be able to take this course to fulfill their physics elective requirement. This course may be especially attractive to biology students.

F. Attach a complete functional syllabus for the course as outlined in the Syllabus

Syllabus is attached at the end of this document

IV. **Attach a detailed plan for assessment of the proposed course that includes the following elements**:

A. Student learning outcomes for this course that are tied to course content and assignments. Key Question: What do you want student to know or be able to do at the end of this course?

- **Students will have a basic understanding of the principles of biomechanics.**
- **Students will have a basic understanding of the muscle dynamics and neural circuitry.**
- **Students will learn how to build models, create differential equations based on fundamental physical principles.**
- **Students will learn numerical techniques and how to apply them to address a research question.**

B. Methods, tools, instruments that will be employed to measure success. Describe methods for measuring inputs and outputs. Key Question: What the indicators of learning and course effectiveness?

Assessment will be based on

- **problem-solving homework assignments – these are directly connected to the learning outcomes listed in Sec IV A**
- **written exams**
- **a research project on a topic chosen jointly between the student and instructor resulting in a powerpoint presentation to the class**

C. Criteria that will be used to measure accomplishments or outcomes. Key Question: How will we know that we are having a positive impact on our students' learning?

Evaluation of all the assessment results will tell us whether or not the students have achieved the learning outcomes for IV A. Individual assessments will be directly linked to those outcomes.

D. Frequency and schedule of assessment of student learning in this course.

There will be weekly homework assignments, two tests during the semester and a final exam. There will be one project with a presentation during the semester

E. Describe mechanisms that will be in place to ensure continuous improvement of course.

The assessment results feed back to changes in elements of the course – reinforcing those that work and changing/eliminating those that don't.

F. Structure and process for administrative and academic oversight of course.

Course instructor is responsible for the structure and content of the course, and reports to the Department Chair

G. Impact of course on accreditation or certification.

N/A

V. Impact on the budget:

A. Staffing. Is current staffing sufficient or will new faculty be needed (whether full-time or part-time)?

No additional staffing is required for this course

B. Library Support. Describe how library support will be affected by this proposal. Include name of library liaison and date this proposal was discussed with liaison.

No additional library support is needed.

C. Support services. Will the proposed change require additional support services (Media Services audio/visual: typing/secretarial, computer services, computer time)?

No additional support services are needed.

D. New equipment. Does the proposed change presuppose the purchase of new equipment or software, whether for support or instruction?

No new equipment is required for the course

E. Is a student fee requested? If yes, provide justification and basis for amount.

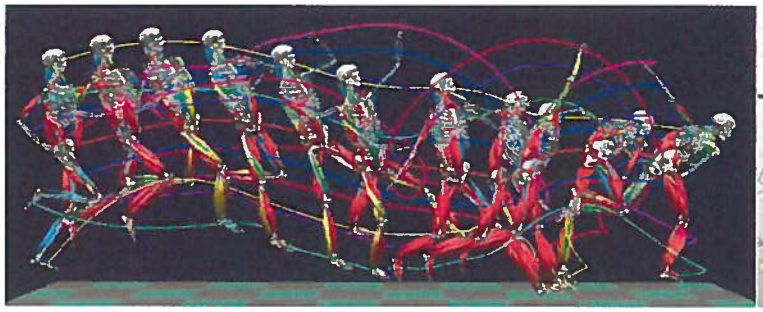
No student fee is requested

F. Additional physical space. Does the proposed change require additional physical space (for classes or labs) or modifications of existing physical plant space?

No additional physics space is needed

G. Impact on other departments. How will the proposed change impact the staffing, equipment, and service budgets of other departments?

There is no impact on other departments.




BioMechanics & Neural Control

Syllabus

PHYS-A494-001

Instructor: Tirtho Biswas

- Email addresses: tbiswas@loyno.edu
- Office: MO 261
- Phone: 3641
- Office Hours: TBA

BOOKS:

- Text: Ronald L. Huston, "Fundamentals of Biomechanics", CRC Press
- Supplementary: Winter & Crago (Editors), "Biomechanics and neural control of posture and movement", Springer

COURSE DESCRIPTION: This course will introduce students to biomechanics and the underlying

neuromuscular control. The course will start by introducing the students to Mechanics and theoretical and numerical techniques needed to analyze biomechanical system. The student will then learn some basic anatomical concepts and muscle properties to enable modeling biomechanical system. The course will discuss terrestrial locomotion in some details before moving to neural control. The students will learn basics of neural circuitry and how periodic neural activation can facilitate locomotion. The course will end with a numerical project.

COURSE LEARNING OBJECTIVES:

- Learn biomechanical modeling and neuromuscular dynamics.
- Learn different mathematical techniques and general physical principles/approaches that physicists use to tackle complex real world problems.
- Acquire programming skills that are imperative to conducting research in physics and engineering.
- Acquire effective skills in collaborating, communicating and presenting

COURSE COMPONENTS:

- **READING ASSIGNMENT:** From time to time I will assign reading assignments which will be followed by a simple quiz.
- **TUTORIALS:** Efforts will be made to have as many tutorials as possible where the students will solve problems in groups. Each group will be required to submit one response, grading will be mostly based on participation. I may schedule a couple of extended lectures to help with the tutorials. Extra credits will be given for all these extra classes/extensions.
- **ASSIGNMENTS:** Approximately, there will be one assignment every week that will be available on Bb. The due dates will be announced in the assignments.
- **PROJECT PRESENTATION:** TBA
- **INTERIM TESTS & FINALS:** Test syllabus and other details will be discussed in class as the test approaches. The test schedule (subject to change) is as follows:
    - 1st Test:
    - 2nd Test:
    - Finals:

E-MAIL AND WEB ACCESS: All students are required to regularly access and use their **loyno** email accounts. Email is the preferred method of communication in this class. All class materials (announcements, syllabus, lecture slides, grades) will be posted on Blackboard.

GRADING:

Reading Quizzes	5 pts
Assignments	20
Tutorials	5

Last Updated: 09/29/16

Mid Term Exams	15x2 = 30	
Project & Presentation		20
Finals		20
Total points		**100**

GRADE DISTRIBUTION:

A	≥85%
A-	≥82% but < 85%
B+	≥78% but < 82%
B	≥75% but < 78%
B-	≥72% but < 75%
C+	≥68% but < 72%
C	≥65% but < 68%
C-	≥62% but < 65%
D+	≥58% but < 62%
D	≥55% but < 58%
F	< 55%

ATTENDANCE POLICY:

Lecture classes are cell phone free zones – please switch your phones off and do not handle cell phones during class. If you do, you will be considered absent.

STUDENTS WITH DISABILITIES: If you have a disability and wish to receive accommodations, please contact the University's Disability Services at 865-2990 (Academic Resource Center, Marquette Hall, Room 112). If you are eligible to receive test accommodations (e.g., extended test time) through the Academic

Resource Center, you will need to give the course instructor an official Accommodation Form from Disability Services. For more information regarding disability services, please see http://www.loyno.edu/arc/disability-services

EMERGENCIES: In case of emergencies, announcements will be made as possible through the instructor via Blackboard (http://loyno.blackboard.com) and/or your loyno.edu email address. You also should check the Loyola University New Orleans homepage on the internet (www.loyno.edu). Should an emergency or an evacuation cause disruption of regular classes, instruction may continue via Blackboard. The course of action will be announced by the instructor in coordination with the University.

It is each student's responsibility to check your loyno.edu email and assignments on blackboard **within 48 hours** of an evacuation. **The Semester may be extended if it is necessary to make up class days due to emergency university closings.**

ACADEMIC INTEGRITY: I take very seriously any form of academic dishonesty, including cheating, plagiarism, or presenting work as your own when it isn't. The policy of Loyola University on plagiarism, misrepresentation and cheating is explained in the *Loyola University New Orleans Undergraduate Bulletin*, (see Academic Regulations, section on Integrity of Scholarship and Grades). You also may find the information at the Loyola WAC lab web site useful in understanding what is or is not plagiarism (http://loyno.edu/wac/handouts-and-helpful-links). A university operates based on trust and honesty. We, the course instructors, trust that you will do your work honestly and you, the students, should trust that we will evaluate your work honestly. It is the responsibility of each student to understand Loyola's policy. It is the policy of the instructor to enforce this policy vigorously. I encourage a certain amount of discussion among students, but in physics you really don't understand a concept and how to apply it unless you start solving problems on your own. Please keep that in mind when you study together.