

COLLEGE COURSE PROPOSAL FORM

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

Department/College: Physics/College of Arts and Sciences

Chairperson: Armin Kargol

Course Title: Gravitational Wave Physics

(Limit 28 Characters or Less)

Course Number: P H Y S - A 4 4 0

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

Effective Term S'17 Course I.D. (SUBJ-LEVL) PHYSA440 Contact Hours 3

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

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

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? N/A Yes _____ \$ _____

No _____

d. Will a course fee be required for this course? Yes _____ \$ _____

No _____

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)

The course provides an introduction to the physics of gravitational waves. Background material in relativity (the special and general theories) will be developed. Particular attention will be paid to experiments that test Einstein's relativity as well as techniques used in the detection of gravitational waves. Topics will also include the astrophysical and cosmological sources of gravitational waves.

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.

This will be an advanced elective for the physics major which gives students an in-depth introduction into a particular subfield of physics. Exposure to current topics in research compliment the more foundational required courses in the physics curriculum.

- 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 is an advanced elective course that fits into the current curriculum. Students in the various physics major tracks are required to take a number of advanced electives. This course will be an addition to the inventory of advanced elective courses and will improve the choice of courses offered to students.

- 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 major or program

- 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.

- 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.

This advanced elective course will be taken mainly by physics majors and minors. It will have no impact on other departments.

- F. Attach a complete functional syllabus for the course as outlined in the Syllabus Template & Policy Undergraduate and Non-Law Graduate Courses

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 special relativity.
Students will have a basic understand of the principles of general relativity.
Students will understand the physical principles underlying the production and detection of a gravitational wave, and will be able to explain the major experimental challenges to achieving the required sensitivity for a real detector.**

Students will know the main types of expected astrophysical sources of gravitational waves.

- 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?

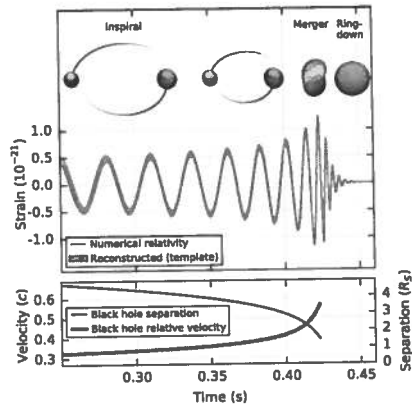
There is no impact on other departments



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NEW ORLEANS

Attachment 1: Syllabus from S'14

Prof. Martin McHugh
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Gravitational Wave Physics PHYS-A494

Fall 2016

MW 3:30 - 4:45

Location: Monroe 317

Prerequisites : PHYS102, MATHA258

Office hours : By appointment (email is the best way to reach me outside of class) or just drop by my office.

Text : material from various sources will be made available via Blackboard

Homework : Problems will be assigned most weeks. Tentatively, there will be about 8 assignments worth 25 points each due during the semester. These assignments will be due on the chosen day at the *beginning* of the class period. 3 points will be deducted for late homework, with 3 additional points for each additional day it is late. No homework will be accepted after solutions are presented.

Project: There will be a final project and presentation due at the end of the semester

Tests : Sept. 28, Nov. 9

Final Exam : Wednesday, December 14, 2:00- 4:00

Grades : The course grade will be calculated based on the following –
20% homework (200 pts)
30% tests and quizzes (300 pts)
20% project (200 pts)
30% final exam (300 pts)
(Total of 1000 pts)

Grading scale :	920 -1000 A	880 - 919 A-
	840 - 879 B+	800 - 839 B
	760 - 799 B-	720 - 759 C+
	680 - 719 C	640 – 679 C-
	600 – 639 D+	520 – 599 D
	519 or below F	

Outline of topics (*tentative*):

- Review of Newtonian gravity, equivalence principle
- Special relativity, spacetime diagrams
- Introduction to General Relativity
- Experimental tests of GR
- Astrophysics, sources of gravitational waves
- Resonant mass detectors
- Interferometric gravitational wave detectors
- Signal processing
- Noise sources
- Binary pulsar
- Cosmology and gravitational waves
- 1st detection!
- We also will plan a visit to the LIGO site in Livingston, Louisiana

Class attendance: Students are expected to come to class and keep up with the course work. **Missed exams cannot be made up except in extreme circumstances.** If an emergency arises and you will miss class, please notify me prior to the class with an email or voicemail message if at all possible.

Classroom policies: Please turn off your cell phones before class and refrain from disrupting the class by arriving late. Refer to the *Undergraduate Bulletin* for a description of classroom discipline.

Academic honesty: Studying with your fellow students is encouraged, and discussing homework problems with classmates is a part of how you learn science. However, copying the work of others, cheating on exams, will not be tolerated. Please see the statement on academic integrity below.

Statement on Academic Integrity: The Academic Honor Code of Loyola University New Orleans represents the University community's commitment to the highest intellectual and ethical standards of honesty, integrity, fairness and justice. Violations of the Academic Honor Code include but are not limited to cheating, plagiarism, false citations, falsified data, falsification of academic records, unauthorized collaboration, misuse of electronic material, and violation of academic property laws. A student in doubt about whether a particular course of conduct might violate the University's Academic Honor Code should talk with the course instructor before engaging in that conduct. For more information please read the University policies and procedures <http://2015bulletin.loyno.edu/academic-honor-code>

Arrangements for Students with Disabilities: If you have a disability and wish to receive accommodations, please contact Disability Services at 504-865-2990, ods@loyno.edu, or visit the Office of Disability Services in Marquette Hall 112. Please note that before any accommodations can be implemented, you must obtain an official Course Accommodation Record from Disability Services for my signature.

For more information regarding disability services, please see <http://loyno.edu/success//disability-services>

Evacuation/Suspension of on-campus activities : At times, ordinary university operations are interrupted as a result of tropical storms, hurricanes, or other emergencies that require evacuation or suspension of on-campus activities. To prepare for such emergencies, all students will do the following during the first week of classes:

1. Practice signing on for each course through Blackboard.
2. Provide regular and alternative e-mail address and phone contact information to each instructor.

In the event of an interruption to our course due to the result of an emergency requiring an evacuation or suspension of campus activities, students will:

3. Pack textbooks, assignments, syllabi and any other needed materials for each course and bring during an evacuation/suspension
4. Keep up with course work during the evacuation/suspension as specified on course syllabi and on-line Blackboard courses.
5. Complete any reading and/or writing assignments given by professors before emergency began.

Assuming a power source is available....

6. Log on to university Web site within 48 hours of an evacuation/suspension.
7. Monitor the main university site (www.loyno.edu) for general information.
8. Log on to each course through Blackboard or e-mail within 48 hours of an evacuation/suspension to receive further information regarding contacting course instructors for assignments, etc.
9. Complete Blackboard and/or other online assignments posted by professors (students are required to turn in assignments on time during the evacuation/suspension period and once the university campus has reopened.)
10. Contact professors during an evacuation/suspension (or as soon as classes resume on campus) to explain any emergency circumstances that may have prevented them from completing expected work.

Further information about student responsibilities in emergencies is available on the Academic Affairs web site: <http://academicaffairs.loyno.edu/students-emergency-responsibilities>