## OFFICIAL COURSE OUTLINE INFORMATION

Students are advised to keep course outlines in personal files for future use.

Shaded headings are subject to change at the discretion of the department and the material will vary + see course syllabus available from instructor

<table>
<thead>
<tr>
<th>FACULTY/DEPARTMENT:</th>
<th>Faculty of Science, Health &amp; Human Services / Physics</th>
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<tbody>
<tr>
<td>COURSE NAME/NUMBER</td>
<td>PHYS 452</td>
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<tr>
<td>FORMER COURSE NUMBER</td>
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<td>UCFV CREDITS</td>
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### INTRODUCTION TO GENERAL RELATIVITY

#### COURSE DESCRIPTIVE TITLE

General Relativity is Einstein’s Theory of Gravitation. It is the first theory that allows the properties of space-time to be determined by the matter contained in the space-time.

#### PREREQUISITES:

PHYSICS 352

#### COREQUISITES:

None

#### SYNONYMOUS COURSE(S)

(a) Replaces: N/A

(b) Cannot take: N/A

#### SERVICE COURSE TO:

None

#### TOTAL HOURS PER TERM: 75

<table>
<thead>
<tr>
<th>STRUCTURE OF HOURS:</th>
<th>HOURS PER DAY:</th>
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<tr>
<td>Lectures:</td>
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<td>Seminar:</td>
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<td>Laboratory:</td>
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<td>Field Experience:</td>
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<td>Student Directed Learning:</td>
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<td>Other (Specify):</td>
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#### TRAINING DAY-BASED INSTRUCTION

LENGTH OF COURSE: 

HOURS PER DAY: 

#### MAXIMUM ENROLLMENT: 24

#### EXPECTED FREQUENCY OF COURSE OFFERINGS:

Once every two years

#### WILL TRANSFER CREDIT BE REQUESTED? (lower-level courses only)

Yes [ ] No [ ]

#### WILL TRANSFER CREDIT BE REQUESTED? (upper-level requested by department)

Yes [ ] No [ ]

#### TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:

Yes [ ] No [ ]

### AUTHORIZATION SIGNATURES:

Course Designer(s): Rob Woodside

Chairperson: Gillian Mimmack (Curriculum Committee)

Department Head: Norm Taylor

Dean: Jackie Snodgrass

UPAC Approval in Principle Date: 
UPAC Final Approval Date: May 26, 200605
LEARNING OBJECTIVES / GOALS / OUTCOMES / LEARNING OUTCOMES:
This course completes the sequence 252, 352, 452. On completion of the course, a successful student will be able to understand and use Einstein's Theory of Gravity. Using GRII, a tensor package plug-in for Maple, the student will be able to do large tensor calculations in a stress-free manner - possibly even original, publishable work. To do this, the student will learn the language of differential geometry. Students will be able to solve various problems in each of the topic areas listed in the Calendar Description section.

METHODS:
This course will be taught using lectures, demonstrations, and computer simulations. (GRII plug-in for Maple).

PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):
Credit can be awarded for this course through PLAR (Please check:) ☑ Yes ☐ No

METHODS OF OBTAINING PLAR:
Please see the Physics PLAR policy on the department’s webpage

TEXTBOOKS, REFERENCES, MATERIALS:
[Textbook selection varies by instructor. An example of texts for this course might be:]
Misner, Thorne & Wheeler, Gravitation, Freeman (1973)

SUPPLIES / MATERIALS:

STUDENT EVALUATION:
[An example of student evaluation for this course might be:]
Assignments 25%
Mid-term examination 30%
Final examination 45%

COURSE CONTENT:
[Course content varies by instructor. An example of course content might be:]
1. Special Relativity
2. Vectors in Special Relativity
3. Tensors in Special Relativity
4. Perfect Fluids in Special Relativity
5. Curved Manifolds
6. Physics in Curved Space-time
7. Einstein Equations
8. Gravitational Radiation
9. Spherical Solutions
10. Schwarzschild Geometry and Kerr Black Holes
11. Cosmology