**COURSE NAME/NUMBER**  
**FACULTY/DEPARTMENT**  
**UFV CREDITS**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Science / Physics</th>
<th>FACULTY/DEPARTMENT</th>
<th>UFV CREDITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHYS 105</td>
<td>Heat, Waves and Optics</td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

**CALENDAR DESCRIPTION:**

Though suitable for all science students, this course is of particular interest to students taking biology and chemistry. Topics include thermodynamics, waves, geometric and wave optics, and electric circuits. This course can be taken by students who only need one non-calculus physics course, and already have Physics 11, or can be the second half of a full-year non-calculus program. The course can also be used in combination with Physics 111 as an entry into a UFV physics major, although PHYS 111 and 112 is the preferred route.  
Note: Both PHYS 101 and PHYS 105 are often required for transfer.

**PREREQUISITES:**  
One of (Principles of Mathematics 12, Pre-Calculus 12, MATH 095, or MATH 110) and one of (Physics 11, PHYS 083, or PHYS 100); or one of Physics 12, PHYS 093, PHYS 101, or PHYS 111.

**SYNONYMOUS COURSE(S):**

(a) Replaces: PHYS 102
(b) Cross-listed with: 
(c) Cannot take: for further credit.

**TOTAL HOURS PER TERM:** 120  
**TRAINING DAY-BASED INSTRUCTION:**  
Length of course: 
Hours per day: 

**STRUCTURE OF HOURS:**

- Lectures: 75 Hrs
- Seminar: ___ Hrs
- Laboratory: 45 Hrs
- Field experience: ___ Hrs
- Student directed learning: ___ Hrs
- Other (specify): ___ Hrs

**OTHER:**  
Maximum enrolment: 36
Expected frequency of course offerings: Annually
*(every semester, annually, every other year, etc.)*

**WILL TRANSFER CREDIT BE REQUESTED?** (lower-level courses only)  
Yes [x] No [ ]

**WILL TRANSFER CREDIT BE REQUESTED?** (upper-level requested by department)  
Yes [ ] No [x]

**TRANSFER CREDIT EXISTS IN BCCAT TRANSFER GUIDE:**  
Yes [x] No [ ]

---

**Course designer(s):** Tim Cooper; Revised Joss Ives

**Department Head:** Norm Taylor  
Date approved: April 2011  
Date of meeting: April 8, 2011

**Supporting area consultation (Pre-UEC)**  
Date approved: May 13, 2011  
Date of meeting: June 3, 2011

**Curriculum Committee chair:** Norm Taylor

**Dean/Associate VP:** Ora Steyn  
Date approved: June 3, 2011  
Date of meeting: October 28, 2011

---
LEARNING OUTCOMES:
Upon successful completion of this course, students will be able to:

- Analyze circuits consisting of multiple resistive elements in series and parallel.
- Use graphical and mathematical representations to describe simple harmonic motion, an important type of oscillation.
- Apply the principle of interference to determine the resulting wave shapes from overlapping waves in systems that involve sound waves, light waves or waves on a string.
- Solve sound and light problems that involve concepts such as intensity and the Doppler shift.
- Use ray optics to solve problems consisting of the reflection and/or refraction of light.
- Analyze systems consisting of lenses in combination including eye glasses and microscopes.
- Identify which of the three processes of heat exchange are dominant in a given physical situation; calculate rate of heat transfer.
- Solve calorimetric problems involving temperature changes and phase changes.
- Analyze situations using the laws of thermodynamics.
- Analyze devices which convert heat into work (heat engines) or use work to remove heat from a system (refrigerators and air conditioners).

METHODS: (Guest lecturers, presentations, online instruction, field trips, etc.)
Lecture, demonstration, small group practice, discussion, and laboratory.

METHODS OF OBTAINING PRIOR LEARNING ASSESSMENT RECOGNITION (PLAR):
- Examination(s)
- Portfolio assessment
- Interview(s)
- Other (specify): Evidence of appropriate laboratory skills.

TEXTBOOKS, REFERENCES, MATERIALS: [Textbook selection varies by instructor. Examples for this course might be:]
Walker, Physics, Pearson
Knight, Jones and Field, College Physics, Pearson
Cutnell and Johnson, Physics, Wiley

SUPPLIES / MATERIALS:
Fully-equipped physics lab.

STUDENT EVALUATION: [An example of student evaluation for this course might be:]

Assignments 15%
Midterm(s) 20%
Laboratory work 15%
Final exam 40%
Quizzes 5%
Final project 5%

COURSE CONTENT: [Course content varies by instructor. An example of course content might be:]

- Weeks 1 & 2 – Chapter 21 – Electric Current and Direct-Current Circuits
- Week 3 – Chapter 13 – Oscillations About Equilibrium
- Week 4 – Chapter 14 – Waves and Sound
- Week 5 – Chapter 25 – Electromagnetic Waves
- Weeks 6 & 7 – Chapter 26 – Geometrical Optics
- Week 8 – Chapter 27 – Optical Instruments
- Week 9 – Chapter 28 – Physical Optics: Interference and Diffraction
- Week 10 & 11 – Chapter 16 – Temperature and Heat
- Week 12 – Chapter 17 – Phase and Phase Changes
- Week 13 – Chapter 18 – The Laws of Thermodynamics

Laboratory Experiments
- Experiment 1 – Introduction to the Lab
- Experiment 2 – Ohm’s Law
- Experiment 3 – Resistors in Series and Parallel
- Experiment 4 – Standing Waves on a Wire
- Experiment 5 – Standing Waves in an Air Column
- Experiment 6 – Thin Lenses
- Experiment 7 – Interference and Diffraction
- Experiment 8 – Grating Spectrometer
- Experiment 9 – Specific Heat of a Metal and Heat of Fusion of Water
- Experiment 10 – Electrical Equivalent of Heat