A. **TITLE:** UNIVERSITY PHYSICS LABORATORY III

B. **COURSE NUMBER:** PHYS 137

C. **CREDIT HOURS:** 1

D. **WRITING INTENSIVE COURSE:** YES

E. **COURSE LENGTH:** 15 weeks

F. **SEMESTER(S) OFFERED:** Fall

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
   2 laboratory hours per week

H. **CATALOG DESCRIPTION:**
   This laboratory course is to accompany University Physics III (PHYS 133). The student will perform experiments related to rotational motion, oscillations and waves, static equilibrium, properties of material, and thermal physics.

I. **PRE-REQUISITES/CO-REQUISITES:**
   a. Pre-requisite(s):
   b. Co-requisite(s): University Physics III (PHYS 133) or permission of instructor

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

<table>
<thead>
<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tbody>
<tr>
<td>a. Demonstrate an understanding of graphing; and determine the mathematical value of Pi experimentally and compare to known value.</td>
<td>1. Communication 2. Crit. Thinking 3. Prof. Competence 4.Inter-Intrapersonal Skills</td>
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| Skills | f. Determine the period of oscillation of an object undergoing simple harmonic motion and simple pendulum, demonstrate an understanding of wave motion. Develop laboratory report. | 1. Communication  
2. Crit. Thinking  
3. Prof. Competence  
4.Inter-Intrapersonal Skills |
| Skills | g. Understand the methods scientists use to explore physical phenomena, including observation, hypothesis development, measurement, data collection, experimentation, evaluation of evidence, and employment of physics analysis. | 1. Communication  
2. Crit. Thinking  
3. Prof. Competence  
4.Inter-Intrapersonal Skills |

J. **TEXTS:** N/A

L. **REFERENCES:** None

M. **EQUIPMENT:** Existing physics laboratory equipment will be used.

N. **GRADING METHOD:** A-F

O. **MEASUREMENT CRITERIA/METHODS:**
   - Lab reports
   - Quizzes
   - Pre-lab Assignments
   - Participation
   - Projects

P. **DETAILED COURSE OUTLINE:** N/A

Q. **LABORATORY OUTLINE:**

I. **Circumference of a Circle and Pi**
The circumference and diameter of different circular objects will be measured and used to determine the mathematical value of Pi (π).

II. **Moment of Inertia**
The moment of inertia of a ring and a disk will be determined experimentally. These dynamic results will be compared to the theoretical moment of inertia calculated from the mass and dimensions measurement of the objects.

III. **Conservation of Angular Momentum**
A non-rotating ring will be dropped onto a rotating disk and the final angular speed of the system determined and compared with the value predicted using conservation of angular momentum formula.

IV. **Static Equilibrium**
When a rigid body is acted on by a system of forces that do not all pass through the same point, a change may be produced in the angular (rotational) velocity of the body as well as in its linear (translational) velocity. Under certain conditions the body will be in equilibrium. This experiment presents a study of the conditions for the equilibrium of a rigid body under the action of several forces.
V. **Hooke’s Law**
The linear behavior of a metal spring will be determined; also, measurement will be made on the behavior of something that is not quite ideal (non-linear).

VI. **Simple Harmonic Motion**
Measurements will be made on a pendulum and a mass hanging from a spring to determine which variables have the most influence on the period of the motion.

VII. **Waves on Elastic String**
A vibrating string apparatus will be used to determine resonant frequencies of waves generated on a string. A frequency generator fed through an amplifier will be used to drive the vibrator.

VIII. **Thermal Expansion of Metal**
The coefficient of linear expansion of different metals will be determined.

IX. **Specific Heat and Heat of Fusion**
The amount of energy needed to increase the temperature and change the state of a substance will be studied using a calorimeter.