CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only	
Number	LS-43
Action	
Date	

UWUCC Use Only	
Number	
Action	
Date	

I. TITLE/AUTHOR OF CHANGE PY 151 Medical Physics Lecture
COURSE/PROGRAM TITLE PY 161 Medical Physics Laboratory
DEPARTMENT Physics
CONTACT PERSON Mr. Richard Roberts/ Dr. John Fox

II. THIS COURSE IS BEING PROPOSED FOR:
_____ Course Approval Only
_____ Course Approval and Liberal Studies Approval
_X_ Liberal Studies Approval only (course previously has been approved by the University Senate)

III. APPROVALS

Richard L. Roberts
Department Curriculum Committee

John R. Fox
Department Chairperson

Kay Bess A Ross
College Curriculum Committee

College Dean*

Director of Liberal Studies
(where applicable)

Provost
(where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. TIMETABLE

Date Submitted to LSC 12/88 to UWUCC 12/88

Semester/Year to be implemented Fall 89

Date to be published in Catalog 1989

Revised 5/88

[Attach remaining parts of proposal to this form.]

LIBERAL STUDIES COURSE APPROVAL

We are submitting PY 151 and PY 161 together as a package because PY 151 is a lecture course and PY 161 is a laboratory associated with the lecture.

PART I. BASIC INFORMATION

A. We are proposing the following categories for PY 151 and PY 161: PY 151 taken by itself constitutes a Natural Science non-laboratory course. If PY 151 is taken with PY 161 then it constitutes a Natural Science Laboratory course.

B. We are requesting regular approval for this course.

C. During the transition from General Education to Liberal Studies PY 151 and PY 161 should NOT be listed as approved substitutes for the current General Education requirements because they do not constitute one of the approved two-semester Laboratory Science sequences nor are they listed as one of the Science/Math Electives.

PART II. WHICH LIBERAL STUDIES GOALS WILL YOUR COURSE MEET?

A. Intellectual Skills and Modes of Thinking:

3. Understanding numerical data is a primary goal particularly in the laboratory where measurements are made and calculations done as part of each and every laboratory exercise. In the lecture course numerical calculations are done as part of the problems that are assigned on at least a weekly basis. An extensive portion of these courses is devoted to problem analysis and solution.

5. Scientific inquiry -- primary goal. Students would certainly acquire this skill by participation in laboratory experiments and weekly problem assignments.

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person:

Primary goal -- Understanding major trends in science and technology. Activities include, for example, studying how electric power is generated and transmitted to our homes.

PART III. DOES YOUR COURSE MEET THE GENERAL CRITERIA FOR LIBERAL STUDIES?

A. The physics department will use the following strategies to assure that basic equivalency exists:
All sections are guided by the same objectives as listed in the syllabus. The equivalency of content and assignments is assured by the use of the same textbook for all sections. Evaluations in all

sections are based upon homework grades and examinations. Grade distribution information is shared by instructors from all sections. Textbook selection is a group decision made by all instructors of this course. Laboratory guidelines are similar except that the laboratory writeups that are used were written by one of the faculty members teaching the courses.

B. The attached syllabus makes explicit that this course will include perspectives and contributions of ethnic and racial minorities and of women wherever appropriate to the subject matter. In addition, faculty will be sensitive about language and choice of examples.

C. The following is a justification of an exception to the reading requirement.
A primary purpose of this course is the development of higher level quantitative skills. They are directed toward scientific inquiry with emphasis on abstract logical thinking and application of mathematical analysis to the models developed. Although we have invoked this exception, students are encouraged to read selections on the history of science and about the scientists who were responsible for the development of science as we know it today.

D. This course is different from what is provided for beginning majors in that calculus is not used in this course and there is much more emhpasis on the application of physics principles to the human body. This is a required course for nursing and respiratory care majors. They are sometimes used as electives by other majors. This course would be an extremely useful course for most students in the College of Human Ecology and Health Sciences as well as many other students in the university. All majors, physics or others, have historically been introduced to the subject through an introductory course that is considered bibliographic in nature. The course covers science from the earliest history of man to the science topic in today's newspaper. All major subject areas in physics are touched upon in this course. The more recent discoveries are discussed with attention being given to the implications of these discoveries to the future of the students seated in that classroom.

E. Our courses will contribute to the Liberal Studies Criteria as follows:

2. Define and analyze problems, frame questions, evaluate available solutions, and make choices -- This is exactly the nature of the problem solving skills that we develop in these courses. One of the ways that we do this is by assigning numerous word problems to be solved by students as part of the requirements of the course. Numerous examples are also presented in class.

PART IV. DO YOUR COURSES MEET THE CRITERIA FOR THE CURRICULUM CATEGORY IN WHICH THEY ARE TO BE LISTED?

Yes -- See enclosed course syllabi.

COURSE SYLLABUS

I. CATALOG DESCRIPTION — 3 credits
PY 151 Medical Physics Lecture — 3 lecture hours

Development of concepts and principles of physics with a strong emphasis as to their use and application in medical and other biophysical areas.

II. COURSE OBJECTIVES

(1) To develop an understanding of physical principles and concepts used in the major areas of Physics.

(2) To show applications and use of the principles of physics applied to the human body.

(3) To be able to use mathematical relations involving physical quantities.

(4) To be able to express in writing an understanding of the physical quantities.

(5) To provide an understanding of some of the "great moments" in the history of physics and the individuals, including women and minorities responsible for them.

(6) Lectures will be given with student discussions and questions on important points.

(7) Numerous demonstrations will be given to illustrate concepts and principles.

(8) Homework assignments will be given involving mathematical and verbal questions given every lecture.

III. COURSE OUTLINE

A. Mechanics (10 lectures)

1. Kinematics
   a. Uniformly accelerated motion
   b. Graphical description of motion
   c. Rotational motion

2. Dynamics
   a. Newton's laws
   b. Force & vectors; mass and scalers
   c. Force of gravity
      (i) addition of forces
   d. Rotational dynamics - torques and equilibrium
   e. Friction and motion
   f. Medical applications

3. Work & Energy
   a. Work & power
   b. Energy
      (i) conservation of
   c. Machines - mechanical energy
   d. Applications to the human body

B. Fluids (9 lectures)

1. Liquids
   a. Pressure
   b. Pascal's principle
   c. Archimedes' principle
   d. Bernoulli's principle
   e. Applications of properties of liquids to the human body

2. Gases
   a. Gas laws
   b. Atmospheric pressure
   c. Applications of

3. Fluids and the body
   a. The circulatory system

4. Medical Applications and Devices
   a. I.V. systems, nebulizers
   b. Drainage systems, flowmeters

5. Biological process & fluids
   a. Diffusion, osmosis and dialysis
   b. Cohesion, adhesion, surface tension, etc.

C. The Atom and its Energy (6 lectures)

1. Structure of the atom

2. The nucleus and radioactivity
   a. Types of
   b. Half Life

3. Radioactivity and the body
   a. Effects

4. Uses in medicine

D. Thermodynamics (4 lectures)

1. Thermal energy, heat and temperature
   a. Thermometers
   b. Specific heat, latent heat and calories

2. Effects of heat
   a. Expansion, change of temperature, change of state

3. The body as a thermodynamical system
   a. Metabolism and body temperature
      (i) methods of heat transfer

E. Electricity and Magnetism (6 lectures)

1. Static electricity
   a. Fields and forces

2. Current electricity
   a. Electromagnetism

3. Circuits
   a. Series and parallel

4. Alternating current
   a. Fuses and transformers

5. Electrical safety

6. Electrical and electronic instruments

7. Bioelectricity

F. Waves (4 lectures)

1. General characteristics and properties
   a. Reflection, refraction, etc.

2. Physics of hearing and speaking
   a. Emitters and receivers

3. Physics of vision
   a. The eye and its defects
      (i) corrective lenses

4. Applications of
   a. Optical instruments
   b. Ultrasonics

5. Electromagnetic spectrum
   a. Atom and quantum theory
   b. Applications of electromagnetic waves in medicine

6. Lasers and electron microscopes

IV. EVALUATION METHODS

The final grade for the course will be determined as follows:
20% Homework
60% Three one-hour exams
20% Final exam

V. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

Textbooks: Urone, P.P. Physics with Health Science Applications, Harper & Row.
Jensen, Physics for the Health Professions, 3rd Ed, Wiley 1982.

COURSE SYLLABUS

I. CATALOG DESCRIPTION

Physics 161 - Medical Physics Laboratory — 1 credit
Corequisite: PY 151 — 3 lab hours

Experiments dealing with applications of physical principles to the field of medicine. Practical experience with use of electronic equipment, chart recorders, etc., of type found in modern day medicine will be introduced.

II. COURSE OBJECTIVES

The experiments are designed to give the student hands-on experience with many of the concepts developed in the concurrent lecture. The labs have been especialy developed to illustrate physical principles that are of importance to the medical field.

1. Each week the student picks up the next week's lab.
2. The student executes the lab and answers problems and questions posed in the post-lab.
3. The labs are collected at the end of the lab period, graded during the week, and returned to the student the next lab period.

III. COURSE OUTLINE

Experiments - one each week

1. Measurement: The Use of Numbers and Units in Science
2. Measuring Instruments and Systems
3. Systems in Equilibrium: Forces, Torques and the Center of Gravity
4. Simple Machines
5. Half Lifes, Radioactive "Cow" and Radioactive Tracing
6. Measurement and Absorption of Radioactivity
7. Fluids: Gases and Liquids
8. Flowing Liquids: IV Bottles and Drainage Systems
9. Electric Charges at Rest and in Motion
10. Recording Devices: Oscilloscopes and Chart Recorders
11. Biophysical Measurements
12. Reflection, Refraction: Mirrors and Lenses
13. The Eye and Color

IV. EVALUATION METHODS

There are 13 laboratories to be conducted by the students. Prior to performing each laboratory a quiz is given and rated as 30% of the lab grade. The performance and laboratory analysis is rated as 70%.

V. REQUIRED TEXTBOOKS, SUPPLEMENTAL BOOKS AND READINGS

The Physics Department provides all the necessary laboratory materials as handouts.

VI. SPECIAL RESOURCE REQUIREMENTS

Graph paper
ruler
protractor