Syllabus: Polymer Physics.

UNIVERSITY OF PUERTO RICO
RÍO PIEDRAS CAMPUS
COLLEGE OF NATURAL SCIENCES
DEPARTMENT OF PHYSICS

Title: Polymer Physics.
Code: PHYS 8105-0U1
Number of Credits: 3
Prerequisites: Permission of the Graduate Committee

Description
Polymer Physics. Development of the basic statements including the various representations and 'pictures' of Polymer Physics. Detailed consideration of Polymer Physics.methods. Application of the Polymer Physics methods to analysis of polymer spectroscopy: UV-VIS-IR Spectroscopy; Pulsed EPR and NMR Spectroscopy; Pulsed Dielectric Energy Loose Spectroscopy. Polymer structure. Statistical models of polymer structure analysis. Biopolymers.

Objectives
Through this course, the students will:

- Acquire a basic understanding of the polymer physics meaning, polymer physics methods, basic statements of polymer physics and polymer structure, application of polymer physics methods to analysis of polymer structure and properties. Analysis of spectroscopic methods applied to study of polymer structure.
- Analysis of the experimental and theoretical tools of the polymer structure and properties.
- Develop problem-solving skills and strategies in basic polymer physics science.
- Communicate effectively a topic pertinent to basic of polymer physics science.

Course Contents and Time Distribution

I. The Basis of the polymer physics science (1 wks)
   a) Introduction:
   b) Historical view..
   c) Natural polymers.
   d) Artificial polymers. .

II. Physics of macro-molecules (2 wks)
   a) Macro-molecules and super elasticity.
   b) Internal rotation and internal isomerization..
   c) Roto-Isomeric theory of polymers.
   d) Macro-molecules as cooperative systems.
   e) Tangle and globule.
   f) Methods of investigations of macro-molecules.
   g) Polyelectrolites.
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III. Water solvable and water no solvable polymers (1 wks).

IV. Polymer thermodynamics (2 wks)

V. Polypeptide physics (2 wks)
   a) Primary structure;
   b) Secondary structure;

c) Tertiary structure;
d) Higher than tertiary level structure.

VI.. Poly-sugar bio-components (2 wks)
a) Primary structure;
b) Secondary structure;
c) Tertiary structure;
d) Higher than tertiary level structure

VII. Poly-nucleotides (2 wks)
a) Primary structure;
b) Secondary structure;
c) Tertiary structure.
d) Higher than tertiary level structure

VIII. Basic physical properties of polymer characterization (2 wks).

IX. Physical and chemical methods of polymer and biopolymer investigation and characterization (2 wks)

X. Polymer spectroscopy (2 wks).

XI. Physics of other biopolymers (1 wks).

Instructional Strategies
Lectures, problem sets, group discussions, and oral presentations by the students.

Minimum Required Facilities
Traditional lecture room

Student Evaluation
Three homework, and oral presentation

Grading System
Standard A to F grading system:
100-90% = A, 89-80% = B, 79-70% = C, 69-60% = D, 59-0% = F.

Bibliography
M. Rubinshtein, R. Colby, Polymer Physics, Oxford University Press, 2003.

http://ocw.mit.edu/courses/materials-science-and-engineering/3-063-polymer-physics-spring-2007/index.htm
http://polymerphysics.net/index.html

Online Resources:
- http://onlinelibrary.wiley.com/journal/10.1002/(ISSN)1099-0488
- http://en.wikipedia.org/wiki/Polymer_physics
- http://www.iop.org/activity/groups/subject/pol/index.html

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Oficina de Asuntos para las Personas con Impedimentos (OAPI) of the Dean of Students. Likewise, students with special needs that require some type of accommodation must contact the professor.