

SOUTHEAST MISSOURI STATE UNIVERSITY

Department (s): Physics and Engineering Physics

Course No. EP 850
Revision: _____ New: Summer 2012

Title of Course: Introduction to Nano-Science and Biomedical Engineering Workshop

- I. **Catalog Description and Credit Hours of Course:** Design and characterization of multifunctional nanocarriers, and interaction with mammalian cells. Synthesis, Dynamic light Scattering, Basic mammalian cell culture technique, Nanosphere uptake assessment (2 credit hour)
- II. **Prerequisite(s):** PH 120 or Ch 185 or Living systems and permission of instructor
- III. **Purposes or Objectives of the Course:**
 - A. To understand basic properties of nanostructures and their potential applications in various fields of biomedical engineering.
 - B. To learn basic laboratory techniques for design and characterization of the smart nanostructures.
 - C. To learn various laboratory techniques associated with mammalian cell culture.
 - D. To develop an understanding of interaction between smart nanostructures and mammalian cells.
- IV. **Student Learning Outcomes (Minimum of 3)**
 - A. Students will demonstrate the ability to design and characterize smart nanostructures for potential therapeutic applications.
 - B. Students will demonstrate a familiarity with fundamental issues associated with maintaining aseptic conditions and culturing mammalian cells.
 - C. Students will demonstrate the ability to assemble and analyze experimentally-derived results.
- V. **Expectations of Students:**
 - A. Students are expected to attend all workshop activities and complete all assignments on time.
 - B. Students are expected to maintain a laboratory research notebook detailing all analyses and results from those analyses.
 - C. Students are expected to perform satisfactorily on all workshop

assignments, individual projects, and other activities.

- D. Graduate Students will have extended individual projects which will include additional experimentation, and greater depth of analysis.

VI. Workshop Content or Outline (indicate number of clock hours per unit or section):

Topic	Clock Hours
Introduction to Nano- science and relevance to Biomedical Engineering	2
Design of superparamagnetic nano-particles	2
Design of stimuli responsive, multifunctional nano-reservoirs	6
Dynamic Light Scattering and Particle Characterization	2
Introduction to mammalian cell culture: aseptic technique, and the use of serum, complete media construction, optimization of growth conditions.	3
Thawing and Culture	3
Cell feeding: change of media	1
Cell splitting and sub-culturing the cells	3
Cryopreservation	3
Cell counting and cell seeding for nanosphere uptake experiment	4
Nanocarrier delivery	3
Cell fixing and slide preparation	3
Fluorescence microscopy and nanosphere uptake assessment (Grad)	3
Final Presentation, Concluding Remarks, Certification	2

VII. Textbook(s) and/or Other Required Materials or Equipment:

In addition to standard word processing software, students must have routine access to high-speed internet, Microsoft Excel or equivalent spreadsheet software, and NIH Image J (available for free of cost) software. Manuals and handouts containing detail description of the experimental procedure will be supplied to each student. No textbook required.

VIII. Basis for Student Evaluation:

<u>Undergraduates</u>	<u>Graduate Students</u>
Daily assignments 70 %	Daily assignments 60 %
Laboratory Notebook 20 %	Laboratory Notebook 20 %
Quiz and	Special Assignments 10 %
Final Presentation 10 %	Quiz and
	Final presentation 10 %

Grading Scale

<u>Undergraduates</u>	<u>Graduate Students</u>
90% - 100% = A	90% - 100% = A
80% - 89% = B	80% - 89% = B
70% - 79% = C	70% - 79% = C
60% - 69% = D	

The weight of the evaluation criteria may vary according to each instructor and will be communicated at the beginning of the course.

There is no "D" grade in the graduate school. Graduate students scoring below 70% will earn a failing grade.

Academic Policy Statement:

Students will be expected to abide by the University Policy for Academic Honesty regarding plagiarism and academic honesty. Refer to:

<http://www6.semo.edu/judaffairs/code.html>

Student with Disabilities Statement:

If a student has a special need addressed by the Americans with Disabilities Act (ADA) and requires materials in an alternative format, please notify the instructor at the beginning of the course. Reasonable efforts will be made to accommodate special needs.