

Nanotechnology: New Revolution Spring 2016 Syllabus

Professor: Emerson Giovanelli, Ph.D.

Course Name: Nanotechnology: New Revolution

Course Code: PHYS-1930 ST

Semester: Spring 2016

Credit Hours: 3 credits

Lecture Room: PRH-12, Monday, Wednesday: 16:00-17:15

Email: giovanellie@slu.edu

Office Location: Padre Arrupe Hall - Science Office (1st Floor)

Office Hours: Monday, Wednesday: 17:15-18:15 and Upon Request

Add/Drop Period: Last day to drop: Jan. 26. Last day to drop with W: March 11

Prerequisites: None

Course Objectives:

This course intends to ignite the interest on the thrilling subject known as Nanotechnology. Through a very informative point of view and an enjoyable language, students will discover what Nanotechnology is and where it is headed.

This course will guide the students allowing them to comprehend the basic concepts of nanotechnology, discover what nanotechnologists are making happen today, and get a look at the groundwork for tomorrow's nano-applications.

No prerequisites are needed, thus complex physics or chemistry concepts will be down-to-earthly explained. In this way, any student (no matter the educational background) with a passing interest in nanotech will be able to fully enjoy the proposed course.

Student Learning Outcomes:

Science Core Program Objectives

- A. Demonstrate broad-based knowledge and deep understanding of the basic principles and concepts acquired through the science courses.
- B. Use conceptual tools and methodologies to gather, analyze, interpret, understand, and present effectively an array of data.
- C. Apply methodological approaches that enable scientists to evaluate and solve problems effectively.
- D. Work effectively with others as part of a team.
- E. Demonstrate an understanding of how science benefits and impacts society.

Program Objectives	Student Learning Outcomes
A	<ul style="list-style-type: none"> A.1. Understand the essence of Nanotechnology. A.2. Identify different type of Optical Spectroscopy Techniques; Infrared (IR), Raman and UltraViolet-Visible. A.3. Comprehend the utility of science broad-known Nanotechnology based Microscopes such as Atomic Force Microscope (AFM), Scanning electron Microscope (SEM), Transmission Electron Microscope (TEM), and Scanning Tunneling Microscope (STM). A.4. Study the origin and applications of widely employed Nanomaterials; Nanotubes, Nanowires and Nanofibers.
B	<ul style="list-style-type: none"> B.1. Analyze and interpret data represented numerically and graphically.
C	<ul style="list-style-type: none"> C.1. Identify the essential aspects of a basic problem, connect it to related areas of Nanotechnology, formulate a strategy for solving the problem, apply appropriate techniques to arrive at a solution, test the correctness of the solution, and interpret the result.
E	<ul style="list-style-type: none"> E.1. Link the relationship among different aspects formulated by Nanotechnology regarding Ethics and Society. E.2. Understand how Nanotechnology is present in our daily routine; Computers, Energy, Personal Health and Medical Applications. E.3. Discover how Nanotechnology affects Industry, Countries and Universities based on an economical repercussion.

Course description:

Understand the basics of nanotechnology and its potential in our daily life and businesses through a simple and understandable language.

In such terms, materials (nanotubes, nanowires, nanofibers, etc.), measuring techniques (Atomic Force Microscope, Scanning Electron Microscope, Transmission Electron Microscope and Scanning Tunneling Microscope), tendencies over already existing technologies (computers, energy and health) and impact on global economy (industry, countries and universities) will be studied.

Textbook:

Nanotechnology for Dummies, R. Booker and E. Boysen. 2009

Grading System:

Homework until Mid-Term Exam: **20%**

Mid-term Exam: **30%**

Homework between Mid-Term Exam and Final Exam: **20%**

Final Exam: **30%**

Grading Scales:

100% < A < 93%

93% < A⁻ < 90%

90% < B⁺ < 87%

87% < B < 83%

83% < B⁻ < 80%

80% < C⁺ < 77%

77% < C < 73%

73% < C⁻ < 70%

70% < D < 60%

F < 60%

POLICY STATEMENT ON ACADEMIC INTEGRITY

The following is a statement of minimum standards for student academic integrity at Saint Louis University.

The University is a community of learning, whose effectiveness requires an environment of mutual trust and integrity, such as would be expected at a Jesuit, Catholic institution. As members of this community, students, faculty, and staff members share the responsibility to maintain this environment. Academic dishonesty violates it. Although not all forms of academic dishonesty can be listed here, it can be said in general that soliciting, receiving, or providing any unauthorized assistance in the completion of any work submitted toward academic credit is dishonest. It not only violates the mutual trust necessary between faculty and students but also undermines the validity of the University's evaluation of students and takes unfair advantage of fellow students. Further, it is the responsibility of any student who observes such dishonest conduct to call it to the attention of a faculty member or administrator.

Examples of academic dishonesty would be copying from another student, copying from a book or class notes during a closed-book exam, submitting materials authored by or editorially revised by another person but presented as the student's own work, copying a passage or text directly from a published source without appropriately citing or recognizing that source, taking a test or doing an assignment or other academic work for another student, tampering with another student's work, securing or supplying in advance a copy of an examination without the knowledge or consent of the instructor, and colluding with another student or students to engage in an act of academic dishonesty.

Where there is clear indication of such dishonesty, a faculty member or administrator has the responsibility to apply appropriate sanctions. Investigations of violations will be conducted in accord with standards and procedures of the school or college through which the course or research is offered. Recommendations of sanctions to be imposed will be made to the dean of the school or college in which the student is enrolled. Possible sanctions for a violation of academic integrity include, but are not limited to, disciplinary probation, suspension, and dismissal from the University. The complete SLU Academic Honesty Policy can be found at the following link:

<http://www.slu.edu/Documents/Madrid/academics/AcademicIntegrity.pdf>

Policies:

- (1) Students are encouraged to participate in class discussions and to ask questions.
- (2) Announcements may be made during the semester.
- (3) Useful information for the course may be found on the web: <https://myslu.slu.edu>.
- (4) Syllabus, reading and homework problems are subject to change.
- (5) Students are responsible for all lecture material, handouts and assigned reading.
- (6) **It is mandatory to attend all classes unless a reasonable excuse is given.** Any unexcused absences in excess of **3** will result in a lowered grade and even in automatic failure in the course.
- (7) **Make up exams are not given.** Students who legitimately miss an exam, due to a doctor's visit or family emergency must provide written documentation of the circumstances. A letter from the university counselor is accepted. Exams that are missed illegitimately result in a score of F. Grades for these students will be based on the remaining exams. Missing more than one exam results in an F grade.
- (8) In recognition that people learn in a variety of ways and that learning is influenced by multiple factors (e.g., prior experience, study skills, learning disability), resources to support student success are available on campus. Students who think they might benefit from these resources can find out more about:
Course-level support (e.g., faculty member, departmental resources, etc.) by asking your course instructor.
University-level support (e.g., tutoring/writing services, Disability Services) by visiting the Academic Dean's Office (San Ignacio Hall) or by going to <http://www.slu.edu/madrid/learning-resources>.
Students who believe that, due to a disability, they could benefit from academic accommodations are encouraged to contact Disability Services at +34 915 54 58 58, ext. 204, send an e-mail to counselingcenter-madrid@slu.edu, or to visit the Counseling Office (San Ignacio Hall). Confidentiality will be observed in all inquiries. Course instructors support student accommodation requests when an approved letter from Disability Services has been received and when students discuss these accommodations with the instructor after receipt of the approved letter.
- (9) Information regarding the collection of student work for assessment.
Saint Louis University - Madrid Campus is committed to excellent and innovative educational practices. In order to maintain quality academic offerings and to conform to relevant accreditation requirements, we regularly assess our teaching, services, and programs for evidence of student learning outcomes achievement. For this purpose we keep on file anonymized representative examples of student work from all courses and programs such as: assignments, papers, exams, portfolios, and results from student surveys, focus groups, and reflective exercises. *Thus, copies of your work for this course, including exams or assignments may be kept on file for institutional research, assessment and accreditation purposes.* If you prefer that Saint Louis University-Madrid Campus does not keep your work on file, you will need to communicate your decision in writing to your professor.

Title IX Syllabus Statement

- Saint Louis University and its faculty are committed to supporting our students and seeking an environment that is free of bias, discrimination, and harassment. If you have encountered any form of sexual misconduct (e.g. sexual assault, sexual harassment, stalking, domestic or dating violence), we encourage you to report this to the University. If you speak with a faculty member about an incident of misconduct, that faculty member must notify SLU's Title IX deputy coordinator, Marta Maruri, whose office is located on the ground floor of Padre Rubio Hall, Avenida del Valle, 28 (mmaruri@slu.edu; 915-54-5858 ext. 213) and share the basic fact of your experience with her. The Title IX deputy coordinator will then be available to assist you in understanding all of your options and in connecting you with all possible resources on and off campus.
- If you wish to speak with a confidential source, you may contact the counselors at the SLU-Madrid's Counseling Services on the third floor of San Ignacio Hall (counselingcenter-madrid@slu.edu; 915-54-5858 ext. 230) or Sinews Multiple therapy Institute, the off-campus provider of counseling services for SLU-Madrid (www.sinews.es; 91-700-1979) To view SLU-Madrid's sexual misconduct policy and for resources, please visit the following web address:
<http://www.slu.edu/Documents/Madrid/campus-life/SLUMadridSexualMisconductPolicy.pdf>.

Course Outline (tentative):

<u>Class Date</u>	<u>Topic</u>
Jan. 13	<i>Presentation</i>
Jan. 18	Grasping the Essence of Nanotechnology
Jan. 20	Going from Lab to Factory Home
Jan. 25	Looking at Ethics and Society
Jan. 27	Big tools to understand the nanoworld (matter and light)
Feb. 01	Spectroscopies: light matters! Part 1 (IR, Raman)
Feb. 03	Spectro. Part 2 (UV-vis, Fluo). Electronic microscopies. Part 1
Feb. 08	Electronic microscopies. Part 2 (SEM)
Feb. 10	Electronic microscopies. Part 3 (TEM)
Feb. 15	Atomic microscopies (AFM, STM)
Feb. 17	<i>Correction exercises I</i>
Feb. 22	<i>Review I</i>
Feb. 24	<i>Mid-Term Exam</i>
Feb. 29	Carbon nanomaterials. Part 1 (Graphene, Buckyballs)
Mar. 02	Carbon nanomaterials. Part 2 (Carbon nanotubes)
Mar. 07	Computers (New chips & memories)
Mar. 09	Nanophotonics I
Mar. 14	Nanophotonics I
Mar. 16	Energy (Fuel Cells) & Energy Consumption
Mar. 21	<i>Holiday</i>
Mar. 23	<i>Holiday</i>
Mar. 28	<i>Correction exercises II</i>
Mar. 30	<i>Review II</i>
Apr. 04	Personal Health (Lab-on-a-Chip)
Apr. 06	Personal Health (X-Ray and DNA)
Apr. 11	Medical Applications
Apr. 13	Nanotechnology Industries
Apr. 18	Countries Investing in Nanotechnology
Apr. 20	Nanotechnology at Universities
Apr. 25	<i>Correction exercises III</i>
Apr. 27	<i>Review III</i>
May. 02	<i>Holiday</i>
May. 04	<i>Final Exam</i>

Visit to IMDEA Nanoscience Research Center to be scheduled in April.