Department of Computer & Electrical Engineering and Computer Science
Florida Atlantic University
Course Syllabus
Version 01. 03.12.2018

1. Course title/number, number of credit hours	
Introduction to Bioengineering(EGN 1935003_2016R_61412)	# of credit hours 3
2. Course prerequisites, corequisites, and where the course fits in the program of study	
There are no course prerequisites	
3. Course logistics	
Term: Summer 2018 (Jun 11-29th 2018) This is a classroom and Lab lecture course with dry and wet lab (hands-on)practice *Class location and time* EE96 #203 (Mon, Wed, Fri, (9:30AM-12:30PM and1:30 PM-4:30 PM) This course has limited design content.	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Mirjana Pavlovic, MD, PhD EE 96, #515 Tue, Thurs, 10:00-12:00 AM 562-297-2348 mpavlovi@fau.edu
5. TA contact information	
TA's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Chad Coarsey, Mazhar Sher ccoarsey@fau.edd, msher2015@ fau.edu
6. Course description	
This is partly demonstrative and partly hands – on Bioengineering based course designed for students interested in advances in Biomedical engineering in both: Wet Lab and Computerized aspects (model simulation) of biological/medical phenomena. No prior background in Lab or Computer methods are assumed. The Bioengineering part is covered through particular lectures from established Intro to Bioengineering and Tissue Engineering courses derived and elaborated from MS program at FAU. The Computer based material and the design methods are covered through MATLAB and Simulink software simulation sessions and lectures. Computer modeling and simulation techniques are playing an increasingly central role in changing both the way medicine is taught and the way it is practiced. Fundamental to the art and science of modeling and simulation is an underlying assumption that insight into system behavior can be developed or enhanced from a model that adequately represents a selected subset of the system's attributes. The course lectures and labs experiences culminate in a design project competition of topics/models chosen and applied for presented simulation either theoretical topic presentation.	

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7. Course objectives/student learning outcomes/program outcomes	
Course objectives	***The course covers the fundamentals of Bioengineering potentials through lectures, calculative approaches, and practical 3-D printing of the prosthesis known as Bionic glove, as well as MATLAB and Simulation lectures dedicated to specific models: classical (Malthusian, Verhulst, Predator-Prey), and modernized, (Excel spreadsheet data presentation). By combining lectures and practical computer lab activities and animations, students will get the insight into the integration of simulation techniques with other types of applications.*** ***They will learn about stem cells, scaffolds and molecules of intracellular interaction in Tissue Engineering, basic calculations necessary for engineering different cell-culture media, determining optimal cell patterns for defected tissues, and essential breakthroughs in significant avenues of this expanding area. They will also learn about graphical presentation of different models through MATLAB, based on differential equations. Students will explore the latest features and a customizable sets of block libraries that will help them to establish/complete the models, through Simulink program (library of necessary components for given model). Students will spend half of their class time in the lab conducting either guided simulations, doing analytical calculative solutions, presenting data in Excel, or doing rapid prototyping on 3D printer. The other half of the class time will be divided between the lectures and demonstration or hand-on wet-lab practice necessary for correct understanding of certain procedures in Biomedical engineering (cell staining, visualization and counting, magnetic bead cell isolation, PCR, wireless spectrometry and use of devices based on different sensors. Due to the special time format constraints (9 full class days spread over three weeks) the course is fast paced and homework-intensive (team lab technical reports/presentations and individual computer and lab assignments).***
Student learning outcomes & relationship to ABET a-k objectives	a) Students will develop deep understanding of the most significant breakthroughs in Bioengineering especially in medical arena in scientific search for improvement of human health. b) They will learn the basic calculative and protocolled operations used in the Wet Bioengineering Lab and be introduced to high technical novelties in Bioengineering Lab instrumentation and devices at the level of wireless systems. d) Students will be exposed to experience of 3D printing and do the basic assembly and evaluation of products (prostheses, or bionic hands) c) They will also develop basic understanding of the modeling processes through MATLAB and Simulink, e.g. how to integrate the programs and simulate the linear and non-linear changes within particular models, based on specific parameters b) They will get a good understanding of basic linear and nonlinear dynamic properties, normalization (scale changes), computer-aided analysis, simulation and control of selected physiological processes and medical/biological systems c) Students will be able to not only graphically present manifestations of specific facet of given medical/biological phenomena, but also to manipulate/tune changes in the graph (background, labeling, and colors).

	d) Students will form the lab teams and learn how to research and present the topics, collect the experimental data and how to process it and present in their team reports and homeworks

8. Course evaluation method

3Homeworks - 36 % 3 Computer Lab Reports - 28 % 6 equally weighted quizzes - 21 % Instructor's Assessment of Lab Participation and work quality 7% Instructor's Assessment of the Final Project (team) 8%	*Note*: The minimum grade required to pass the course is C.

9. Course grading scale

Grading Scale:
90 and above: "A", 87-89: "A-", 83-86: "B+", 80-82: "B", 77-79 : "B-", 73-76: "C+", 70-72: "C", 67-69: "C-", 63-66: "D+", 60-62: "D", 51-59: "D-", 50 and below: "F."

10. Policy on makeup tests, late work, and incompletes

Make up tests are impossible due to very intensive pace pf course .Late work will not be tolerated except with physician's confirmation of affected health.

11. Special course requirements

. Submission of Homeworks, Computer Lab Reports and Presentations requirements:

1. Homeworks are due the morning of the next class day, individually. They should be brief and involve answers to questions and solutions to the problems.
2. The computer lab reports are due also the morning of the next class, by each team.
Each team should submit one brief report per experiment. The report should include the relevant simulation results in two cases and one Excel result.
3. The last report on either computer model or literature searched topic should be submitted last day of course in written and PP form and presented orally by each team.
4. All students are expected to be active participants of the team. Students who consistently let their lab partners do most of the work may lose the entire percentage of the grade in corresponding category.

12. Classroom etiquette policy

University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.

13. Disability policy statement

In compliance with the Americans with Disabilities Act (ADA), students who require special accommodations due to a disability to properly execute coursework must register with the Office for

Students with Disabilities (OSD) located in Boca Raton campus, SU 133 (561) 297-3880 and follow all OSD procedures.

14. Honor code policy

Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high quality education in which no student enjoys unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf

15. Required texts/reading

1.Introduction to Bioengineering
Conceptual Approach
Mirjana Pavlovic
Springer, New York, 2015

2.Mathematical Modeling in Systems Biology – An Introduction
Brian Ingalls
MIT Press, 2013

16. Supplementary/recommended readings

Modeling and Simulation in Medicine and the Life Sciences
(2nd Edition)
Frank C. Hoppensteadt and Charles S. Peskin
Springer, New York, 2002.

17. Course topical outline, including dates for exams/quizzes, papers, completion of reading

Monday, June 11th

9:30-9:45 Orientation
10:00-11:25 Lecture: (Introduction to Bioengineering: general remarks)
11:30-12:30 Computer Lab: (Access to MATLAB and Simulink-Mahesh, if necessary)
12:30-1:30 Lunch
1:30-4:30 Lecture: (Differences between Wet and Computer Lab used in Bioengineering: Break through Wet-Laboratory procedures in Bioengineering: Animations)

Wednesday, June 13th

9:30-12:30 Lecture: (The use of stem cells in Medical arena: entities, patterns, optimization and transplantation. Concepts of Cell and regenerative therapy.)
12:30-1:30 Lunch
1:30- 4:30 Computer Lab: (Wet- Lab calculus: use of computer and Canvas).

Friday, June 15th

9:30-12:30 Lecture: (Cancer Stem Cell Concept and targeted therapy; concepts of drug delivery)
12:30- 1:30 Lunch
1:30-4:30 Computer Lab: (Mechanisms of targeted drug delivery: animations. Remote control)

Monday, June 18th

9:30 -12:30 Lecture: (Tissue engineering as essential topic in Biomedical engineering)
12:30-1:30 Lunch
1:30-4:30 Computer lab: (TE calculus: media, concentrations, cells, growth)

Wednesday, June 20th

9:30-12:30 Lecture: (Artificial organs and transplantation without a donor)
12:30-1:30 Lunch
1:30-4:30 Wet Lab: (Demonstration of novelties in devices and equipment, chosen Lab topics)

Friday, June 22nd,

9:30-12:30 Lecture: (Mirjana Pavlovic and Chad Coursey: 3D printing-Rapid prototyping and BIONIC GLOVES)
12:30-1:30 Lunch
1:30-4:30 3D printing Lab: (printing, assembling, etc.)

Monday, June 25th

9:30 -12:30 Lecture: (Modeling and Simulation in Medicine: State of the Art)
12:30-1:30 Lunch
1:30-4:30 Computer Lab: (MATLAB+SIMULINK tutorials (via analysis of Population Growth Dynamics): Malthusian Growth, Verhulst Logistic curve, Predator-Prey models and their Applications in Biomedical Engineering: cell culture exponential growth, confluent and subconfluent cultures, cellular "cannibalism").

Wednesday, June 27th

9:30-12:30 Lecture: (Data normalization/linearization)
12:30-1: 30 Lunch
1:30-4:30 Computer Lab (Excel Spreadsheet: Data presentation)

Friday, June 29th
9:30-12:30 Lecture: (Breakthroughs in Bioengineering with emphasis on Biomedical Topics nanotechnology, bio imaging, bioinstrumentation,).
12:30-1:30 Lunch
1:30-4:30 Computer Lab: (Student team presentations: chosen topics either from mathematical models or Bioengineering topics)

Slight modifications are possible dependent on conditions/circumstances.