FAU
FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

Department Computer & Elec. Eng. and Computer Sci

College College of Engineering and Computer Science
(To obtain a course number, contact erudolph@fau.edu)

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Prefix EEE **Number** 5425	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Course Title** Nanobiotechnology
Credits *(Review Provost Memorandum)* 3 **Effective Date** *(TERM & YEAR)* Fall 2017	**Grading** *(Select One Option)* **Regular** ◉ **Sat/UnSat** ○	**Course Description** *(Syllabus must be attached; see Guidelines)* This course covers the sensing and characterization of biological entities with novel nanoscale devices and nano-object mediated modalities. It also covers the fundamentals of nanotechnology in biological and biomedical research.

Prerequisites	Corequisites	Registration Controls *(Major, College, Level)*
Graduate level standing in engineering and/or physical/biological sciences	N/A	Graduates, Seniors (College of Engineering or College of Science)

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course: Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	**List textbook information in syllabus or here** No text book is required.
Faculty Contact/Email/Phone Waseem Asghar wasghar@fau.edu	**List/Attach comments from departments affected by new course** College of Eng. and Comp. Sci, Department of Ocean and Mechanical Eng. College of Science, Department of Biological Sciences

Approved by	***Date***
Department Chair	02/03/17
College Curriculum Chair	2/6/17
College Dean	2/6/17
UGPC Chair	3-1-2017
Graduate College Dean	3-5-17
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

Department of Computer & Electrical Engineering and Computer Science
Florida Atlantic University
Course Syllabus

1. Course title/number, number of credit hours	
Nanobiotechnology EEE 5425	# of credit hours = 3
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Prerequisites: Graduate level standing in engineering and/or physical/biological sciences	
3. Course logistics	
Term: Fall 2017 Location: TBD	
4. Instructor contact information	
Instructor's name *Office address* *Office Hours* *Contact telephone number* *Email address*	Waseem Asghar, PhD Bldg. EE 96/ Room 435 TBD 561-297-2800 wasghar@fau.edu
5. TA contact information	
TA's name *Office address* *Office Hours* *Contact telephone number* *Email address*	TBD
6. Course description	
This course covers the sensing and characterization of biological entities with novel nanoscale devices and nano-object mediated modalities. It also covers the fundamentals of nanotechnology in biological and biomedical research. The sensing and characterization of biological entities, processes and events, with novel nanoscale devices and nano-object mediated modalities, will have immediate and far reaching impacts. The course work is approached from an engineering perspective offering insights on the details of nanoscale fabrication processes as well as cell biology. The basics of biology and chemistry, with focus on how to engineer the behavior of molecules at the nanoscale, are also introduced and analyzed. Concepts and processes related to BioMEMS and microfluidics will also be explained.	
7. Course objectives/student learning outcomes/program outcomes	
Course objectives	To introduce the students to the concepts of nanobiotechnology and its applications in biological and biomedical engineering, pharmaceuticals, diagnostics, and public health. Students will also learn material properties of natural and synthetic materials and their applications in biomedical engineering.
8. Course evaluation method	
5 Homework assignments (4% each): 20% Key paper review: 20%	For key paper review, each student has to find a key paper in nanobiotechnology which has first

Group research proposal: 20% Midterm exam: 20% Final exam: 20%	reported some fundamentally novel mechanism, method, or technique which laid the foundation of significant work later on. Student has to make a presentation on this paper and present in class. For group research proposal, students will be divided into groups of 2-3 students. Each group will propose an interesting topic related to latest key advances in the field of Silicon Integrated Circuit Fabrication. Each group will present and defend their proposal topic in class.

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

Students are strongly suggested to inform the instructor in advance in the case of emergency (if possible). Makeup exams are given only if there is solid evidence of a medical or otherwise serious emergency that prevents the student of participating in the exam.

Students must turn in homework, assignment and projects on time. Students will lose 25% (after 1 day) and 50% of marks (after 2 days) if they turn in late. Submissions are not accepted after 2nd day of due date.

11. Special course requirements

NA

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 Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS)—in Boca Raton, SU 133 (561-297-3880); in Davie, LA 131 (954-236-1222); or in Jupiter, SR 111F (561-799-8585) —and follow all SAS 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

No textbook is required

16. Supplementary/recommended readings

Books:

Mauro Ferrari Ph.D., Abraham P. Lee, L. James Lee: *BioMEMS and Biomedical Nanotechnology*, ISBN: 978-0-387-25563-7 (Print) 978-0-387-25842-3 (Online), 2006

Iqbal, Samir M., Bashir, Rashid (Eds.): *Nanopores Sensing and Fundamental Biological Interactions*, ISBN 978-1-4419-8252-0, 2011

Research Articles:

M. Sher, R. Zhuang, V. U. Demirci, W. Asghar, "Paper-based analytical devices for clinical diagnosis: recent advances in the fabrication techniques and sensing mechanisms," Expert Review of Molecular Diagnostics, Accepted, DOI: 10.1080/14737159.2017.1285228 (2017)

W. Asghar, H. Shafiee, V. Velasco, V. R. Sah, S. Guo, R. El Assal, F. Inci, A. Rajagopalan, M. Jahangir, R. M. Anchan, G. L. Mutter, M. Ozkan, C. S. Ozkan, and U. Demirci "Toxicology Study of Single-walled Carbon Nanotubes and Reduced Graphene Oxide in Human Sperm," Scientific Reports, vol 6, article 30270 (2016)

K. Rappa, HF Rodriguez, GC Hakkarainen, RM. Anchan, GL. Mutter, W. Asghar, "Sperm processing for advanced reproductive technologies: Where are we today?", Biotechnoloy Advances, doi:10.1016/j.biotechadv.2016.01.007 (2016)

M. Safavieh, C. Coarsey, N. Esiobu, A. Memic, J. Mahesh, H. Shafiee, W. Asghar, "Advances in Candida Detection Platforms for Clinical and Point-of-Care Applications", Critical Reviews in Biotechnology, DOI:10.3109/07388551.2016.1167667 (2016)

W. Asghar, M. Yuksekkaya, H. Shafiee, M. Zhang, M. Ozen, F. Inci, M. Kocaculak, U. Demirci, "Engineering long shelf life multi-layer biologically active surfaces on microfluidic devices for point of care applications", Scientific Reports, 6: 21163 (2016)

M. Safavieh, M.K. Kanakasabapathy, F. Tarlan, M. Ahmed, M. Zourob, W. Asghar#, and H. Shafiee#, "Emerging Loop-mediated Isothermal Amplification-based Microchip and Microdevice Technologies for Nucleic Acid Detection", ACS Biomaterials Science and Engineering", vol. 2, no. 3, 2016

W. Asghar*#, R. EL Assal*, H. Shafiee, S. Pitteri, R. Paulmurugan, and U. Demirci#, "Engineering cancer microenvironments for in vitro 3-D tumor models", Materials Today, vol 18, no. 10, (2015)

H. Shafiee, W. Asghar, F. Inci, M. Yuksekkaya, M. Jahangir, M. H. Zhang, N.G. Durmus, U.A. Gurkan, D. R. Kuritzkes, and U. Demirci, "Paper and flexible substrates as materials for biosensing platforms to detect multiple biotargets," Scientific Reports, 5, (2015)

W. Asghar, V. Velasco, J.L. Kingslye, M.S. Shoukat, H. Shafiee, R.M. Anchan, G.L. Mutter, E. Tuzel, and U. Demirci, "Selection of functional human sperm with higher DNA integrity and fewer reactive oxygen species," Advanced HealthCare Materials, vol 3. no. 10 (2014)

Department of Computer & Electrical Engineering
and Computer Science
Florida Atlantic University
Course Syllabus

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

Weekly Schedule	Topics
Week 01	Introduction to Nanobiotechnology, historical prospective, solid-state fabrication, Moore's law and its implication in bioengineering. Basic semiconductor materials, Crystal structure, Miller indices, Crystalline materials.
Week 02	Standard fabrication processes and modules, oxidation (wed and dry), oxide properties, Photolithograpy Projection Lithography, Pitch limit and diffraction, Light sources
Week 03	Doping, Diffusion, Ion Implantation, dry etching, wet etching, Isotropic and anisotropic etching. Deep reactive ion etching, LPCVD, PECVD, PVD **HW-1**
Week 04	Trade-offs in lithography, next generation lithography. X-Ray lithography, XPS, Auger electron spectroscopy, EUV lithography, Proximal X-ray lithography
Week 05	E-beam lithography, Focused ion beam lithography, Projection e-beam and ion beam lithography Scanning probe lithography, atomic force lithography **Key paper review nomination**
Week 06	Dip pen lithography, AFM lithography by local probe oxidation, STM lithography Soft lithography, contact printing, PDMS properties **HW-2**
Week 07	Micro transfer molding, replica molding, PDMS issues, CD based fluidics Nanoimprint lithography, step and flash lithography
Week 08	Biomolecules, cells and organelles, chemical structure of phospholipids Functional groups, structure of nucleic acids, genes, electronics properties of nucleic acids, aptamers **HW-3**
Week 09	DNA structure and fundamentals, human genome project **Midterm Exam**

Week 10	**Presentations for Key Paper Reviews**
Week 11	DNA microarrays, Integration of bionano, need to biosensing, electronic properties of biomaterials Molecular sensing, DNA hybridization, Annealing, Polymerase chain reaction (PCR), DNA replication and amplification. **HW-4**
Week 12	Real-time PCR, SYBR staining, Taqman, Scorpian, RT-PCR, PCR on-chip, microfluidics Next generation sequencing, ion torrent technology, Solid-state and biological nanopores for DNA analysis
Week 13	**Group Research Proposal Presentations**
Week 14	Gene translation and expression (mRNA, tRNA, rRNA) Types and structure of protein, types of amino acids, surface funcationalization with protein and DNA/RNA probes **HW-5**
Week 15	Nanowires, synthesis, nanowire biosensors Quantum dot confinement, carbon nanotubes and graphene, synthesis and their applications in biomedical engineering
	Final Exam

Re: Request of approval - new course in Nanobiotechnolgy.

Tsung-Chow Su
Sent: Tuesday, January 31, 2017 2:41 PM
To: Waseem Asghar
Cc: Mihaela Cardei; Zvi Roth; Nurgun Erdol

Dear Professor Asghar,

Thanks for sending me syllabus of new course you proposed.

This appears to be an excellent course and I look forward it being offered.

Best

Joe

Sent from my iPhone

On Jan 31, 2017, at 2:33 PM, Waseem Asghar <wasghar@fau.edu> wrote:

> Dear Dr. Su,
> The Department of Computer & Electrical Engineering and Computer Science (CEECS) is proposing a new course: EEE 5425 - Nano Biotechnology. Please see the attached syllabus for this course.
>
> I heard that you have taught a course on "nanotechnology" before, just wondering if you can look at the attached syllabus and send me an email in the support of this course (if you like it) which may be helpful during the course approval process. I will be happy to hear if you have any suggestions.
>
> Thanks
> Waseem
>
> --
> Regards,
> Waseem Asghar, Ph.D.,
> Assistant Professor,
> Department of Computer & Electrical Engineering and Computer Science,
> Department of Biological Sciences (Joint Appointment),
> Florida Atlantic University,
> 777 Glades Road, EE 96/Rm 435, Boca Raton, FL 33431
> Ph: 561.297.3728
> Fax: 561.297.2800
> http://faculty.eng.fau.edu/asghar/

<SACS FORM-Nanobiotechnology (EEE 5425)-Waseem.docx>

RE: Request of approval - new course in Nanobiotechnolgy.

Michelle Cavallo
Sent: Wednesday, February 01, 2017 10:35 AM
To: Waseem Asghar
Cc: Mihaela Cardei; Zvi Roth; Nurgun Erdol; Rodney Murphey

Dear Dr. Asghar,

Our apologies for the delay. On behalf of Dr. Rod Murphey, I am writing to confirm that the Department of Biological Sciences supports this proposal.

All the best,

Michelle

Michelle Cavallo
Administrative Assistant & Graduate Coordinator
Department of Biological Sciences
Florida Atlantic University
777 Glades Road
Boca Raton, FL 33431
PH: 561-297-0384

From: Waseem Asghar [mailto:wasghar@fau.edu]
Sent: Tuesday, January 31, 2017 2:46 PM
To: Michelle Cavallo <MCAVALLO@fau.edu>
Cc: Mihaela Cardei <mcardei@fau.edu>; Zvi Roth <rothz@fau.edu>; Nurgun Erdol <erdol@fau.edu>; Rodney Murphey <RMURPHEY@fau.edu>
Subject: Re: Request of approval - new course in Nanobiotechnolgy.

Hi Michelle,
Just wondering if you get a chance to talk to Dr. Murphey about the new course proposal (see below email for further details. Thank you

--
Regards,
Waseem Asghar, Ph.D.,
Assistant Professor,
Department of Computer & Electrical Engineering and Computer Science,
Department of Biological Sciences (Joint Appointment),
Florida Atlantic University,
777 Glades Road, EE 96/Rm 435, Boca Raton, FL 33431
Ph: 561.297.3728
Fax: 561.297.2800
http://faculty.eng.fau.edu/asghar/

From: Waseem Asghar
Sent: Friday, January 27, 2017 11:28 AM
To: Michelle Cavallo
Subject: Fwd: Request of approval - new course in Nanobiotechnolgy.

Hi Michelle,
I just talked to you over phone. Please see the below email. Thank you for your help

Regards,
Waseem
Assistant Professor,
CEECS, College of Eng and Comp Sci
FAU, Boca Raton, FL 33431
Sent from my iPhone, excuse for brevity

Begin forwarded message:

From: Waseem Asghar <wasghar@fau.edu>
Date: January 26, 2017 at 12:32:56 PM EST
To: Rodney Murphey <RMURPHEY@fau.edu>
Cc: Nurgun Erdol <erdol@fau.edu>, Mihaela Cardei <mcardei@fau.edu>
Subject: RE: Request of approval - new course in Nanobiotechnolgy.

Dear Dr. Murphey,
The Department of Computer & Electrical Engineering and Computer Science (CEECS) is proposing a new course: EEE 5425 - Nano Biotechnology. Please see the attached syllabus for this course.

We need your approval that Department of Biological Sciences has no objection to this new course proposal. Can you please review the syllabus and email me your decision on approval? Thank you for your time.

Thanks
Waseem

--
Regards,
Waseem Asghar, Ph.D.,
Assistant Professor,
Department of Computer & Electrical Engineering and Computer Science,
Department of Biological Sciences (Joint Appointment),
Florida Atlantic University,
777 Glades Road, EE 96/Rm 435, Boca Raton, FL 33431
Ph: 561.297.3728
Fax: 561.297.2800
http://faculty.eng.fau.edu/asghar/

From: Waseem Asghar
Sent: Thursday, December 15, 2016 3:37 PM
To: Rodney Murphey
Cc: Mihaela Cardei; Nurgun Erdol
Subject: Request of approval - new course in Nanobiotechnolgy.

Dear Dr. Murphey,
The Department of Computer & Electrical Engineering and Computer Science (CEECS) is proposing a new course: EEE 5425 - Nano Biotechnology. Please see the attached syllabus for this course.

We need your approval that Department of Biological Sciences has no objection to this new course proposal. Can you please review the syllabus and email me your decision on approval? Thank you and Happy Holidays.

--

Regards,
Waseem Asghar, Ph.D.,
Assistant Professor,
Department of Computer & Electrical Engineering and Computer Science,
Department of Biological Sciences (Joint Appointment),
Florida Atlantic University,
777 Glades Road, EE 96/Rm 435, Boca Raton, FL 33431
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