
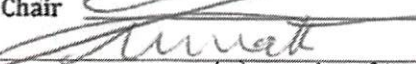
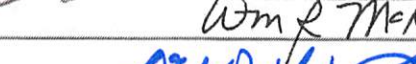

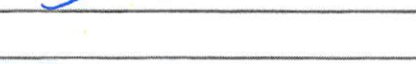
 FLORIDA ATLANTIC UNIVERSITY	NEW COURSE PROPOSAL Graduate Programs		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department Computer & Elec. Eng. and Computer Sci College College of Engineering and Computer Science <i>(To obtain a course number, contact erudolph@fau.edu)</i>		
Prefix EEE Number 5425	<i>(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)</i> Lab Code	Course Title Nanobiotechnology	
Credits <i>(Review Provost Memorandum)</i> 3	Grading <i>(Select One Option)</i> Regular <input checked="" type="radio"/> Sat/UnSat <input type="radio"/>	Course Description <i>(Syllabus must be attached; see Guidelines)</i> 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.	
Effective Date <i>(TERM & YEAR)</i> Fall 2017	Prerequisites Graduate level standing in engineering and/or physical/biological sciences		Corequisites N/A
		Registration Controls <i>(Major, College, Level)</i> Graduates, Seniors (College of Engineering or College of Science)	
<i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course</i>			
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	
<i>Instructor's name</i>	Waseem Asghar, PhD
<i>Office address</i>	Bldg. EE 96/ Room 435
<i>Office Hours</i>	TBD
<i>Contact telephone number</i>	561-297-2800
<i>Email address</i>	wasghar@fau.edu
5. TA contact information	
<i>TA's name</i>	TBD
<i>Office address</i>	
<i>Office Hours</i>	
<i>Contact telephone number</i>	
<i>Email address</i>	
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	
<i>Course objectives</i>	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

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Group research proposal: 20% Midterm exam: 20% Final exam: 20%	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 2 nd 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		

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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?," *Biotechnology 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
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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 (wet and dry), oxide properties, Photolithography 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

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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, Scorpion, 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 functionalization 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

2/1/2017

Re: Request of approval - new course in Nanobiotechnology.

Re: Request of approval - new course in Nanobiotechnology.

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>

2/1/2017

RE: Request of approval - new course in Nanobiotechnology.

RE: Request of approval - new course in Nanobiotechnology.

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 Nanobiotechnology.

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 Nanobiotechnology.

2/1/2017

RE: Request of approval - new course in Nanobiotechnology.

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 Nanobiotechnology.

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 Nanobiotechnology.

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.

--

2/1/2017

RE: Request of approval - new course in Nanobiotechnology.

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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