

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>NEW COURSE PROPOSAL</b> <b>Graduate Programs</b>		UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner _____ Catalog _____	
	<b>Department</b>  <b>College</b> (To obtain a course number, contact <a href="mailto:erudolph@fau.edu">erudolph@fau.edu</a> )			
<b>Prefix</b>  <b>Number</b> 5741	(L = Lab Course; C = Combined Lecture/Lab; add if appropriate) <b>Lab Code</b>	<b>Type of Course</b>	<b>Course Title</b>	
<b>Credits</b> (See <a href="#">Definition of a Credit Hour</a> )	<b>Grading</b> (Select One Option)  <b>Regular</b>  <b>Sat/UnSat</b>	<b>Course Description</b> (Syllabus must be attached; see <a href="#">Template</a> and <a href="#">Guidelines</a> )		
<b>Effective Date</b> (TERM & YEAR)				
<b>Prerequisites</b>      <i>Prerequisites, Corequisites and Registration Controls are enforced for all sections of course.</i>		<b>Academic Service Learning (ASL) course</b> Academic Service Learning statement must be indicated in syllabus and approval attached to this form.		
		<b>Corequisites</b>	<b>Registration Controls</b> (For example, Major, College, Level)	
<b>Minimum qualifications needed to teach course:</b> Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field).		<b>List textbook information in syllabus or here</b>		
<b>Faculty Contact/Email/Phone</b>		<b>List/Attach comments from departments affected by new course</b>		

<b>Approved by</b> Department Chair _____ <i>Javad Hashemi</i> College Curriculum Chair _____ <i>Francisco Presuel-Moreno</i> College Dean _____ <i>Raquel Assis</i> UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	<b>Date</b> 3/10/25 3/11/2025 3/11/2025 _____ _____ _____ _____ _____
---	---

Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) 10 days before the UGPC meeting.

**Department of Biomedical Engineering, Florida Atlantic University Course  
Syllabus**

<b>1. Course title/number, number of credit hours</b>	
Electron Microscopy, BME 5741	3 credit hours
<b>2. Instructional Method</b>	
<p>This class consists of lectures which will be conducted in class and/or live using WebEx or Zoom, and recorded so students can watch the lectures at a later time and date.</p> <p>You will need to have a computer (or laptop), a reliable WIFI access, and a webcam and micro-phone connected to your computer if you wish to enroll in distance-learning option.</p> <p>Please note: Students will be required to attend instrument demonstrations and take exam on campus.</p>	
<b>3. Course pre-requisites, co-requisites, and where the course fits in the program of study</b>	
<p>Prerequisites: None.</p> <p>This course is designed for any student in science, engineering, or medicine with an interest in electron microscopy.</p>	
<b>4. Course logistics</b>	
<p><b>Term:</b> TBA</p> <p><b>Time &amp; Location:</b> TBA</p>	
<b>5. Instructor contact information</b>	
<p>Instructor's name: Dr. Vivian Merk</p> <p>Office address: SE 43, Rm. 138</p> <p>Office Hours: TBA</p> <p>Contact telephone number: 561 297 3819</p> <p>Email address: vmerk@fau.edu</p>	
<b>6. TA contact information</b>	
<i>TA's name</i> <i>Office address</i> <i>Office Hours</i> <i>Contact telephone number</i> <i>Email address</i>	TBA TBA TBA TBA TBA
<b>7. Course description</b>	
<p>Course topics:</p> <ul style="list-style-type: none"> <li>- Imaging with light vs. electrons</li> <li>- Scanning Electron Microscopy (SEM)</li> <li>- Transmission Electron Microcopy (TEM)</li> <li>- Preparation of TEM samples for materials and life sciences</li> <li>- Scanning Transmission Electron Microscopy (detectors, applications)</li> <li>- Energy-dispersive X-ray Spectroscopy (EDS)</li> <li>- Electron Energy Loss Spectroscopy (EELS)</li> </ul>	

**Department of Biomedical Engineering, Florida Atlantic University Course  
Syllabus**

<p>- Advanced topics (e.g., Electron Tomography, in-situ TEM, cryo-TEM, Correlative Imaging)</p>	
<p><b>8. Course objectives/student learning outcomes/program outcomes</b></p>	
<p><i>Course objectives</i></p>	<p>This course will provide an in-depth introduction to Scanning Electron Microscopy (SEM) and transmission Electron Microscopy (TEM) in materials and life science. The course will enable students to understand the physical principles of electron microscopy, discuss suitable sample preparation strategies, and learn about state-of-the-art developments (e.g., Electron Energy Loss Spectroscopy, in-situ TEM). This course will include hands-on demonstrations at FAU's SEM and TEM facilities.</p>
<p><i>Student learning outcomes &amp; relationship to ABET 1-7 objectives</i></p>	<p>The student will learn how to solve complex engineering problems by applying their knowledge of science, engineering and mathematics (1). Students will discuss the pros and cons of different sample preparation and characterization methods (2, 4). To apply engineering design to produce solutions, the course will cover recent developments and technologies in the field of electron microscopy (2). Active participation in class is encouraged (3). Students will give a presentation on a current topic of their choice in front of a diverse audience (3). To foster inquiry-based learning, students will watch pre-recorded experiments, participate in hands-on demonstrations and draw conclusions from their experimental observations (6). Students will extract information from various media, e.g. research publications (7).</p>
<p><b>9. Course evaluation method</b></p>	
<p>Homework assignments (20%), research talk and report (20%), midterm exam (30%), final exam (30%) = 100% Graduate students will be asked to give a research talk and write a report on a current topic in Electron Microscopy.</p>	
<p><b>10. Course grading scale</b></p>	
<p>100-92(A), 91-90(A-), 89-88(B+), 87-82(B), 81-80(B-), C+(79-78), C (77-71), C- (70), D+ (69-68), D (67-61), D- (60), F (less than 60) Note: For graduate students, the minimum grade required to pass the course is C.</p>	
<p><b>11. Policy on makeup tests, late work, and incompletes</b></p>	
<p><i>Makeup tests</i> are given only if there is solid evidence of a medical or otherwise serious emergency before the tests that prevented the student of participating in the exam. Makeup exams should be administered and proctored by department personnel unless there are other pre-approved arrangements. Exams can be seen after taken, but not after the subsequent exam is taken. The final exam can be seen the day after grades are posted on Canvas. No grade changes will be allowed after a week from the final exam day. After that period, the grade stands. <b><i>Late work without verifiable justification will NOT be graded.</i></b></p>	

**Department of Biomedical Engineering, Florida Atlantic University Course  
Syllabus**

*Incomplete grades* are against the policy of the department. Unless there is solid evidence of medical or otherwise serious emergency situation incomplete grades will not be given.

**12. Special course requirements**

N/A

**13. 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, are to be turned off in class sessions.

**14. Policy on the Recording of Lectures**

Students enrolled in this course may record video or audio of class lectures for their own personal educational use. A class lecture is defined as a formal or methodical oral presentation as part of a university course intended to present information or teach students about a particular subject. Recording class activities other than class lectures, including but not limited to student presentations (whether individually or as part of a group), class discussion (except when incidental to and incorporated within a class lecture), labs, clinical presentations such as patient history, academic exercises involving student participation, test or examination administrations, field trips, and private conversations between students in the class or between a student and the lecturer, is prohibited. Recordings may not be used as a substitute for class participation or class attendance and may not be published or shared without the written consent of the faculty member. Failure to adhere to these requirements may constitute a violation of the University's Student Code of Conduct and/or the Code of Academic Integrity.

**15. Attendance Policy Statement**

Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.

**16. 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) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and

**Department of Biomedical Engineering, Florida Atlantic University Course  
Syllabus**

Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at [www.fau.edu/sas/](http://www.fau.edu/sas/)

**17. Counseling and Psychological Services Center**

Life as a university student can be challenging physically, mentally and emotionally. Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <http://www.fau.edu/counseling/>

**18. Code of Academic Integrity Policy Statement**

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](http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf)

Cell phones are not allowed during exams. If cell phones are detected during any exam periods, this will result in a **grade of "zero" on that exam and a note in the student's academic file.**

**19. Required texts/reading/Lab kits**

Textbook: Peter J. Goodhew, John Humphreys, Richard Beanland, Electron Microscopy and Analysis, 3rd Edition, 2000, 272pp, softcover, ISBN 0-748-40968-8.

**20. Supplementary/recommended readings**

Lecture notes, additional course material, and homework assignments will be uploaded on Canvas.

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

**Course Topics (tentative course schedule):**

- 1) History of electron microscopy; principle of imaging with light vs. electrons
- 2) Electrons and their interactions with the specimen
- 3) Scanning Electron Microscopy (SEM): Instrument components, imaging modes, applications
- 4) Electron Diffraction
- 5) Transmission Electron Microscopy (TEM): Instrument components, imaging contrast, applications
- 6) Scanning Transmission Electron Microscopy (STEM)
- 7) Chemical Analysis in the Electron Microscope (EDS, EBSD, EELS)
- 8) Sample Preparation for Life Sciences: Fixation, dehydration, embedding, thin sectioning (ultramicrotomy), cryo-preparation

**Department of Biomedical Engineering, Florida Atlantic University Course  
Syllabus**

- 9) Sample Preparation for Materials Science: Electropolishing, mechanical polishing, cleaving, Focused Ion Beam (FIB)
- 10) Recent Developments (e.g., Electron Tomography, in-situ TEM, cryo-TEM, Correlative Imaging)

**Exam Dates:**

Midterm exam: TBA

Final exam: TBA