

# **APP PHYS 401-1 and 402-1**

## **LIST OF SUBSTITUTE CLASSES**

**Note:**

The following list is not comprehensive. It is continually being updated with the help of Applied Physics students.

Since syllabi of classes can change, it is **the student's responsibility to confirm** with the respective instructor that an

- **APP PHYS 401-1 substitute has a significant, hands-on computational component,**
- **APP PHYS 402-1 substitute has a significant, hands-on laboratory component.**

**Classes not yet listed require approval from the Director of Graduate Studies.**

## APP PHYS 401-1 Computational Methods of Applied Physics

- CHEM 448: Computational Chemistry
- CHEM ENG 451: Applied Molecular Modeling
- EECS 495/395 Machine Learning: Foundations, Applications and Algorithms  
(Note: there are different classes listed under EECS 495; approval is for this specific one.)  
<http://eecs.northwestern.edu/course-list/914-eecs395-495-machine-learning-foundations-applications-and-algorithms>
- EECS 463: Adaptive Filters  
[http://www.ece.northwestern.edu/%7Emh/463/course\\_des](http://www.ece.northwestern.edu/%7Emh/463/course_des)  
(Must complete computational project for approval.)
- ES\_APPM 446 - 2: Numerical Solution of Partial Differential Equations  
<http://www.esam.northwestern.edu/courses/descriptions/446-2-numerical-solution-of-partial-differential-equations.html>
- MAT\_SCI 458: Atomic Scale Computational Materials Science  
<http://matsci.northwestern.edu/courses/descriptions/458.html>
- MECH\_ENG 417: Multiscale Modeling and Simulation in Mechanics I  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/417-multiscale-modeling-and-simulation-in-mechanics-I.html>
- MECH\_ENG 418: Multiscale Modeling and Simulation in Mechanics II  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/418-multiscale-modeling-and-simulation-in-mechanics-II.html>
- MECH\_ENG 423: Introduction to Computational Fluid Dynamics  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/423-introduction-to-computational-fluid-dynamics.html>
- MECH\_ENG 426-1 or 2: Advanced Finite Element Methods  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/426-1-advanced-finite-element-methods-I.html>  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/426-2-advanced-finite-element-methods-II.html>
- PHYS 430: Nonlinear Dynamics And Chaos  
<http://www.physics.northwestern.edu/graduate/doctorate/catalog.html>
- EECS 495-0-77 Optimization techniques for machine learning and deep learning  
<http://www.mccormick.northwestern.edu/eecs/courses/descriptions/395-495-44.html>
- EECS 495-0-78 Deep learning from scratch  
<http://www.mccormick.northwestern.edu/eecs/courses/descriptions/395-495-45.html>

## APP PHYS 402-1 Experimental Methods of Applied Physics

- MECH\_ENG 433: Advanced Mechatronics  
<http://www.mccormick.northwestern.edu/mechanical/courses/descriptions/433-advanced-mechatronics.html>
- MAT\_SCI 460: Electron Microscopy  
<http://matsci.northwestern.edu/courses/descriptions/460.html>
- MAT\_SCI 461: Diffraction Methods in Material Science  
<http://matsci.northwestern.edu/courses/descriptions/461.html>
- MAT\_SCI 465: Advanced Electron Microscopy & Diffraction  
<https://www.mccormick.northwestern.edu/materials-science/courses/descriptions/465.html>
- MAT\_SCI 466: Analytical Electron Microscopy  
<http://matsci.northwestern.edu/courses/descriptions/466.html>