**ICS 2207 Scientific Computing**

**Week 1: Introduction to Scientific Computing and Python**

* Overview of Scientific Computing
* Basics of Python Programming
* Reference: Langtangen, H. P. (2016). A Primer on Scientific Programming with Python.

**Week 2: Python Programming Foundations**

* Data Types, Variables, and Basic Operations
* Control Structures (Loops, Conditionals)
* Reference: Lutz, M. (2013). Learning Python.

**Week 3: Functions and Modules in Python**

* Writing Functions
* Organizing Code with Modules and Packages
* Reference: Hetland, M. L. (2017). Beginning Python: From Novice to Professional.

**Week 4: Numerical Computing with NumPy**

* NumPy Arrays and Operations
* Basic Numerical Methods
* Reference: VanderPlas, J. (2016). Python Data Science Handbook.

**Week 5: Data Visualization with Matplotlib**

* Introduction to Matplotlib
* Plotting Graphs, Histograms, and Other Visualizations
* Reference: Hunter, J. D., et al. (2018). Matplotlib for Python Developers.

**Week 6: Scientific Data Processing with Pandas**

* Data Analysis with Pandas
* Reading and Writing Data
* Reference: McKinney, W. (2017). Python for Data Analysis.

**Week 7: Midterm Week (Review and Examination)**

**Week 8: Symbolic Computing with SymPy**

* Introduction to Symbolic Computation
* Algebra, Calculus, and Equation Solving
* Reference: Meurer, A., et al. (2017). SymPy: symbolic computing in Python.

**Week 9: Statistical Analysis in Python**

* Descriptive Statistics and Probability
* Hypothesis Testing and Inference
* Reference: VanderPlas, J. (2016). Python Data Science Handbook.

**Week 10: Introduction to Machine Learning with Scikit-Learn**

* Basic Concepts of Machine Learning
* Implementing Simple Models
* Reference: Géron, A. (2019). Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow.

**Week 11: Scientific Simulations**

* Basic Principles of Scientific Simulation
* Case Studies in Scientific Computing
* Reference: Langtangen, H. P., & Linge, S. (2016). Finite Difference Computing with PDEs.

**Week 12: High-Performance Scientific Computing**

* Introduction to Parallel Computing
* Performance Optimization Techniques
* Reference: Gorelick, M., & Ozsvald, I. (2015). High Performance Python.

**Week 13: Special Topics in Scientific Computing**

* Choose from: Computational Biology, Computational Physics, Data Mining, etc.
* Reference: Varied based on the topic selected.

**Week 14: Course Wrap-up and Project Presentations**

* Review of Key Concepts
* Final Project Presentations

**Assignments and Assessments**

* Weekly Programming Assignments
* Midterm Exam (Week 7)
* Final Project (Week 14)
* Final Exam (During Exam Period)

This outline provides a comprehensive approach to learning scientific computing using Python, with each week dedicated to a specific area. The references included are standard resources that offer in-depth coverage of each topic.