Requirements - M.S. in Computational Physics and Astronomy

This degree is a subspeciality program for students with a background in physics, astronomy, computer science, mathematics, or engineering who wish to become familiar with computer--based approaches to problems in these fields. Minimum preparation expected includes a year's course in general physics, mathematics through differential equations, and a knowledge of either FORTRAN, C++ or another programming language.

A total of 30 hours of graduate credit is required for the degree. The 33 hours listed below under parts 1 and 2 may include certain undergraduate level EECS courses. (Only courses numbered 500 or above count as graduate credit.) Students entering the program may have satisfied several of these requirements but a total of 30 hours of graduate credit is still required. No more than the required six hours of PHSX 899 (Master's Research/Thesis) may be counted toward the degree.

1. Within 12 months of entering the program the student must fulfill the undergraduate physics certification requirement for all graduate degrees.

2. Required courses (21 credit hours):
    - **PHSX/ASTR 815** Computational Physics and Astronomy (3)
    - **PHSX 718** Mathematical Physics (3)
    - **MATH/EECS 781** Numerical Analysis I (3)
    - **EECS** - one course at the 300 level or above (in addition to EECS 781) (3) (Note: courses below the 500 level will not count towards the required 30 hours of graduate credit.)
    - One additional PHSX/ASTR/ATMO lecture course at the 500 level or above (3)
    - **PHSX 899** Master's Research/Thesis (6)

3. Twelve (12) or more credits from the following list of courses:
   (Note: No double counting: a course used to fulfill a requirement under A. (e.g. EECS 448) may not also be counted under B.)
    - **EECS 360** Signal and System Analysis (3) *
    - **EECS 368** Functional Programming (3) *
    - **EECS 388** Computer Systems and Assembly Language (4) *
    - **EECS 448** Software Engineering I (3) *
    - **EECS 560** Data Structure (3)
    - **EECS 672** Introduction to Computer Graphics (3)
    - **EECS 848** Software Engineering II (3)
    - **MATH 596, 696, or 796** - Special Topics (Examples of recent topics: Mathematics of Wall Street Computer-aided, Study of Differential Geometry, Chaos and Fractals , Fractional Brownian Motion and Its

Applications, Wavelet Analysis,Statistical Theory , Stochastic Differential Equations and Applications
- **MATH 611** Fourier Analysis of Time Series (3)
- **MATH 627** Probability (3)
- **MATH 647** Partial Differential Equations (3)
- **MATH/EECS 782** Numerical Analysis II (3)
- **MATH 783** Applied Num. Methods for PDEs (3)
- **PHSX/ASTR/ATMO** Courses Numbered 500 and above

* Courses below the 500 level do not count towards the required 30 hours of graduate credit.

4. Communication Skills
   All graduate students, after their first semester, will deliver at least one oral presentation per semester. The guidlines are listed here.

5. Thesis
   An important component of this degree is the completion and documentation of a successful computer project. A thesis must be presented that describes the basic physics involved in the project, the method of implementing the project, and a discussion of the results. An oral defense of the thesis is required before a committee of at least three members of the graduate faculty.

6. An Example Schedule
   (This schedule is meant only to illustrate one possible set of courses that would allow one to complete the degree in two years.)

FA Year 1	PHSX 718 (3)	MATH 781 (3)	EECS 448 (3)
SP Year 1	PHSX 815 (3)	MATH 796 (3)	PHSX/ASTR/ATMO (500 or above) (3)
FA Year 2	MATH 647 (3)	PHSX 671 (3)	PHSX 899 (3)
SP Year 2	PHSX 721 (3)	MATH 783 (3)	PHSX 899 (3)