International option for PHY832 and PHY480 - Spring 2014
International Course on Computational Physics (ICCP)

This course is run jointly by Professor Phillip Duxbury at MSU and Professor Jos Thijssen from Delft University of Technology (TUDelft) in the Netherlands and is now in its 11th year. A maximum of 10 MSU-PA students can enroll in the course. Students from MSU are partnered with one or two students from Delft and they work collaboratively on a series of three or four projects. **In the 2014 course students from Delft will visit MSU for the week February $1^{st} – 7^{th}$** and during that week the first project will be developed to an advanced stage. MSU students will visit Delft in May 2014 (usually the week after finals) and complete the last project of the course. During the semester there will be video conferences and email communications to maintain the international collaborations. During the week of the Dutch visit MSU students need to commit a significant fraction of their time to the course, and there are usually some evening social events. On the last day of the course in Delft (May), each group will give a 20min presentation on their last project. Each project requires submission of a write up (in latex) of the project and results found, along with a copy of the computer code that was developed. The project reports and final presentation form the basis for the course assessment.

The ICCP course develops students' ability to write computer programs for simulating many body classical and quantum physics systems. Groups choose either Fortran 90 or C++ as their coding language. The course is project based and Socratic in style. Students are encouraged to think of their own solutions to setting up the simulation problems and coding them. All students do the same warm up project (MC for and Ising model) and the same first joint project which involves writing a molecular dynamics code for simulation of Argon. The second project involves writing a Monte Carlo code and students may choose between simulation of polymer conformations, quantum Monte Carlo or cluster Monte Carlo. The third and/or fourth projects may be chosen from many possibilities, and can involve suggestions by the students. Each group works on a different project and makes a presentation on the last day of the course. Students from MSU receive $300 to assist with their air ticket to the Netherlands. Often MSU graduate students are able to cover the rest of their airfare from either their research group, from the College of Natural Science or from the Graduate School. The hotel costs and a per diem of about 20 euros are provided by Delft University of Technology while students are visiting Delft to participate in the course.

Prerequisites: Basic programming skills in a programming language like Fortran, C or C++. Basic understanding of numerical methods. Understanding of quantum mechanics and statistical mechanics at the junior/senior undergraduate level. Once an MSU student is partnered with a TUDelft student they can choose the programming language they want to use for their projects. Students from the CMP, Nuclear and HEP groups at MSU have taken this course in the past.

P.S. Professor Thijssen is the author of a well known testbook on computational physics and is the director of the nanoscience program at TUDelft.