What will be covered in the core courses?

Computational Science Methods

Gain an understanding of measurement error and computational accuracy, while learning about statistical methods for model validation. Develop introductory modeling skills with a software system (e.g. MATLAB). Utilize integrated problem-solving methods found in modern research facilities and high-technology workplaces.

Modeling and Simulation

Learn more about the role of modeling and simulation in science; approaches to modeling, issues of computational accuracy, model verification and validation; and example models of linear and non-linear systems. Obtain a working knowledge of a modeling package such as MATLAB and complete a project that produces a model, related visualizations of the results and a technical report describing the projects.

Computational Biology, Computational Chemistry or Computational Physics

Develop mathematical models of biological, chemical, or physical systems using the computational methods most appropriate for that discipline. Construct simulations from the models using those computational tools, explore the complex systems using the simulations and present the results effectively in oral and written form.

Research or Internship Experience

Complete a research or internship experience of at least 1-2 months by applying developing computational skills to a research problem under the direction of a faculty member or as an intern with a private firm. Work on the practical project and assemble a project report.

Electives that are part of an undergraduate minor:

Differential Equations & Discrete Dynamical Systems
Programming & Algorithms
Distributed/Parallel Programming
Scientific Visualization
Optimization

Ralph Regula School of Computational Science
an initiative of the Ohio Supercomputer Center

National Science Foundation, DUE-0703087

What is the benefit of an Associate of Science degree with a concentration in Computational Science?

An Associate of Science degree with a concentration in Computational Science gives you a high-quality, closer-to-home start toward a baccalaureate degree with a major in science or engineering, enhanced with a minor in computational science. The program will provide students like you, who have expertise in science and engineering, with valuable skills. Plus, the competencies created by the participating faculty have been reviewed and approved by a business advisory committee. This affirmation means that when you complete the associate degree and baccalaureate degree programs and enter the workforce with this background, you will have the specific skills sought by employers.

How does the associate program curriculum work?

The final curriculum is being approved at each of the participating institutions and will consist of the same core courses. To complete the program, you must take three core courses (including one computational course in your science area), a full year of calculus and a research or internship experience.

No matter where the courses are taught, you and students at any of the participating institutions can register for any of the courses that are part of the program. You register and pay tuition at your home institution. The only difference is that courses run on the schedule of the teaching institution (quarter or semester), which might be different than the one at your campus.

Participating Institutions
Owens Community College
Sinclair Community College
Stark State College
Project Lead The Way Ohio

How do I register or get more information?

If you find a course offered at your home institution, simply register for it in the normal way. If you wish to take a course at another institution, you need to fill out the Application for Host Institution Class Enrollment form, found on the same website, and turn it in to your registrar's office.

A list of associate degree courses being offered in the current academic year is available at www.rrscs.org/assoc.shtml. The website also lists the name of a program adviser at each campus who can help you with registration.

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Ohio Supercomputer Center

Ohio Learning Network

Ohio Board of Regents

Ralph Regula School of Computational Science

Associate Degree Program

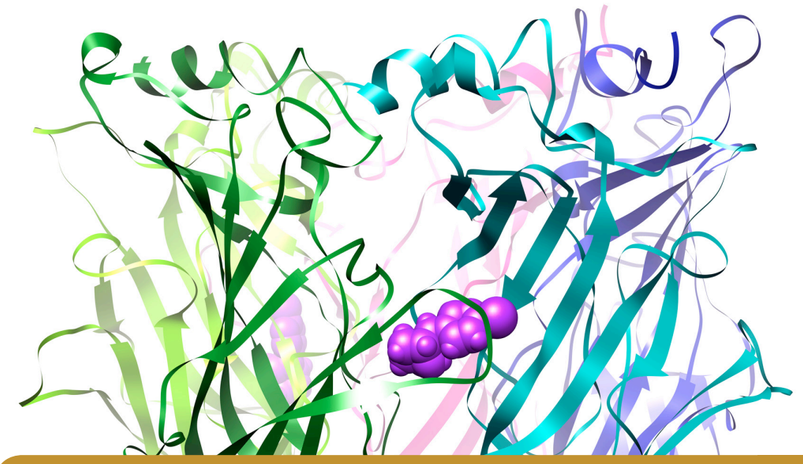
www.rrscs.org

Why should you study Computational Science?

- To use computers to solve significant and complex problems
- To acquire unique skills that are highly sought by employers
- To prepare for further study in the physical, life, behavioral and/or social sciences

What exactly is Computational Science?

Computational Science is the emerging and rapidly growing interdisciplinary field in which researchers use computer modeling and simulation to solve complex business, technical and academic problems. Businesses recognize computational science as an essential tool for innovation and use it to develop new products. Researchers do the same to expand the frontiers of knowledge. Computational science has produced enormous advances in scientific and technological inquiry including DNA sequencing, behavioral modeling, global climatic predictions, drug design, financial forecasting systems and medical visualization.



What is the Ralph Regula School?

The Ralph Regula School of Computational Science is a statewide, virtual school focused on computational science, and specifically computer modeling and simulation. It is a collaborative effort of the Ohio Board of Regents, Ohio Supercomputer Center, Ohio Learning Network, and Ohio's colleges and universities. The Ralph Regula School does not offer degrees or program certificates on its own – in all cases this will be handled by participating colleges and universities. Instead, the Ralph Regula School draws upon the resources and expertise of Ohio's colleges and universities to develop and offer coursework for academic programs and certificates.

Examples of Ohio companies using computational science

A number of companies with ties to Ohio employ computational scientists to increase their industrial productivity. Computational science allows these companies to compete in the global marketplace by reducing costs and time to market while increasing the quality of product and service development. Ohio Supercomputer Center's Blue Collar Computing™ program provides the innovative computational tools that allow Ohio industries to affordably develop new and improved products and services.

The following industries already use computational science as part of their development processes and their Ohio community connections:

Procter & Gamble *(Cincinnati)*
- Redesign Pringles potato crisps so they don't flutter off moving conveyor belts during production
- Develop new Folgers AromaSeal* canisters to replace the traditional metal coffee cans

Ford Motor Company *(Avon, Cleveland, Lima, Maumee, Batavia, Sharonville)*
- Simulate the crash-worthiness of new vehicle designs
- Predict noise, vibration and harshness (NVH) performance of powertrain assemblies

Medical Device Solutions *(Cleveland)*
- Performs complex computational modeling to create new medical devices

The Kroger Company *(Cincinnati)*
- Use biometric finger scanning to pilot retail point-of-sale transactions
- Employ biometric finger scanning technology to address employee time and attendance issues

Goodyear Tire *(Akron)*
- Reduce the cost of physical tire prototypes from 40 percent to 15 percent

General Motors *(Cincinnati, Columbus, Defiance, Lordstown, Toledo, Moraine, Parma, Mansfield)*
- Search for ways to convert a vehicle's waste heat into usable electricity

M-Seven Technologies *(Youngstown)*
- Collect and analyze productivity data to help larger manufacturers improve their operations
- Use precision measurement for metrology inspection, laser scanning, & reverse engineering

GE Aviation *(Evendale, Cincinnati, Peebles, Dayton)*
- Model complex turbomachinery to create better, faster, more fuel-efficient jet engines

J.P. Morgan Chase & Co. *(Columbus)*
- Use grid computing to develop mathematical models for pricing, hedging and risk measurement of derivative securities

Ohio CAE Inc. *(Cincinnati, Hudson)*
- Develops advanced coupled structural-fluid physics analysis tools for applications such as elastic artery modeling for stent design

Military researchers *(Wright-Patterson AFB, NASA Glenn Research Center)*
- Design energy-absorbing seats for armored vehicles to protect soldiers' ability to survive a mine blast
- Simulate how chemicals bind to amino acids to develop more effective chemical warfare agent antidotes

Rolls-Royce Energy Business *(Mount Vernon)*
- Model the effects of jet engines striking birds in flight and engine behavior following the collisions
- Track data from sensors on aircraft engines to predict if faults might arise

The Boeing Company *(Heath)*
- Create next-generation tools for designing aircraft
- Design a Delta IV rocket to launch satellites into space

Timken *(Canton)*
- Develop improved NASCAR suspension system components and steering system geometries

Cedar Fair *[parent company of Cedar Point and King's Island] (Sandusky)*
- Hired a Swiss contractor to design the Top Thrill Dragster roller coaster using finite element analysis to analyze its structural integrity, biodynamic impacts and aesthetic appeal

Nationwide Insurance Co. *(Columbus)*
- Use risk modeling techniques by creating regional climate forecasts to estimate future losses

Jo-Ann Stores *(Cleveland)*
- Used computer modeling to evaluate workforce skills, labor pool depth and transportation options in selecting Visalia, Calif., for the location of their West Coast distribution hub

Forensic Bioinformatics Services, Inc. *(Fairborn)*
- Provides automated analysis and expert review of forensic DNA evidence