Submit original with signatures + 1 copy + electronic copy to Faculty Senate (Box 7500).
See http://www.uaf.edu/uafgov/faculty-senate/curriculum/course-degree-procedures/ for a complete description of the rules governing curriculum & course changes.

TRIAL COURSE OR NEW COURSE PROPOSAL

SUBMITTED BY:
Department: Physics Department
Prepared by: Saundra Jefko
Email Contact: physics@uaf.edu
College/School: CNSM
Phone: 907-474-7347
Faculty Contact: Curt Szuberla

1. ACTION DESIRED
(CHECK ONE):
Trial Course [X] New Course

2. COURSE IDENTIFICATION:
Dept: PHYS Course #: F694 No. of Credits: 3.0

Justify upper/lower division status & number of credits:

3. PROPOSED COURSE TITLE:
Core Skills for Computational Science

4. To be CROSS LISTED?
YES/NO
No
If yes, Dept:

(Requires approval of both departments and deans involved. Add lines at end of form for additional required signatures.)

5. To be STACKED?
YES/NO
No
If yes, Dept:

Stacked course applications are reviewed by the (Undergraduate) Curricular Review Committee and by the Graduate Academic and Advising Committee. Creating two differentyllabi—undergraduate and graduate versions—will help emphasize the different qualities of what are supposed to be two different courses. The committees will determine: 1) whether the two versions are sufficiently different (i.e. is there undergraduate and graduate level content being offered); 2) are undergraduates being overtaxed?; 3) are graduate students being undertaxed? In this context, the committees are looking out for the interests of the students taking the course. Typically, if either committee has qualms, they both do. More info online - see URL at top of this page.

6. FREQUENCY OF OFFERING:
Fall

Fall, Spring, Summer (Every, or Even-numbered Years, or Odd-numbered Years) — or As Demand Warrants

7. SEMESTER & YEAR OF FIRST OFFERING
(AY2013-14 if approved by 3/1/2013; otherwise AY2014-15)

Fall 2013

8. COURSE FORMAT:
NOTE: Course hours may not be compressed into fewer than three days per credit. Any course compressed into fewer than six weeks must be approved by the college or school's curriculum council. Furthermore, any core course compressed to less than six weeks must be approved by the core review committee.

COURSE FORMAT:
(check all that apply)

[ ] 1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 [X] 6 weeks to full semester

OTHER FORMAT
(specify)

Mode of delivery
(specify lecture, field trips, labs, etc)

LECTURES/LAB

RECEIVED

Governance
FEB 28 2013
Dean's Office
College of Natural Science & Mathematics

3/11/13 TWP
9. CONTACT HOURS PER WEEK:

LEcTICREUMBACHOURS/HOURS WEELK
35 16 

35 LECTURE hours/weeks 16 LAB hours/week PRACTICUM hours/week

Note: # of credits are based on contact hours. 800 minutes of lecture = 1 credit. 2400 minutes of lab in a science course = 1 credit. 1600 minutes in non-science lab = 1 credit. 2400-4800 minutes of practicum = 1 credit. 2400-8000 minutes of internship = 1 credit. This must match with the syllabus. See http://www.uaf.edu/ufqro/faculty-senate/curriculum/course-degree-procedures-
guidelines-for-computing/ for more information on number of credits.

OTHER HOURS (specify type)

10. COMPLETE CATALOG DESCRIPTION including dept., number, title, credits, credit distribution, cross-listings and/or stacking (50 words or less if possible):

Example of a complete description:

FISH F487 W, O Fisheries Management

3 Credits Offered Spring

Theory and practice of fisheries management, with an emphasis on strategies utilized for the management of freshwater and marine fisheries. Prerequisites: COMM F131X or COMM F141X; ENGL F111X or ENGL F211X or ENGL F213X; ENGL F614; FISH F425; or permission of instructor. Cross-listed with NRM F487. (3+0)

PHYS F694 F01 Core Skills for Computational Sciences 3.0 Offered Fall

Course description: This course provides students of computational sciences, an introduction to the basic skills required to operate in the modern high performance computing (HPC) environment offered at the Arctic Regional Supercomputing Center (ARSC). Topics include an introduction to HPC, basic Unix/batch/scripting skills, performance programming, shared and distributed memory parallelism, code validation and debugging, data storage and management, and data visualization. Each of these topics will be presented in lecture form. To provide additional applied knowledge, either a thorough case study by a guest speaker and/or a hands-on lab session will be given in support of each.

11. COURSE CLASSIFICATIONS: Undergraduate courses only. Consult with CLA Curriculum Council to apply S or H classification appropriately; otherwise leave fields blank.

H = Humanities
S = Social Sciences [x]

Will this course be used to fulfill a requirement for the baccalaureate core? If YES, attach form.

YES: [ ] NO: [x]

IF YES, check which core requirements it could be used to fulfill:

O = Oral Intensive, Format 6
W = Writing Intensive, Format 7
[Natural Science, ("X" for Core) Format 8]

11.A Is course content related to northern, arctic or circumpolar studies? If yes, a "snowflake" symbol will be added in the printed Catalog, and flagged in Banner.

YES [ ] NO [x]

12. COURSE REPEATABILITY:

Is this course repeatable for credit?

YES [ ] NO [x]

Justification: Indicate why the course can be repeated (for example, the course follows a different theme each time).

How many times may the course be repeated for credit?

TIMES

If the course can be repeated for credit, what is the maximum number of credit hours that may be earned for this course?

CREDITS

If the course can be repeated with variable credit, what is the maximum number of credit hours that may be earned for this course?

CREDITS

13. GRADING SYSTEM: Specify only one. Note: Later changing the grading system for a course constitutes a Major Course Change.

LETTER: [x]
PASS/FAIL: [ ]
14. PREREQUISITES
Graduate Standing in physical sciences, experience with FORTAN or C programming language, or permission of instructor.
These will be required before the student is allowed to enroll in the course.

15. SPECIAL RESTRICTIONS, CONDITIONS
None

16. PROPOSED COURSE FEES
$0
Has a memo been submitted through your dean to the Provost for fee approval?
Yes/No

17. PREVIOUS HISTORY
Has the course been offered as special topics or trial course previously?
Yes/No
If yes, give semester, year, course #, etc.:
Fall semesters 2005; 2006; 2007; 2009; 2010; 2011; 2012- PHYS693

18. ESTIMATED IMPACT
WHAT IMPACT, IF ANY, WILL THIS HAVE ON BUDGET, FACILITIES/SPACE, FACULTY, ETC.
Tom Logan will need to be hired as Adjunct due to his expertise in the field. Budget impact would be $10,000 to CNSM/Physics Department.

19. LIBRARY COLLECTIONS
Have you contacted the library collection development officer (klijensen@alaska.edu, 474-6695) with regard to the adequacy of library/media collections, equipment, and services available for the proposed course? If so, give date of contact and resolution. If not, explain why not.
Yes/No
No X Yes
No media required.

20. IMPACTS ON PROGRAMS/DEPTS
What programs/departments will be affected by this proposed action?
Include information on the Programs/Departments contacted (e.g., email, memo)

Since this course has been offered as a Special topics class for a number of years there should be no real additional impact on other departments or overall additional positive or negative impacts on other courses or programs. However because this course has been taught for a number of years, and students from many departments have taken the course, not offering it could have an negative impact on overall computing ability in the graduate student population and the ability of a number of programs to effectively train their graduate students.

21. POSITIVE AND NEGATIVE IMPACTS
Please specify positive and negative impacts on other courses, programs and departments resulting from the proposed action.

Since this course has been offered as a Special topics class for a number of years there should be no real additional impact on other departments or overall additional positive or negative impacts on other courses or programs. However because this course has been taught for a number of years, and students from many departments have taken the course, not offering it could have a negative impact on overall computing ability in the graduate student population and the ability of a number of programs to effectively train their graduate students.
JUSTIFICATION FOR ACTION REQUESTED
The purpose of the department and campus-wide curriculum committees is to
scrutinize course change and new course applications to make sure that the quality
of UAF education is not lowered as a result of the proposed change. Please address
this in your response. This section needs to be self-explanatory. Use as much
space as needed to fully justify the proposed course.

In order to meet the needs of modern science, though scientific computing, this course takes students from
an introduction to High Performance Computing, through to actual applications of High Performance
Computing (including parallelization and optimization). The course includes a project that can be an
application of these principles to a real work scientific code in the students’ research area.

APPROVALS: Add additional signature lines as needed.

Signature, Chair,
Program/Department of: Curt Szuberla
Date 2/3/2003
Physics

Signature, Chair, College/School
Curriculum Council for:
Date 3/8/13
CNSM

Signature, Dean, College/School
of: Paul Layar
Date 3/8/13
College of Natural Science and Mathematics

Offerings above the level of approved programs must be approved in advance by
the Provost.

Signature of Provost (if above level of approved programs)

ALL SIGNATURES MUST BE OBTAINED PRIOR TO SUBMISSION TO THE GOVERNANCE OFFICE

Signature, Chair
Date
Faculty Senate Review Committee: __Curriculum Review __GAAC
__Core Review __SADAC

ADDITIONAL SIGNATURES: (As needed for cross-listing and/or stacking)

Signature, Chair,
Program/Department of:
Date

Signature, Chair, College/School
Curriculum Council for:
Date

Signature, Dean, College/School
of:
Syllabus Online version

PHYS 693
Core Skills for Computational Science

Content
This course provides students of computational sciences an introduction to the basic skills required to operate in the modern high performance computing (HPC) environment offered at the Arctic Region Supercomputing Center (ARSC). Topics include an introduction to HPC, basic Unix/Batch/scripting skills, performance programming, shared and distributed memory parallelism, code validation and debugging, data storage and management, and data visualization. Each of these topics will be presented in lecture form. To provide additional applied knowledge, either a thorough case study by a guest speaker and/or a hands-on lab session will be given in support of each.

PHYS 693 as ARSC User Training
In the past, components of this class have been regularly offered as individual training sessions by the staff at ARSC. The impetus for creation of the ‘core skills’ class was to provide a more intensive training environment for new student users, while still providing distinct modules for more advanced researchers to refresh/update skills.

As such, the PHYS 693 lectures are open to any interested individuals. While the structure, lectures, labs and grading policies of this course are designed for UAF students enrolled in the course for credit, the course doubles as ARSC user training. ARSC users and prospective ARSC users are strongly encouraged to attend any lectures they would find beneficial. There will be no other formal ARSC user training on these topics offered this fall.

Instructors
This course will be taught by several instructors including Arctic Region Supercomputing Center staff, UAF Physics department faculty and guest speakers.

Contacting Us
The primary points of contact for the class are:
Tom Logan, ARSC, WRRS 105, 450-8624, talogan@alaska.edu
Dr. David Newman, 112 NSF, 474-7858, denewman@alaska.edu

Links to Course Syllabus, Homework, and References

Schedule & Lectures Homework References

In approaching this (and all) classes, please note the following ancient Chinese proverb: Teachers can open the door, but you must enter by yourself.

Prerequisites
Graduate standing in physical sciences; experience with FORTRAN or C programming language; or permission of instructor.

Lectures/Lab Meeting Time and Place
West Ridge Research Building 009, Tuesday/Thursday, 9:15 - 11:15am

Grading
The course grade will consist of the following components
Homework: 40%
Semester project: 30%
Mid-term: 20%
Attendance and Participation: 10%

Grading Components

Homework: There will be approximately one homework assignment per week. The assignment will be given out and posted on the web. These assignments help in assessing your understanding of the material, and will count as a major part of your final grade.

Project: There will be a semester project, which will require a final presentation and paper.

Mid-term Exam: A mid-term exam will be given.

Special Needs

The Office of Disability Services implements the Americans with Disabilities Act (ADA), and ensures that UAF students have equal access to the campus and course materials. We will work with the Office of Disabilities Services (203 WHIT, 474-7043) to provide reasonable accommodation to students with disabilities.

Plagiarism

Plagiarism and cheating are matters of serious concern for students and academic institutions. This is true in this class as well. The UAF Honor Code (or Student Code of Conduct) defines academic standards expected at the University of Alaska Fairbanks which will be followed in this class. (Taken from the UAF plagiarism web site, which has many links with good information about this topic)

Complaints and Concerns

You are always welcome to talk to the instructors about anything, however, if you have a non-subject matter question or concern that cannot be resolved by the instructors contact the department chair, Dr. Chowdhury, Physics Department Office, room 215 Reichardt.

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For questions or comments regarding this website, contact info@arsc.edu
<table>
<thead>
<tr>
<th>Class</th>
<th>Date</th>
<th>Instructor</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30-Aug TL</td>
<td>TL</td>
<td>Introduction to ARSC &amp; HPC</td>
</tr>
<tr>
<td>2</td>
<td>4-Sep ON</td>
<td>ON</td>
<td>Introduction to Linux / Semester Project</td>
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<tr>
<td>3</td>
<td>6-Sep TL</td>
<td>TL</td>
<td>Data Management / Unix Scripting</td>
</tr>
<tr>
<td>4</td>
<td>11-Sep TL</td>
<td>TL</td>
<td>Introduction to Fortran, Part 1</td>
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<tr>
<td>5</td>
<td>13-Sep TL</td>
<td>TL</td>
<td>Introduction to Fortran, Part 2 (Lab session)</td>
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<tr>
<td>6</td>
<td>18-Sep TL</td>
<td>TL</td>
<td>Introduction to <strong>PACMAN</strong> and <strong>Fish</strong> Supercomputers</td>
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<tr>
<td>7</td>
<td>20-Sep TL</td>
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<td><strong>Makefiles</strong> (Lab session)</td>
</tr>
<tr>
<td>8</td>
<td>25-Sep TL</td>
<td>TL</td>
<td><strong>Viz 1: Basic Visualization Tools</strong></td>
</tr>
<tr>
<td>9</td>
<td>27-Sep TL</td>
<td>TL</td>
<td>Performance Programming <strong>Part I Part II</strong></td>
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<tr>
<td>10</td>
<td>2-Oct TL</td>
<td>TL</td>
<td>Performance Programming <strong>Part III</strong></td>
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<tr>
<td>11</td>
<td>4-Oct TL</td>
<td>TL</td>
<td><strong>Profiling</strong> and <strong>Introduction to CrayPat</strong></td>
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<tr>
<td>12</td>
<td>9-Oct TL</td>
<td>TL</td>
<td><strong>Parallel Processing Concepts &amp; Parallel Shared Memory Programming, Part 1</strong></td>
</tr>
<tr>
<td>13</td>
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<td>Parallel Shared Memory Programming, Part 2</td>
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<td>18-Oct DM</td>
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<td>Parallel Programming Application (Example)</td>
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<tr>
<td>16</td>
<td>23-Oct SM</td>
<td>SM</td>
<td><strong>Viz 2: Importing Data and Graphics Formats</strong></td>
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<td>17</td>
<td>25-Oct SM</td>
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<td>Viz 3: Animation 101 (Lab session)</td>
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<tr>
<td>18</td>
<td>30-Oct TL</td>
<td>TL</td>
<td>--- MIDTERM EXAM ---</td>
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<tr>
<td>19</td>
<td>1-Nov TL</td>
<td>TL</td>
<td><strong>Parallel Distributed Memory Programming, Part 1</strong></td>
</tr>
<tr>
<td>20</td>
<td>6-Nov TL</td>
<td>TL</td>
<td>Parallel Distributed Memory Programming, Part 2</td>
</tr>
<tr>
<td>21</td>
<td>8-Nov TL</td>
<td>TL</td>
<td>Parallel Distributed Memory Programming (Class Exercises), Part 3</td>
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<td>22</td>
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<td>TL</td>
<td>Parallel Distributed Memory Programming (Lab Session), Part 4</td>
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<tr>
<td>23</td>
<td>15-Nov KH</td>
<td>KH</td>
<td><strong>Parallel Programming Application (Example)</strong></td>
</tr>
<tr>
<td>24</td>
<td>20-Nov EK</td>
<td>EK</td>
<td><strong>Debugging Applications</strong></td>
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<tr>
<td>25</td>
<td>22-Nov ---</td>
<td>---</td>
<td>Thanksgiving Holiday</td>
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<tr>
<td>26</td>
<td>27-Nov KH</td>
<td>KH</td>
<td><strong>Version Control Systems</strong></td>
</tr>
<tr>
<td>27</td>
<td>29-Nov TL</td>
<td>TL</td>
<td><strong>How to Give Presentations &amp; Answer Questions</strong></td>
</tr>
<tr>
<td>28</td>
<td>4-Dec TL</td>
<td>TL</td>
<td><strong>Introduction to Co-Array Fortran</strong></td>
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<tr>
<td>29</td>
<td>6-Dec TL</td>
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<td>Open Session - Project Work</td>
</tr>
<tr>
<td></td>
<td>13-Dec TL</td>
<td>TL</td>
<td>--- <strong>Final Presentations - 9:15 AM</strong></td>
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<td>Key</td>
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<td>Position</td>
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<tr>
<td>DM</td>
<td>Don Morton</td>
<td>Research Professor</td>
<td><a href="mailto:Don.Morton@alaska.edu">Don.Morton@alaska.edu</a></td>
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<td>HPC Specialist</td>
<td><a href="mailto:eakornkven@alaska.edu">eakornkven@alaska.edu</a></td>
</tr>
<tr>
<td>KH</td>
<td>Kate Hedstrom</td>
<td>Oceanographic</td>
<td><a href="mailto:kshedstrom@alaska.edu">kshedstrom@alaska.edu</a></td>
</tr>
<tr>
<td>ON</td>
<td>Oralee Nudson</td>
<td>User Consultant</td>
<td><a href="mailto:onudson@alaska.edu">onudson@alaska.edu</a></td>
</tr>
<tr>
<td>SM</td>
<td>Sergei Maurits</td>
<td>HPC Specialist</td>
<td><a href="mailto:samaurits@alaska.edu">samaurits@alaska.edu</a></td>
</tr>
<tr>
<td>TL</td>
<td>Tom Logan</td>
<td>Associate Faculty</td>
<td><a href="mailto:talogan@alaska.edu">talogan@alaska.edu</a></td>
</tr>
</tbody>
</table>

Thomas Logan – 11 December 2012, Tuesday 08:01

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For questions or comments regarding this website, contact **info@arsc.edu**
# PHYS 693
Core Skills for Computational Science

<table>
<thead>
<tr>
<th>Assigned Date</th>
<th>Due Date</th>
<th>Points</th>
<th>Homework</th>
</tr>
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<tbody>
<tr>
<td>8/30</td>
<td>9/04</td>
<td>10</td>
<td>Account Creation</td>
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<tr>
<td>9/04</td>
<td>9/11</td>
<td>10</td>
<td>Basic Unix Skills</td>
</tr>
<tr>
<td>9/11</td>
<td>9/18</td>
<td>10</td>
<td>Semester Project: Proposal for Project</td>
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<td>9/13</td>
<td>9/27</td>
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<td>9/27</td>
<td>10/11</td>
<td>10</td>
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<td>10/11</td>
<td>10/23</td>
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<td>OpenMP</td>
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<td>10/23</td>
<td>11/8</td>
<td>20</td>
<td>Visualization &amp; Animation</td>
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<td>11/6</td>
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<td>Semester Project: Optimization, Parallelization, Visualization</td>
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<td>11/13</td>
<td>12/04</td>
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</table>

Thomas Logan – 30 October 2012, Tuesday 11:13

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List of References
Unix for Dummies - Quick Reference (IDG Books)
Unix in a Nutshell (O'Reilly)
Linux in a Nutshell (O'Reilly)
Fortran 90/95 Explained, Metcalf & Reid, Oxford Univ Press, 1999
Fortran 90 for Engineers and Scientists, Larry Nyhoff and Sanford Leestma, Prentice-Hall, 1997
Parallel Programming in OpenMP (Chandra et al)
Using MPI (Gropp, Lusk, & Skjellum)
Parallel Programming with MPI (Pacheco)

List of Related Links
Introduction to Using PACMAN Cluster
Introduction to Using Cray Fish Cluster
ARSC HPC Newsletters
List of Fortran Tutorials

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