Course Syllabus*

PHYS 3730 / 6730
Introduction to Computers in Physics
Ben Bromley

* based on the syllabus template for the College of Science (version from 7/17/20)

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Course Number and Title: PHYS 3730 / 6720 — Introduction to Computers in Physics
Semester and Year: Fall 2020
Instructor: Ben Bromley (he, him, his)
   Email: Benjamin.Bromley@utah.edu
   Zoom Handle: https://utah.zoom.us/j/9335316512
   Office: INSCC 218
   Phone: CAMPUS 1-8227
   Accessibility & Support: E-mail is the preferable method of contact for questions and concerns. Include "3730" or "6730" in the subject line.
COURSE DESCRIPTION

The goal of this course is to provide a brief introduction to computing tools for science and engineering work on modern workstations. Topics include linux (file structures, commands, scripts, etc.), editing, technical document preparation, symbolic manipulation, programming in Python, use of library routines (SciPy). These tools will be illustrated by applying them to scientific and engineering problems. 4.0 credits.

Prerequisites: "C-" or better in ((PHYS 2210 OR PHYS 3210) OR (AP Physics C Mech score of 4+) AND PHYS 2235).
Corequisites: "C-" or better in MATH 2250 OR (MATH 2270 AND MATH 2280).

COURSE DETAILS

- **Course Type**: Interactive Video Conferencing (IVC - synchronous online)
- **Location & Meeting Times**: CANVAS, TTh, 8:35am-10:30am.
- **Mandatory In-Person Attendance**: N/A. This is a computer course.
- **Recommended In-Person Attendance**: N/A
- **Attendance & Punctuality**: Attendance is optional. But do join in!
- **COVID-19 Considerations**: Students must self-report if they test positive for COVID-19 via coronavirus.utah.edu.
- **Instructional Support Team**: N/A
- **Course Materials**:
  - **Textbook**: None
  - **Additional course materials**: Any supplemental course materials, including videos, virtual handouts or note will be available through Canvas.
- **Technical requirements**:
  - Students are expected to be able to use Canvas and Zoom in a learning environment. Knowledge and navigation of Canvas and Zoom is critical to access all features and resources of this course. It is recommended that students be able to log into Zoom for class with audio and video enabled.
  - Lecture sessions will be online and synchronous. A strong internet connection and bandwidth are recommended. Provisions will be made to offer other resources so that student success is possible even if bandwidth is limited, including recordings of lecture posted to Canvas and pre-recorded videos.
  - You must have a laptop or desktop computer capable of running Microsoft Virtual Desktop (or equivalent) and be able to remotely log in to department servers. Students must be able to transfer text and image files to and from department servers using putty, ssh/scp or equivalent. Students are also strongly encouraged to install Python, and an integrated development/execution environment such as Jupyter, on their personal computer.
  - For technical assistance, review the Canvas Getting Started Guide for Students and/or contact TLT, Knowledge Commons, etc., and also see the department Computing Resources web page (https://www.physics.utah.edu/computing/index.php)
- **Syllabus subject to change**: This syllabus is meant to serve as an outline and guide for our course. Please note that I may modify it with reasonable notice to you. I may also modify the Course Schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas.

CONTENT OVERVIEW

The course will introduce students to computational tools that will facilitate success in research and academic work, and will provide skills that are valuable in the workforce.

COURSE EXPECTED LEARNING OUTCOMES
1. Students will be able to navigate the linux operating system, work with its utilities, and gain experience with Python coding.
2. Students will have the tools to communicate of their technical work and results in plots, animations and in technical documents.
3. Students will become facile with a suite of numerical tools to solve physics and engineering problems.

Assessment of these outcomes will be based on submitted code, its successful execution of the assigned task, and on plots and documents that must contain required elements.

COURSE DESIGN

The course is designed to give "hands-on" computational experience in a classroom lab format delivered synchronously on Zoom, with students working in a virtual desktop environment on department servers. Lecture sessions thus consist of a short presentation by the instructor followed by lab exercises completed in that session by each student. Exercises are submitted for check-point grading. Homework sets (due roughly every other week) are more in-depth explorations of the topics covered in lecture. The midterm and final exams will be open book, open internet take-home format.

CLASS SCHEDULE & IMPORTANT DATES

Mandatory Online Instruction Periods: All classes will be online the weeks of October 5-10 and November 30-December 3. There will be no change of modality of the course during these times.

Exam Dates: The midterm and final exams are initiated on 15-Oct-2020 and 08-Dec-2020, respectively. They are take-home exams and you will be allowed at least 24 hours to complete each one.

Official Drop/Withdraw Dates: The last day to drop classes is 04-Sept-2020; the last day to withdraw from this class is 16-Oct.-2020. Please check the academic calendar for more information pertaining to dropping and withdrawing from a course. Withdrawing from a course and other matters of registration are the student's responsibility.

Holidays: There will be no class on Monday, September 7 (Labor Day) and November 26-29 (Thanksgiving break).

Lecture Plan:

<table>
<thead>
<tr>
<th>Week</th>
<th>Day</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tu, 25-Aug.</td>
<td>Course overview, review of Unix, emacs.</td>
</tr>
<tr>
<td></td>
<td>Th, 27-Aug.</td>
<td>More Unix (redirects, pipes, and processes),</td>
</tr>
<tr>
<td>2</td>
<td>Tu, 01-Sep.</td>
<td>Scripting, plus awk and sed</td>
</tr>
<tr>
<td></td>
<td>Th, 03-Sep.</td>
<td>Python: a refresher</td>
</tr>
<tr>
<td>3</td>
<td>Tu, 08-Sep.</td>
<td>Python: numpy arrays</td>
</tr>
<tr>
<td></td>
<td>Th, 10-Sep.</td>
<td>Python: plotting with Matplotlib</td>
</tr>
<tr>
<td>4</td>
<td>Tu, 15-Sep.</td>
<td>Python: animations + the beauty of imagemagick's convert</td>
</tr>
<tr>
<td></td>
<td>Th, 17-Sep.</td>
<td>Python: data types, random numbers</td>
</tr>
<tr>
<td>5</td>
<td>Tu, 22-Sep.</td>
<td>Probability, briefly, ...</td>
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<tr>
<td></td>
<td>Th, 24-Sep.</td>
<td>...And Statistics, briefly</td>
</tr>
<tr>
<td>6</td>
<td>Tu, 29-Sep.</td>
<td>Monte Carlo methods</td>
</tr>
<tr>
<td></td>
<td>Th, 01-Oct.</td>
<td>Model fitting</td>
</tr>
<tr>
<td>7</td>
<td>Tu, 06-Oct.</td>
<td>C++: an introduction</td>
</tr>
<tr>
<td></td>
<td>Th, 08-Oct.</td>
<td>C++: diving in a little</td>
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<tr>
<td>8</td>
<td>Tu, 13-Oct.</td>
<td>REVIEW</td>
</tr>
<tr>
<td></td>
<td>Th, 15-Oct.</td>
<td>MIDTERM</td>
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<tr>
<td>9</td>
<td>Tu, 20-Oct.</td>
<td>Maple: an introduction</td>
</tr>
<tr>
<td></td>
<td>Th, 22-Oct.</td>
<td>Maple: a little deeper</td>
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<tr>
<td>10</td>
<td>Tu, 27-Oct.</td>
<td>Doc prep: HTML</td>
</tr>
<tr>
<td></td>
<td>Th, 29-Oct.</td>
<td>Doc Prep: LaTex</td>
</tr>
<tr>
<td>11</td>
<td>Tu, 03-Nov.</td>
<td>Numerical Integration, ODEs &amp; Vote!</td>
</tr>
<tr>
<td></td>
<td>Th, 05-Nov.</td>
<td>PDEs</td>
</tr>
<tr>
<td>12</td>
<td>Tu, 10-Nov.</td>
<td>Minimization</td>
</tr>
<tr>
<td></td>
<td>Th, 12-Nov.</td>
<td>Optimization</td>
</tr>
<tr>
<td>Week 13.</td>
<td>Tu, 17-Nov.</td>
<td>Linear systems: an intro</td>
</tr>
<tr>
<td>Th, 19-Nov.</td>
<td>Linear systems, more fun</td>
<td></td>
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<tr>
<td>Week 14.</td>
<td>Tu, 24-Nov.</td>
<td>FFTs</td>
</tr>
<tr>
<td>Th, 26-Nov.</td>
<td>Machine learning: an intro</td>
<td></td>
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<tr>
<td>Week 15.</td>
<td>Tu, 01-Dec.</td>
<td>Machine learning: examples</td>
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<tr>
<td>Th, 03-Dec.</td>
<td>REVIEW</td>
<td></td>
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<tr>
<td>Tu, 08-Dec.</td>
<td>FINAL EXAM</td>
<td></td>
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</tbody>
</table>

* Homework will be assigned approximately every other week, and will due on Fridays, 11:59pm Mountain time.

**COMMUNICATION**

Clarify which forms of communication and responsibilities you expect from your students. For instance:

- All course material will be accessible through the Course Canvas site. Class announcements will be done via email through the Canvas server. You will be responsible for any information contained in them as well as the information announced in class.
- It is your responsibility to also regularly check your Umail. Your Umail is the only way for me to communicate privately with you, there will be occasions during the semester that we may need to reach out to you individually (e.g. regarding a grade or assignment) and it is in your best interest to respond promptly.
- Feel free to contact me by email for questions at Benjamin.Bromley@utah.edu. Please use "3730" or "6720" in the subject line of emails. I would like to encourage you to email me only if it is something personal that requires individual attention, if instead you have questions about logistics of the class, course material and assignments, and anything else your classmates may wonder as well, please post a question on the Discussions Board instead. This way the information is shared quickly to the entire class, and each of you can benefit from seeing other classmates' questions.
- I will always do my best to ensure the communication relevant to the course is clear and transparent, it is your responsibility as well to keep yourself updated by regularly checking: the announcements on Canvas, your Umail, the posts on the Discussions Board, and pay attention to the announcements given in class and Discussion Section.
- Course Canvas Page: Include expectations for Canvas monitoring (e.g. Students are expected to log in and check canvas everyday for posted announcements and assignments. Students are also strongly advised to set up notifications for Canvas so they do not miss any important notifications.)

**NETIQUETTE - EXPECTATIONS FOR ONLINE LEARNING ENVIRONMENT**

- Classroom equivalency: Respectful participation in all aspects of the course will make our time together productive and engaging. Zoom lectures, discussion threads, emails and canvas are all considered equivalent to classrooms and student behavior within those environments shall conform to the student code. Specifically:
  - Posting photos or comments that would be off-topic in a classroom are still off-topic in an online posting.
  - Disrespectful language and photos are never appropriate.
  - Using angry or abusive language is not acceptable, and will be dealt with according to the Student Code. The instructor may remove online postings that are inappropriate.
  - Do not use ALL CAPS, except for titles, or overuse certain punctuation marks such as exclamation points and question marks. (Do not emulate the instructor in this regard.)
  - Course e-mails, e-journals, and other online course communications are part of the classroom and as such, are University property and subject to the Student Code. Privacy regarding these communications between correspondents must not be assumed and should be mutually agreed upon in advance, in writing.
- Other expectations for online communication (on Discussion Board, Emails, Zoom chat etc):
Emails: When emailing your instructor, keep a professional tone, and sign your message with your name. Please consult this page for tips on how to write appropriate professional emails: https://academicpositions.com/career-advice/how-to-email-a-professor

- Treat your instructor and classmates with respect in email or any other communication.
- Remember that all college level communication should have correct spelling and grammar (this includes discussion boards).
- Avoid slang terms and texting abbreviations such as “u” instead of “you.”
- Be cautious when using humor or sarcasm as tone is sometimes lost in an email or discussion post and your message might be taken seriously or be offensive to others.
- Be careful with personal information (both yours and others).

Electronic or equipment failure: It is your responsibility to maintain your computer and related equipment in order to participate in the online portion of the course. Equipment failures will not be an acceptable excuse for late or absent assignments.

Online submissions: You are responsible for submitting the assignment with the required naming convention, correct file extension, and using the software type and version required for the assignment.

Canvas allows students to change the name that is displayed AND allows them to add their pronouns to their Canvas name. Additionally, students can indicate their pronouns in Zoom.

ASSIGMENTS, ASSESSMENT & GRADING

Grade determination:

- Students are graded on the basis of lab exercises (text files, source code, plots etc.) submitted each class session. Each exercise is weighted equally weighted, contributing to 15 pts toward the total score. The lowest four scores are dropped without penalty.
- Students are also graded on homework assignments (more in-depth versions of the lab exercises) submitted approximately every other week; weighted equally, worth 45 points. The lowest homework score is dropped without penalty.
- An additional 20 points is required for students on PHYS 6720 only for a final project--a written 3-5 page research paper.
- A midterm exam, with the format of a short homework assignment (take-home, open book) counts for 15 points.
- A final exam, with a similar format, cumulative subject matter, is worth 25 points.
- The total score is a sum of these components, taken as a percentage of 100 points (120 points for PHYS 6720 students). Final letter grades are based on the standard conversion of the percentage of point earned (e.g. 94-100% = A).
- In case of an unexpected serious illness a doctor’s note will be required for you to take an exam on another day.
- Students seeking academic accommodations should contact me and make necessary arrangements BEFORE the first exam.
- It is the student’s responsibility to ensure the accuracy of all recorded homework, quizzes, online assignments, and exam grades. You should keep as record all your graded assignments. If you see any error in your grades on Canvas, reach out to the instructor as soon as possible, or at the latest within two weeks from when the assignment was returned.

Late Assignments/Missed Assignments/Regrading Policies:

- Extensions to deadlines, including take-home exams, are for University-excused absences. Always contact the instructor if unexpected circumstances arise.
- Regrades are available on request to the instructor up to one week after the item grade is posted on Canvas.

Incompletes: According to university policy, to be considered for an incomplete, a student must have 20% or less of the course work remaining and be passing the course with a C or better. You must request an incomplete grade and I will consider giving that grade only under exceptional circumstances.

Content Accommodations: Consistent with principles of academic freedom, the faculty, individually and collectively, has the responsibility for determining the content of the curriculum. Students are expected to take courses that will challenge them intellectually and personally. Students must understand and be able to articulate the ideas and theories that are important to the discourse within and among academic disciplines. Personal disagreement with these ideas and theories or their implications is not sufficient grounds for requesting an accommodation (see https://regulations.utah.edu/academics/6-100.php). Describe your content accommodation policies here.
Plagiarism: Unless stated otherwise, you are expected to write and submit your own code for grading. However, it is common practice, even among professionals, to use code snippets posted on the internet. If you do, you must cite the source of the copied code (e.g., with a hyperlink). Otherwise your work will be considered plagiarism, a violation of the Student Code of Conduct.

INFORMATION SECURITY

Every student must designate as private all work that they create and save for this course (e.g., codes associated with lab exercises, homework or exams), meaning that their files and folders must be unreadable by anyone but the student, no matter where the files are stored (e.g., dept servers). The posting of a file with a solution that is viewable by anyone else (e.g., on Ch3gg or the like) will subject the student to the fullest penalty for academic dishonesty (see next item).

ACADEMIC CODE OF CONDUCT

Students are encouraged to review the Student Code for the University of Utah: https://regulations.utah.edu/academics/6-400.php. In order to ensure that the highest standards of academic conduct are promoted and supported at the University, students must adhere to generally accepted standards of academic honesty, including but not limited to refraining from cheating, plagiarizing, research misconduct, misrepresenting one's work, and/or inappropriately collaborating. A student who engages in academic misconduct as defined in Part I.B. may be subject to academic sanctions including but not limited to a grade reduction, failing grade, probation, suspension or dismissal from the program or the University, or revocation of the student's degree or certificate. Sanctions may also include community service, a written reprimand, and/or a written statement of misconduct that can be put into an appropriate record maintained for purposes of the profession or discipline for which the student is preparing. Incidents of academic misconduct (e.g. cheating, plagiarizing, including submission of source code without attribution or reference, misrepresenting one's work, and/or inappropriately collaborating on exams) will be subject to penalty per Section V of Policy 6-400, the Student Code. Incidents of academic dishonesty on homework assignments will result in a minimum penalty of a full letter-grade reduction and up to a failing grade (E) for the course. Incidents of academic dishonesty on exams will result in a minimum penalty of a failing grade (E) for the course, and the incident(s) will be referred to the Dean of the College of Science for possible further sanction.

ADDITIONAL POLICIES AND RESOURCES

Inclusivity Statement: It is my intent that students from all diverse backgrounds and perspectives be well served by this course, that students’ learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength and benefit. It is my intent to present materials and activities that are respectful of diversity: age, color, disability, gender, gender identity, gender expression, national origin, political affiliation, race, religion, sexual orientation, and veteran status, and other unique identities. gender, sexuality, disability, age, socioeconomic status, ethnicity, race, culture, and other unique identities. Your suggestions are encouraged and appreciated. Please let me know ways to improve the effectiveness of the course for you personally or for other students or student groups. In addition, if any of our class meetings conflict with your religious events, please let me know so that we can make arrangements for you.

Discrimination and Harassment: If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS). Please see Student Bill of Rights, section E http://regulations.utah.edu/academics/6-400.php. I will listen and believe you if someone is threatening you.

Names/Pronouns. Canvas allows students to change the name that is displayed AND allows them to add their pronouns to their Canvas name. Class rosters are provided to the instructor with the student’s legal name as well as “Preferred first name” (if previously entered by you in the Student Profile section of your CIS account, which managed can be managed at any time). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class or on assignments. Please advise me of any name or pronoun changes so I can help create a learning environment in which you, your name, and your pronoun are respected. If you need any assistance or support, please reach out to the LGBT Resource Center. https://lgbt.utah.edu/campus/faculty_resources.php

English Language Learners. If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center.
Undocumented Student Support. Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801.213.3697 or visit dream.utah.edu.

Veterans Center. If you are a student veteran, the U of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: http://veteranscenter.utah.edu/. Please also let me know if you need any additional support in this class for any reason.

Wellness Statement. Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., can interfere with a student’s ability to succeed and thrive at the University of Utah. For helpful resources contact the Center for Student Wellness at www.wellness.utah.edu or 801-581-7776.

Student Success Advocates: The mission of Student Success Advocates is to support students in making the most of their University of Utah experience (ssa.utah.edu). They can assist with mentoring, resources, etc. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact a Student Success Advocate for support (https://asuu.utah.edu/displaced-students).

The Americans with Disabilities Act:
The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, 801-581-5020. CDA will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the Center for Disability & Access.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a Civil Rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted on the basis of your sex, including sexual orientation or gender identity/expression, you are encouraged to report it to the University’s Title IX Coordinator; Director, Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or to the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to police, contact the Department of Public Safety, 801-585-2677(COPS).

Campus Safety: The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu

University Counseling Center The University Counseling Center (UCC) provides developmental, preventive, and therapeutic services and programs that promote the intellectual, emotional, cultural, and social development of University of Utah students. They advocate a philosophy of acceptance, compassion, and support for those they serve, as well as for each other. They aspire to respect cultural, individual and role differences as they continually work toward creating a safe and affirming climate for individuals of all ages, cultures, ethnicities, genders, gender identities, languages, mental and physical abilities, national origins, races, religions, sexual orientations, sizes and socioeconomic statuses.

Office of the Dean of Students The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. Please consider reaching out to the Office of Dean of Students for any questions, issues and concerns. 200 South Central Campus Dr., Suite 270. Monday-Friday 8 am-5 pm.