PHYSICS 598  **Special Topics in Physics**  credit: 1 TO 4 hours.

Subject offerings of new and developing areas of knowledge in physics intended to augment the existing curriculum. See Class Schedule or departmental course information for topics and prerequisites. May be repeated in the same or separate terms if topics vary.

<table>
<thead>
<tr>
<th>CRN</th>
<th>Type</th>
<th>Section</th>
<th>Time</th>
<th>Days</th>
<th>Location</th>
<th>Instructor</th>
</tr>
</thead>
<tbody>
<tr>
<td>61725</td>
<td>Lecture</td>
<td>ADS</td>
<td>03:30 PM - 04:50 PM</td>
<td>TR</td>
<td>222 - Loomis Laboratory</td>
<td>Leigh, R</td>
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<td>42392</td>
<td>Lecture</td>
<td>CPA</td>
<td>12:30 PM - 01:50 PM</td>
<td>TR</td>
<td>158 - Loomis Laboratory</td>
<td>Shapiro, S</td>
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<tr>
<td>34941</td>
<td>Lecture</td>
<td>PTD</td>
<td>01:00 PM - 02:20 PM</td>
<td>MW</td>
<td>276 - Loomis Laboratory</td>
<td>Leggett, A</td>
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Credit Hours: 4 hours
AdS/QFT Correspondence
Restricted to Graduate - Urbana-Champaign.

This course will give students a working knowledge of the AdS/QFT correspondence, and its applications in particle physics, hydrodynamics, fluid mechanics, and condensed matter physics. Although students will benefit from having already a good knowledge of quantum field theory (such as from Physics 582-583), all other necessary material will be introduced in class, including rudimentary material on general relativity and string theory. Throughout the course, we will collaboratively develop code using Mathematica and/or Matlab to calculate interesting holographic observables.

Credit Hours: 4 hours
Topics in Comp Phys and Astr
Restricted to Graduate - Urbana-Champaign.

**TOPICS IN COMPUTATIONAL PHYSICS AND ASTRONOMY.** A numerical laboratory course designed to familiarize students with the use of a computer to solve diverse problems in physics. Problems will be drawn from several different branches of physics and astrophysics. Hydrodynamics, including the physics of shock waves, will be emphasized as the main paradigm for nonlinear phenomena. For the hydrodynamics, the necessary analytic results will be derived in class. Examples drawn from classical mechanics, electromagnetism, quantum mechanics, etc. will already be familiar to students from standard physics courses. Numerical methods discussed will include solving ordinary and partial differential equations, linear algebra and eigenvalue problems, Monte Carlo techniques, FFTs, etc. Students will work on assigned numerical exercises and simulations both individually and in small teams. The results of these simulations will be presented in class periodically and will constitute an integral part of the class development. The emphasis throughout the semester will be on building confidence and expertise at solving physical problems on the computer. Prerequisites: No formal requirements other than a working knowledge of some scientific programming language like Fortran, C, or C++. Graduate students and upper level undergraduates with solid backgrounds in basic physics are welcome. This course should only be taken by students who plan to participate actively.

Credit Hours: 4 hours
Physics in Two Dimensions
Restricted to Graduate - Urbana-Champaign.

**PHYSICS IN TWO DIMENSIONS.** This course is intended as an introduction to some of the peculiarities of physics in systems which are effectively two-dimensional. It will emphasize the comparison of theory with experiment, especially in those cases in which the two apparently do not agree. Specimen topics include the question of long-range order in two dimensions, weak localization, the (integral and fractional) quantum Hall effect, the apparently metallic behavior seen in Si MOSFETs and other quasi-two-dimensional systems, and the general idea of topological quantum computation and some of its proposed implementations.