Physics

PHYS 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>51206</td>
<td>Lecture</td>
<td>GF2</td>
<td>01:00 PM - 02:20 PM</td>
<td>TR</td>
<td>322 - Loomis Laboratory</td>
<td>Leigh, R</td>
</tr>
<tr>
<td>51225</td>
<td>Lecture-Discussion</td>
<td>IC</td>
<td>09:00 AM - 10:20 AM</td>
<td>TR</td>
<td>141 - Altgeld Hall</td>
<td>Di Francesco, P</td>
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</tbody>
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Credit Hours: 4 hours

**Geom of Field Thry & Strings 2**
Restricted to Graduate - Urbana-Champaign.

GEOMETRY OF FIELD THEORY AND STRINGS, PART 2. Continuation from Fall 2008 of a self-contained treatment of the mathematics underlying quantum field theory and string theory, designed to prepare students for research in these fields. Prerequisite: Fall 2008 PHYS 598GFT or consent of instructor

Credit Hours: 4 hours

**Integrable Combinatorics**
INTEGRABLE COMBINATORICS. Meets with MATH 595 IC. Classical combinatorics is the art of counting, guessing and proving. It is the simplest way into many sophisticated physics and mathematics problems. In this course, we address various counting problems arising in theoretical physics, mostly statistical physics and field theory, and unravel their very rich mathematical structures, inherited from either classical or quantum integrability. We target an audience of both mathematicians and physicists. We will develop various technical tools, such as: matrix integrals, orthogonal polynomials, tree bijections, lattice paths and associated determinants, transfer matrices, (quantum) R-matrices, divided difference equations such as the quantum Knizhnik-Zamolodchikov (qKZ) equation and their multiple contour integral solutions. While we always put a special emphasis on the combinatorial aspects, each technique will be applied within its original physical context. However, each of the problems addressed will be put into a simple combinatorial form that does not require any prior knowledge. Conversely, all techniques will be self-contained and only basic mathematical knowledge is required. Applications range from quantum gravity to algebraic geometry, always in relation to simple two-dimensional lattice models. The scope of this course is to expose the extent and depth of various connections between mathematics and physics, as both inspirational tools and fields of application.