Research seminar "Modern Problems of Theoretical Physics" is supposed to teach students to read, understand and represent to the audience recent advances in theoretical physics. Each student is supposed 1) to choose one of recent research papers from the list composed by the instructor in the beginning of each term, 2) read it carefully, 3) present the major results of the paper to his/her colleagues during the seminar talk, 4) answer the questions from the audience about the content of the paper. The papers in the list are selected, normally, from the condensed matter theory and related fields, like: physics quantum computing, statistical physics, etc. The papers to the list are usually chosen from most competitive physics journals, like Nature Physics, Science, Physical Review Letters, Physical Review X and others.

Student is supposed to have active knowledge of quantum mechanics, statistical physics, diagrammatic methods of quantum field theory.
3. Assignments

<table>
<thead>
<tr>
<th>Assignment Type</th>
<th>Assignment Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Report</td>
<td>To present detailed account of selected modern research paper in theoretical or experimental physics</td>
</tr>
</tbody>
</table>

4. Grading

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Activity weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lab Reports</td>
<td>100</td>
</tr>
</tbody>
</table>

Grading Scale

- A: 86
- B: 76
- C: 66
- D: 56
- E: 46
- F: 0

Attendance Requirements: Mandatory with Exceptions

5. Basic Information
### Maximum Number of Students

<table>
<thead>
<tr>
<th>Overall:</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Per Group (for seminars and labs):</td>
<td></td>
</tr>
</tbody>
</table>

### Course Stream

Science, Technology and Engineering (STE)

### Course Term (in context of Academic Year)

- Term 1
- Term 1A (first four weeks)
- Term 1B (last four weeks)
- Term 2
- Term 3
- Term 4

### Course Delivery Frequency

Every year

### Students of Which Programs do You Recommend to Consider this Course as an Elective?

- **Masters Programs**
  - Mathematical and Theoretical Physics
- **PhD Programs**
  - Physics

### Course Tags

- Physics

### 6. Textbooks and Internet Resources

#### Web-resources (links)

<table>
<thead>
<tr>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>journals.aps.org</td>
</tr>
<tr>
<td>sciencemag.org</td>
</tr>
<tr>
<td>arxiv.org</td>
</tr>
</tbody>
</table>

### 7. Facilities

#### Software

- Access to international physics journals

### 8. Learning Outcomes
### Knowledge

Students will know new results from scientific literature in the broad field of condensed matter physics, theoretical and experimental.

### Skill

Students will be able to analyze critically results of modern scientific publications and explain the content of those publications at professional level.

### Experience

Experience to present scientific results to colleagues and experience to discuss with them controversial scientific subjects.

### 9. Assessment Criteria

#### Input or Upload Example(s) of Assignment 1:

**Select Assignment 1 Type** | Report  
---|---  
**Assessment Criteria for Assignment 1**  
1. Ability of student to analyze modern scientific publication in terms of its real content.  
2. Ability of student to present the results of scientific publication in clear and critical form.  
3. Ability of student to carry on the scientific discussion on the issues of the publication to be discussed.

#### Input or Upload Example(s) of Assignment 2:

#### Input or Upload Example(s) of Assignment 3:

#### Input or Upload Example(s) of Assignment 4:

#### Input or Upload Example(s) of Assignment 5:

### 10. Additional Notes