

<b>Course title: Phase Transitions and Critical Phenomena</b>			
<b>Lecturer: Darko Kapor</b>			
<b>Required Course:</b> elective			
<b>Number of ECTS:</b> 15			
<b>Prerequisites:</b> passed all C and U courses of the previous 4 years			
<b>Course Objective:</b> Students should become familiar with both common and specific features of various phase transitions. They also learn about different theoretical models and the application of statistical physics methods			
<b>Course Outcome:</b> After taking the course, the student should have developed: General capabilities: basic knowledge of this field, following the literature, analysis of various solutions and the choice of most adequate solution, application in other subjects, creativity. Subject-specific capabilities: assigning the corresponding model to a particular transition, independent estimate of transition temperature in various approximations; the estimate of critical indices in various approximations.			
<b>Course Content:</b> <i>Theoretical instruction</i> <ul style="list-style-type: none"> <li>- Basic concepts in phase transitions. Critical phenomena. Modern approach to the study of the critical phenomena. Critical exponents and their inequalities. Universality. Scaling hypothesis. Exact relations between critical exponents. Critical and tricritical point.</li> <li>- Ginzburg – Landau- Wilson theory of phase transitions: examples of physical systems.</li> <li>- Model systems and exactly solvable cases.</li> <li>- Modern theories of critical phenomena. Renormalization group equations and statistical sum. Dimensionality as a continual parameter.</li> <li>- Kosterlitz-Thouless transition, vortices and spin waves.</li> <li>- Quantum phase transitions.</li> </ul> <i>Student research</i> Homeworks and seminars.			
<b>Reading List:</b> <ol style="list-style-type: none"> <li>1) H.E.Stanley: Introduction to Phase Transitions and Critical Phenomena , Clarendon Press, Oxford (1971)</li> <li>2) Shang-keng Ma: Modern Theory of Critical Phenomena, W.A. Benjamin, Reading (Ma) (1976)</li> <li>3) I.Herbut: A Modern Approach to Critical Phenomena, Cambridge UP, Cambridge, 2007</li> </ol>			
<b>Total hours:</b>			10
Lectures: 5	Practicals:	Other:	Student research work:5
<b>Methods of instruction:</b> Lectures, consultations, seminars, homeworks.			
<b>Assessment (maximum number of points 100)</b>			
<b>Requirements</b> Active participation in lectures 10 pts, Seminar work 15pts, Homeworks 10 pts, Written exam 25 pts Oral exam 40pts			