

Course Unit Descriptor

<b>Study Programme:</b> MSc in Biology			
<b>Course Unit Title:</b> Cryobiology			
<b>Course Unit Code:</b> MB31			
<b>Name of Lecturer(s):</b> Associate Professor Željko D. Popović			
<b>Type and Level of Studies:</b> Master of Science, Second cycle			
<b>Course Status (compulsory/elective):</b> Elective			
<b>Semester (winter/summer):</b> Winter			
<b>Language of instruction:</b> English			
<b>Mode of course unit delivery (face-to-face/distance learning):</b> Face-to-face			
<b>Number of ECTS Allocated:</b> 7			
<b>Prerequisites:</b> Biochemistry, Animal physiology or similar			
<p><b>Course Aims:</b></p> <p>Cryobiology aims to enable students to understand how low temperatures affect living organisms and how living organisms during evolution have adapted to survive low temperatures. Students are introduced to all levels at which low temperatures influence living organisms – from behavioral, physiological, cellular and biochemical/molecular. Furthermore, focus of this course is how fundamental cryobiological knowledge can be applied in the field of cryopreservation of molecules, cells, tissues and organs, as well as in food and other industries.</p>			
<p><b>Learning Outcomes:</b></p> <p>After completing the Course, students should become familiar with various processes occurring during the low temperature exposure of living organisms. Types of adaptations to low temperatures among living organisms – whether they avoid or survive low temperature exposure. Also, students will be able to understand basic cryopreservation techniques and their application in science and industry.</p>			
<p>Syllabus:</p> <p><i>Theory</i></p> <p>(1) Introduction to cryobiology. (2) Physical aspects of low temperatures. (3) Water and water-based solutions. (4) Water in living organisms – necessity or threat at low temperatures? (5) Effects of freezing on living organisms. (6) Low temperature survival strategies of endotherms. (7) Low temperature survival strategies of ectotherms. (8) Molecular cryobiology. (9) Cryoprotectants and cryomediums. (10) Intro to cryopreservation techniques. (11) Vitrification. (12) Cryopreservation in conservation biology, medicine and industry. (13) Cryosurgery and cryonics. Food cryopreservation. (14) Cryobanks. Ethical and legal aspects.</p> <p><i>Practice</i></p> <p>Types of cryomediums. Different techniques of cryopreservation. Survival tests. Visit to companies that deal with cryopreservation.</p>			
<p><b>Required Reading:</b></p> <ol style="list-style-type: none"> <li>Muldrew, K., McGann, L.E. (1999) Cryobiology – a short course. University of Calgary, Alberta, Canada.</li> <li>Denlinger, D.L. and Lee, E.J. (2010) Low temperature biology of insects. Cambridge University Press.</li> <li>Chian, R-Ch. and Quinn, P. (2010) Fertility Cryopreservation. Cambridge University Press.</li> </ol>			
<b>Weekly Contact Hours:</b> 4	<b>Lectures:</b> 2	<b>Practical work:</b> 2	
<p><b>Teaching Methods:</b></p> <p>Lectures and students practical work.</p>			
<b>Knowledge Assessment (maximum of 100 points):</b>			
<b>Pre-exam obligations</b>	points	<b>Final exam</b>	points
Active class participation		written exam	50
Practical work	20	oral exam	10
Seminar	20	.....	