



University of Split

Department of Professional Studies

---

# **HIGH VOLTAGE TECHNIQUE**

## **COURSE SYLLABUS**

<b>COURSE DETAILS</b>		
<i>Type of study programme</i>	Professional study - 180 ECTS	
<i>Study programme</i>	POWER ENGINEERING	
<i>Course title</i>	High Voltage Technique	
<i>Course code</i>	SEN029	
<i>ECTS (Number of credits allocated)</i>	5	
<i>Course status</i>	Core	
<i>Year of study</i>	Third	
<i>Semester</i>	Sixth (spring)	
<i>Course Web site</i>	<a href="http://www.oss.unist.hr/">http://www.oss.unist.hr/</a>	
<i>Total lesson hours per semester</i>	Lectures	30
	Practicals	
	Laboratory work and practical demonstrations	30
<i>Prerequisite(s)</i>	None	
<i>Lecturer(s)</i>	Department of Electrical Engineering faculty: Mislav Majstrović, Ph.D., full professor	
<i>Language of instruction</i>	Croatian, English	

<b>COURSE DESCRIPTION</b>	
<i>Course Objectives:</i>	<ul style="list-style-type: none"> <li>• familiarization with high-voltage plants, their insulation and protection against over voltages,</li> <li>• high voltage plants usage in all types of electric power plants.</li> </ul>
<i>Learning outcomes</i>  <i>On successful completion of this course, student should be able to:</i>	<ol style="list-style-type: none"> <li>1. define basic concepts, values and laws in high-voltage power plants,</li> <li>2. describe electric networks insulation systems,</li> <li>3. test protection methods in high-voltage plants,</li> <li>4. name testing plants and measurements in high-voltage laboratory,</li> <li>5. monitor high-voltage electric plants,</li> <li>6. maintain independently high-voltage plants.</li> </ol>
<i>Course content</i>	<p><i>Electric networks insulation systems:</i> electric field in insulation, air, gas SF, liquid and solid insulation, insulation materials basic properties (specific electric conductivity, relative dielectrics and dielectric losses). <i>Insulation pollution and maintenance:</i> industrial pollution, humidity influence, insulation maintenance. <i>High voltage laboratory (HVL):</i> (AC) alternating testing plant (testing transformers, low (AC) alternating voltage sources, voltage dividers, testing transformers cascade connection) impact testing plant (types of impact overvoltages, impact generator), (DC) direct testing plant, HVL measurements. (Delon circuit and voltage doubling, Greinacher generator), measurements in high-voltage laboratory (direct and indirect). <i>Voltage stresses of insulation systems:</i> service voltage, temporary overvoltages, ferroresonance, galvanic, magnetic and capacitance coupling. <i>Atmospheric overvoltages:</i> thunderbolt stochastic nature, direct and indirect thunderbolt, protection. <i>Travelling waves:</i> voltage and current travelling wave equations, Petersen's rule. <i>Overvoltage protection:</i> classic and metal oxide overvoltage arresters, protection devices and zones. <i>Insulation coordination (IC):</i> withstand equipment voltages, classical and statistical method for IC.</p>

**CONSTRUCTIVE ALIGNMENT – Learning outcomes, teaching and assessment methods**

<b>Alignment of students activities with learning outcomes</b>		
<b>Activity</b>	<b>Student workload ECTS credits</b>	<b>Learning outcomes</b>
<i>Lectures</i>	<b>30 hours/ 1 ECTS</b>	<b>1,2,3,4,5,6</b>
<i>Laboratory work /field work/ field trips</i>	<b>30 hours/ 1ECTS</b>	<b>3,4,5,6</b>
<i>Mid-term exams, preparation and delivery</i>	<b>45 hours/ 1.5 ECTS</b>	<b>1,2,3,4</b>
<i>Self- study</i>	<b>33 hours/ 1.1 ECTS</b>	<b>1,2,3,4</b>
<i>Contact hours, final exam</i>	<b>12 hours/ 0.4 ECTS</b>	<b>1,2,3,4</b>
<b>TOTAL:</b>	<b>150 hours / 5 ECTS</b>	<b>1,2,3,4,5,6</b>

<b>CONTINUOUS ASSESSMENT</b>		
<b>Continuous testing indicators</b>	<b>Performance <math>A_i</math> (%)</b>	<b>Grade ratio <math>k_i</math> (%)</b>
<i>Lectures attendance and participation</i>	<b>70 - 100</b>	<b>10</b>
<i>First mid-term exam</i>	<b>50-100</b>	<b>30</b>
<i>Second mid-term exam</i>	<b>50-100</b>	<b>30</b>
<i>Third mid-term exam</i>	<b>50-100</b>	<b>30</b>

<b>FINAL ASSESSMENT</b>		
<b>Testing indicators – final exam (first and second exam term)</b>	<b>Performance <math>A_i</math> (%)</b>	<b>Grade ratio <math>k_i</math> (%)</b>
<i>Theoretical exam (written and/or oral)</i>	<b>50 - 100</b>	<b>100</b>
<b>Testing indicators – makeup exam (third and fourth exam term)</b>	<b>Performance <math>A_i</math> (%)</b>	<b>Grade ratio <math>k_i</math> (%)</b>
<i>Theoretical exam (written and/or oral)</i>	<b>80 - 100</b>	<b>100</b>

<b>PERFORMANCE AND GRADE</b>		
<b>Percentage</b>	<b>Criteria</b>	<b>Grade</b>
<b>50% - 61%</b>	<i>basic criteria met</i>	<b>sufficient (2)</b>
<b>62% - 74%</b>	<i>average performance with some errors</i>	<b>good (3)</b>
<b>75% - 87%</b>	<i>above average performance with minor errors</i>	<b>very good (4)</b>
<b>88% - 100%</b>	<i>outstanding performance</i>	<b>outstanding (5)</b>

### **ADDITIONAL INFORMATION**

Teaching materials for students (scripts, exercise collections, examples of solved exercises), teaching record, detailed course syllabus, application of e-learning, current information and all other data are available by MOODLE system to all students (<https://moodle.oss.unist.hr/>).