

Course Name: Railways design and construction				
Course Code	Course Status	Semester	ECTS Credits	Number of classes
	Compulsory	II	6	3P+2V+1L
Study programmes: Master academic studies - study programme Civil Engineering - Infrastructures; 4 semesters and 120 ECTS credits.				
Conditioned by other courses: /				
Aims of the course: Getting basic knowledge in Design and construction railways				
Learning outcomes: After passing this exam, student will be able to: 1. Knowledge about rail track and vehicle resistance, 2. Knowledge about train mass, haul force and braking force calculations, 3. Knowledge about rail track construction elements, 4. Knowledge about various track design solutions evaluation, 5. Knowledge about track capacity calculation, 6. Knowledge about second track construction procedure.				
Teacher and assistant: Assoc.Prof. Zlatko Zafirovski, Dr-Ing. - teacher Katarina Mirkovic, PhD - assistant				
Methods of teaching and learning: Lectures, exercises, laboratory exercise, consultations, semester project.				
Course content:				
I teaching week	Introduction – General about railways, historic development, Functions of a railway company, Infrastructure, Electrification, Developing countries, Major rail infrastructure project			
II teaching week	Geometry of a railway line, Clearances, Alignment, General track considerations, Track requirements, Load-bearing function of the track, Indication of rail forces and displacements, Track geometry components			
III teaching week	Wheel-rail guidance, , heel-rail contact stresses			
IV teaching week	Train resistances, Types of resistances, Required pulling force, Adhesion force			
V teaching week	General considerations, Curvature and superelevation in horizontal curves, Curve radius/curvature, Curve effects			
VI teaching week	Superelevation, Transition curves, Cross level transitions, Curve resistance, Gradients			
VII teaching week	PRE-EXAM I			
VIII teaching week	Ballasted track, Formation, Ballast bed, Rails, Rail joints and welds, Sleepers, Fastening systems, Track on structures with a continuous ballast bed and sleepers			
IX teaching week	Slab track			
X teaching week	Switches and crossings			
XI teaching week	Numerical optimization of railway track			
XII teaching week	High-speed tracks			
XIII teaching week	Railway asset management systems			
XIV teaching week	PRE-EXAM II			
XV teaching week	Summary and preparation for the final exam.			
Student's obligations: Attending of lectures and exercises, elaboration of semester project, passing of pre-exams.				
STUDENTS LOAD				
<u>Per week</u>		<u>In semester</u>		
6 credits x 40/30 = <u>8 hours</u>		Teaching and final exam: (8 hours) x 16 = <u>128 hours</u>		
Structure:		Necessary preparations before semester (administration, enrolment etc)		
3 hours lectures		2 x (8 hours) = <u>16 hours</u>		
3 hours exercises		Total load for the course: <u>6x30 =180 hours</u>		
2 hours individual work, including consultations		Additional work for exam preparation in the additional exam session, including passing of correctional exam <u>between 0 and 36 hours</u> (remaining time from the previous issues to the final load for the course of 180 hours)		
		Load structure:		
		128 hours (teaching) + 16 hours (preparation) + 36 hours (additional work)		
Literature: <u>Basic literature:</u>				
1. Zdenka Popović, <i>Osnove projektovanja železničkih pruga</i>				
2. Marušić, D., Projektiranje i građenje željezničkih pruga, Građevinski fakultet Split, Split, 1994 (Faculty of Civil Engineering, Split).				
3. MODERN RAILWAY TRACK Second Edition Coenraad Esveld Professor of Railway Engineering Delft University of Technology				
Examining system and grading:				
Examining is continuous during the semester and in the final exam.				
Maximum number of points in semester: 100. Maximum number of points at final exam: 50.				
The structure of examination and points is as follows:				
- semester project: 15 do 30 (min positively marked part of semester project = 4.5 points);				
- pre-exams: 2 x (10 do 20) = 20 do 40 (min positively marked pre-exam = 15 points);				
- final exam: do 50 (min positively marked final exam = 25 points).				
Pre-exams and final exam are in written form.				
Positive grade is obtained for min 51 points.				
Special notes for the course:				
Data prepared by teacher: Assoc.Prof Zlatko Zafirovski, Dr-Ing.				
Note: Additional information on course may be obtained from course teacher, assistant, head of the study programme and vice-dean for teaching.				