



SVEUČILIŠTE U SPLITU  
FAKULTET GRAĐEVINARSTVA,  
ARHITEKTURE I GEODEZIJE

UNIVERSITY OF SPLIT  
FACULTY OF CIVIL ENGINEERING,  
ARCHITECTURE AND GEODESY

# Application of Ground Penetrating Radar (GPR) in Civil Engineering

2017



University of Split

Spend your summer at  
SPLIT SUMMER SCHOOL for students  
of Civil Engineering, Architecture & Geodesy  
CROATIA / Split

## Welcome to Split Summer School!

### The Course: Application of Ground Penetrating Radar (GPR) in Civil Engineering

Non-destructive methods (NDT) are widely used in many areas of civil engineering since they can provide insight in material or structural properties of the concerned object without damage or weakening of the, for example, structural element. Each NDT method can provide information on some specific property, but the combination of several NDT methods will result in very elaborate answer. This course will focus on using georadar for detection of cracks in structural elements, reinforcement pattern in reinforced concrete, underground and buried objects, but it will be demonstrated how to combine GPR with other NDT methods (FLIR camera, ambient vibration and ultrasound). The students will be trained to work with three different GPR antennas (200 MHz, 600/900 MHz and 2 GHz), FLIR camera and ultrasound device.

This school is co-organized by the COST Action TU1208 "Civil engineering applications of Ground Penetrating Radar." COST is supported by the EU Framework Programme Horizon2020.

We would like to introduce you to the people organising the course and to the lecturers.

#### Organising committee

<p>Boris Trogrlić</p> <p>Ph.D. Dean, Associate professor btroglic@gradst.hr</p>	<p>Mirela Galić</p> <p>Ph.D. Vice Dean for Int. Cooperation, Associate professor mgalic@gradst.hr</p>	<p>Ana Jeličić</p> <p>Mag. ing. aedif. Academic Associate ana.jelicic@gradst.hr</p>	<p>Dragan Poljak</p> <p>Ph.D. Full professor dragan.poljak@fesb.hr</p>
			



## Lecturers

<p>Dragan Poljak</p> <p>Ph.D. Full professor dragan.poljak@fesb.hr</p>	<p>Damir Varevac</p> <p>Ph.D. Dean of Faculty of Civil Engineering Osijek Associate professor dvarevac@gfos.hr</p>	<p>Ivica Guljaš</p> <p>Ph.D. Vice Dean of Faculty of Civil Engineering Osijek Full professor iguljas@gfos.hr</p>	<p>Silvestar Šesnić</p> <p>Ph.D. Assoc. professor silvestar.sesnic@fesb.hr</p>
			

## Program structure

### Sunday, 3/9 Faculty Entry hall

19.30-21.00	Registration
20.30 - ...	Welcome and address by Organising Committee

### Monday, 4/9 Classroom B2, 4<sup>th</sup> floor

9.00 – 9.30	Introduction (to the course, the participants and the lecturers)
09.30 - 10.30	Lecture: Introduction into GPR technology
10.30 - 11.00	Coffee break: cafeteria, -1 <sup>st</sup> floor
11.00 - 12.30	Lecture: Introduction into GPR technology
12.30 - 13.30	Lunch break: student restaurant, -1 <sup>st</sup> floor
13.30 - 14.15	Exercise: Demonstration of GPR equipment



### **Tuesday, 5/9 Classroom B2, 4<sup>th</sup> floor**

09.00 – 10.30	Lecture: Fundamentals of electromagnetics and applications
10.30 - 11.00	Coffee break: cafeteria, -1 <sup>st</sup> floor
11.00 - 12.30	Exercise: Computer simulation of GPR operation using gpr Max software tool
12.30 - 13.30	Lunch break: student restaurant, -1 <sup>st</sup> floor
13.30 - 14.15	Exercise: Set up of GPR equipment, calibration of antenna

### **Wednesday, 6/9 Classroom B2, 4<sup>th</sup> floor**

09.00 – 10.30	Exercise: Detecting reinforcement with 2 GHz antenna
10.30 - 11.00	Coffee break: cafeteria, -1 <sup>st</sup> floor
11.00 - 12.30	Exercise: Detecting reinforcement with 2 GHz antenna
12.30 - 13.30	Lunch break: student restaurant, -1 <sup>st</sup> floor
13.30 – 15.00	Lecture: Introduction into other non-destructive methods (NDT): FLIR and ultrasound

### **Thursday, 7/9 Classroom C4, 4<sup>th</sup> floor**

09.00 – 10:30	Exercise: Detecting underground infrastructure (electric cables, water or sewage pipes) with 200 MHz and 600/900 MHz antennas
10.30 - 11.00	Coffee break: cafeteria, -1 <sup>st</sup> floor
11.00 – 12.30	Exercise: Survey of the road structure with 200 MHz and 600/900 MHz antennas
12.30 - 13.30	Lunch break: student restaurant, -1st floor
13.30 – 16.00	Exercise: Use of FLIR camera, ultrasound, vibration measuring
	Free time on beach
18.00 -	City tour (Diocletian's palace)



## Friday, 8/9 Classroom C4, 4<sup>th</sup> floor

09.00 – 10.30	Final project: group work with assistance (completion of the projects and preparation of the presentations)
10.30 - 11.00	Coffee break: cafeteria, -1 <sup>st</sup> floor
11.00 – 12.30	Final project: group work with assistance (completion of the projects and preparation of the presentations)
12.30 - 13.30	Lunch break
13.30 - 15.30	Final projects presentations
	Free time
18.30-19.30	Diploma awarding
19:30 -	Dinner at Faculty restaurant

