



UNIVERSITÀ DEGLI STUDI  
DI PERUGIA



# CIVIL AND ENVIRONMENTAL ENGINEERING

## DOCTORAL PROGRAM



Simon Laflamme is the Waldo. W. Wegner Professor in Civil Engineering in the Department of Civil, Construction, and Environmental Engineering at Iowa State University. He holds a Courtesy Appointment in the Department of Electrical and Computer Engineering, and is an Associate Director of the Center for Nondestructive Evaluation. He received his Ph.D in Structures and Materials from the Massachusetts Institute of Technology, and was granted the Early Achievement in Research Award by Iowa State University in 2017.

Simon is currently leading research efforts funded by the National Science Foundation (NSF) and Air Force Office of Scientific Research (AFOSR). He is a member of the editorial boards of Measurement Science and Technology, and Sensors. His research yielded a textbook on Structural Motion Engineering, four U.S. patents, and more than 150 articles in the areas of Structural Health Monitoring, Smart Structures and Systems, and Structural Control.

**Location:** Campus of Engineering of University of Perugia  
Latitude: 43.118177 Longitude: 12.357942

**Timetable:** November 27-28-29, 9:00 a.m. – 2:00 p.m.,  
“Aula Magna”

## SPECIAL COURSE ON STRUCTURAL HEALTH MONITORING (SHM)

**Instructor:** Simon Laflamme, Associate Professor, Iowa State University

**Course Description:** This special course is a short version of the SHM course offered by the instructor at Iowa State University. It covers both introductory and advanced topics in SHM of aeronautical, civil, and mechanical systems. The course is organized in five consecutive modules covering the essentials of SHM engineering, including the justification of SHM systems, sensors and transducers, basic and advanced signal processing methods, and SHM systems. At the end of the course, students will be capable of engineering SHM solutions.

**Evaluation:** Students will be evaluated through an applied laboratory (25%), and a final presentation (75%) in which the students will need to demonstrate knowledge through the presentation of an applied SHM solution in their field of interest.

**November, 27th 2019**

**Module 1: Justifying SHM systems**

9:00-10:00 Motivations for SHM

10:00-12:00 Application-Based SHM, challenges & needs

**Module 2: Sensors and Transducers**

12:00-14:00 Terminology

**November, 28th 2019**

9:00-10:00 Strain gauges, accelerometers

**Module 3: Signal Processing: Basics**

10:00-11:30 Basics in filtering and frequency domain

11:30-13:00 Laboratory: Exploring the Fourier kingdom

**Module 4: Signal Processing: Toward decision-making**

13:00-14:00 Feature extraction, pattern recognition

**November, 29th 2019**

9:00-10:00 Prognosis

**Module 5: SHM Systems**

10:00-11:30 Multifunctional systems

11:30-13:00 Physics-informed systems

**Evaluation**

13:00-14:00 Presentations

