



Dept. of Civil Engineering | Master's Module | CPD Course

IoT and GIS for Civil Engineering

16 – 20 September 2024



Introduction

This course will be of use to a wide variety of students and professionals in engineering, the built environment, water resource management and environmental science. Advanced geospatial technologies have revolutionized environmental monitoring, allowing for accurate and efficient data collection and analysis. This includes remote sensing, Geographic Information Systems (GIS), and Internet of Things (IoT). The technologies presented in this course will build capacity of participants to collect and process data using:

- Remote sensing - the use of satellite imagery to collect data on the environment. This technology will be used to monitor changes in vegetation, water quality, and land use, among other things.
- Geographic Information Systems – the integration and analysis of different types of spatial data, such as satellite imagery, ground-level observations, and digital maps. This will be used to identify environmental patterns and trends needed to design and manage projects.
- Internet of Things - the use of sensors and other devices to collect and transmit data over the internet. This technology will be used to collect data and detect changes in real-time. This includes the use of Artificial Intelligence (AI) tools in the programming of sensors.

Continuing Professional Development

The course is offered to Continuing Professional Development delegates, who can obtain 5 CPD credits. If you attend the course as a CPD participant, credit cannot be claimed in retrospect. A certificate of attendance will be awarded to CPD participants. Participants need to attend 80% of the lectures to qualify for an attendance certificate.

Course Objectives

The course has been designed to equip practitioners or those interested in expanding their knowledge base in the rapidly evolving technologies of environmental data collection and management, using IoT and spatial science. Objectives include:

- An overview of GIS and Remote Sensing.
- Collection, management, display and analysis of geospatial data of the environment
- An overview of Internet of Things (IoT) technology
- Programming and deployment of IoT sensors to collect environmental data
- An introduction to the use of Artificial Intelligence tools to program IoT sensors
- Assimilate all practical knowledge in an assignment and a project, which students will complete to demonstrate problem-solving, critical thinking and understanding of the technology.

Course Format

The course will be delivered in person over the period of one week (16 – 20 September 2024). There will be a mixture of traditional lectures, and hands-on practical sessions comprising computer programming and GIS tutorials.

Participants are encouraged to arrive with the following software installed on their laptops:

- Quantum GIS (QGIS). Go to <https://www.qgis.org/en/site/> and install the latest stable version.

Students are encouraged to have the Windows Operating System for the course. If you are using a MacOS, then please arrange to have Windows Virtual Machine installed.

Course Content

- Introduction to GIS and Remote Sensing
- Introduction to spatial data – vector vs raster, data formats, data sources.
- Basic mapmaking and spatial data analysis
- Analysis of remotely sensed data
- Internet of Things for environmental monitoring
- Intro and components
- Building an IoT system
- System optimisation using programming and AI

Who Should Attend

This course is aimed at a wide variety of students in engineering, urban planning, architecture, environmental and water resources management. It is also suited to engineers, environmental scientists, planners, architects and geomatics practitioners. The course is offered as an inter-disciplinary course that will benefit from a cohort of students from diverse educational backgrounds and level of qualifications. Candidates should be able to communicate well in English.

Course Presenters



Dr John Okedi, PrEng, PhD, Course Convenor, holds a BSc Civil Engineering (Makerere University), MSc in Water Resources Engineering (KU Leuven) and a PhD Civil Engineering (Cape Town). Dr. Okedi is a full-time employee of the University of Cape Town where he is a convener of two undergraduate programmes i.e., Engineering Hydrology and Urban Water Services. He also convenes 3 post-graduate courses i.e., Groundwater, Urban Hydrology & Modelling Urban Drainage Systems, and IoT&GIS. He has over 15 years' experience in industry and academia. Research interests include alternative 'non- conventional' water resources for water scarce countries, big data, Internet of Things (IoT), and application of Real-Time Control on hydrological systems. He is a professional engineer registered with ECSA (Reg No. 202001361), with key industry experience including civil engineering design and project management, construction supervision and operations, quantitative data analysis and modelling. Contact details: john.okedi@uct.ac.za



Dr Siddique Motala, PhD, is a senior lecturer in the Department of Civil Engineering. He is the academic lead of Global Digital Heritage Afrika (GDHA), a research group dedicated to the digital preservation, virtualisation and research of African Heritage. He holds a BSc in Land Surveying, MSc in Digital Photogrammetry, Higher Diploma in Higher Education & Training, and a PhD in Education. His research interests are spatio-temporal mapping, 3D heritage preservation, storytelling, posthumanism and socially just pedagogies in engineering education.



Ms Miriam Arinaitwe holds a BSc in Civil Engineering from Makerere University, Uganda, and an MSc (Eng) in Civil Engineering from the University of Cape Town (UCT), South Africa. Currently, she is pursuing a PhD in Civil Engineering at UCT focusing on integrating IoT technologies with groundwater modeling to enhance water management and climate change resilience. Her expertise includes urban drainage, stormwater management, groundwater modeling, and IoT technologies. Miriam is dedicated to advancing water systems engineering through innovative solutions and professional excellence.



Mr Ralph Schroeder, Dipl.-Ing, holds a degree as a Diplom-Ingenieur from the University of Bonn (Germany). His degree is equivalent to a Geomatics Master's degree. In 2003, he graduated as a "Vermessungsassessor" (surveying assessor/land surveyor) at the District Government of Düsseldorf (Germany). Ralph pursued further education in Geographic Information Systems (GIS) at the FGE Training Center in Paderborn (Germany) and successfully became a qualified GIS-Engineer in 2005. He joined the Geomatics Division at the University of Cape Town as a senior scientific officer and was a team member of the Zamani Project until the end of 2023. Ralph was promoted to the position of Chief Scientific Officer in 2014. In 2024 Ralph became a team member of the research group Global Digital Heritage Africa at the University of Cape Town. Ralph's responsibilities encompass a wide range of expertise, including Geographic Information Systems (GIS), terrestrial 3D Laser-Scanning, conventional surveying, creation of 3D models, development of virtual tours (Panorama tours), and web development. In addition to his involvement in the planning and execution of 3D laser scanning and GPS survey fieldwork, Ralph was involved in the teaching on the use of Geographic Information Systems (GIS) during various international field trips to local government authorities.

Course Overview

Name	IoT and GIS for Civil Engineering, CIV5154Z	
Duration	16 – 20 September 2024	
Venue	Postgraduate Seminar Room, New Engineering Building, UCT	
CPD	5 CPD points, ECSA validation no: UCTCIVIGCE24	
Participants	Suitable for engineers, students and academics	
Fees	Standard fee: R16 500	UCT student or staff: R8250

Registration

Registration and Cancellation

- [Register online](#)
- Registration covers attendance of all sessions of the course and course material.
- Registrations close one week before the start of the course. Confirmation of acceptance will be sent on receipt of a registration form.
- **Cancellations must be received one week before the start of a course, or the full course fee will be charged.**
- For more information on application and registration procedures, please visit our website www.cpd.uct.ac.za

Certificates and CPD Points

- A certificate of attendance will be awarded to CPD participants for each course. Participants need to attend 80% of the lectures to qualify for an attendance certificate.
- According to guidelines set out by the Engineering Council of South Africa, attendance of this course will earn participants 5 points towards Category 1 (Developmental Activities). The ECSA validation number for this course is *UCTCIVIGCE24*
- Please note: If you are interested in attending this course for credit purposes, you will need to register for the Master's Programme or as an occasional student. If you attend the course as a CPD participant, credit cannot be claimed in retrospect.
- CPD participants can also request a formal university transcript, which will show this course as part of a Professional Development Career.

Contact details

For more information or details on CPD courses, visit our website or contact us.

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