DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL MANAGEMENT AND ENERGY STUDIES

FACULTY OF SCIENCE

UNIVERSITY OF JOHANNESBURG

CERTIFICATE COURSE IN GEO-INFORMATICS 2: REMOTE SENSING (S2RSEQ)

(A SAQA registered course)

SECOND SEMESTER – 2023

Module/ Course Title: Post-graduate course in Remote Sensing

Qualification: Certificate in Geo-Informatics 2: Remote Sensing and Image Processing

Module / Course Code: S2RSEQ

Module / Course Credit Value: 30

National Qualifications Framework (NQF) Level: 7

Name of Lecturers: Prof. S.G. Tesfamichael

Name of Module / Course Coordinator: Prof. S.G. Tesfamichael

1. PURPOSE OF THE QUALIFICATION

The **Geo-Informatics 2: Remote Sensing and Image Processing** course is an NQF Level 7 module that runs for a full semester (14 weeks). The course aims to familiarize postgraduate students with the utility of remote sensing to a wide range of study fields that have direct or indirect relevance to geographical and environmental forms and processes. This is essential in stimulating geographical and environmental science thinking and research that applies state-of-the-art spatial technologies.

The course is intended to equip students with the skill to design, undertake and report academic research efforts that relate to remote sensing techniques. Students are thus expected to work towards being self-motivated readers, inquisitive of ideas and critical reviewers of academic/scientific evidence. It is therefore vital that they allocate substantial amount of time to gain an in-depth understanding of the subject matters covered in the course. This is achieved through knowledge absorption in both the theories and practical applications of remote sensing and image interpretation for information extraction.

2. ACADEMIC REQUIREMENTS

Students who intend to register for the course must have a recognized Bachelor's degree or equivalent qualification, preferably with prior knowledge of Geographic Information System, spatial analysis, remote sensing or aerial photography in undergraduate studies.

3. COURSE CONTENT

The contents below are informed by the predominant experience in the learning-teaching of remote sensing techniques worldwide. This experience essentially promotes equipping students with the principles and applications of remote sensing in a plethora of geographical and environmental forms and processes. In doing so, the course strives to keep students abreast with the current technological advances of remote sensing and its applications. To this end, adjustments to the contents may be made whenever necessary.

1. Basic principles of electromagnetic radiation
    −   Components of remote sensing
    −   Electromagnetic energy
    −   Interaction of electromagnetic energy and targets on Earth's surface

2. Characteristics of remotely-sensed data
    −   Active and passive remote sensing
    −   Sensors
    −   Spatial, spectral, radiometric, temporal resolutions

3. Earth observation sensors
    −   Weather monitoring systems
    −   Coastal observation sensors
    −   Land   observing   sensors

4. Image analysis and interpretation for land use / land cover classification
   – Image preprocessing
   – Supervised / unsupervised classification
   – Land use / land cover interpretation

5. Accuracy assessment
   – Reference data for accuracy assessment
   – Accuracy indices
   – Computation of accuracies
   – Classification errors

6. Remote sensing of change detection
   – Benefits of remote sensing for change detection
   – Change detection methods
   – Time-series analysis using remote sensing

7. Applications of multispectral remote sensing to vegetation characterisation
   – Species classification
   – Disease/damage monitoring
   – Growth monitoring
   – Biophysical characterization

8. Applications of hyperspectral remote sensing to vegetation characterisation
   – Disease/damage monitoring
   – Biophysical characterization
   – Crop seed assessment

9. Applications of multispectral/hyperspectral remote sensing to urban environment
   – Rooftop characterisation
   – Urban expansion monitoring
   – Urban heat island mapping

10. Applications of multispectral/hyperspectral remote sensing to geology and mining
    – Geoarcheological mapping
    – Mineral monitoring
    – Reclamation monitoring

11. Lidar remote sensing
    – Principles of Lidar remote sensing
    – Lidar remote sensing for vegetation biophysical assessment
    – Lidar remote sensing for urban structure classification
    – Lidar–optical fusion for improved vegetation and urban features mapping

12. Radar remote sensing
    – Principles of radar remote sensing
    – Factors controlling radar data performance
    – Radar remote sensing for vegetation assessment
    – Radar remote sensing for urban features characterisation
    – Radar remote sensing for land subsidence mapping
    – Radar remote sensing for quantifying soil moisture

4. FEES

The fee for Geo-Informatics 2: Remote Sensing and Image Processing is **R11825.00 for 2023** when taken as a non-graduate course. Furthermore, students need to arrange their own computers to take the course, should it become necessary to run the course remotely. The course fee is payable **in advance** during registration (If a student discontinues a percentage of this fee can be refunded depending on the date of discontinuation).

Once you have been notified of acceptance to the course, please contact our Faculty Officer Mrs Tsholanang Nyoka at the following address for assistance in the registration process and to obtain invoice.

- E-mail: tshulin@uj.ac.za
- Phone: +27 11 559 2459
- Office: C-Ring 201

5. APPLICATION

The application form to enrol for the course is attached at the last page of this document. Applications to attend the course in the **second semester** must reach the course coordinator before or on **July 7, 2023 for 2023**. Applications can be made by e-mail given below and must be accompanied by certified copies of previous academic records. *You will then receive a notification on the success of your application*.

To submit an application for enrolment to the course or for further information, contact:

Prof Solomon G. Tesfamichael
Course coordinator
Dept. of Geography, Environmental Management and Energy Studies
University of Johannesburg
P.O. Box 524
Auckland Park
2006

Tel. No. 011 559 3927
E-mail: sgtesfamichael@uj.ac.za (preferred method)

TAKE NOTE OF THE FOLLOWING ARRANGEMENTS FOR 2023:

Enrolment:

Enrolment for accepted applicants takes place as follows:

- Department: Geography, Environmental Management and Energy Studies.
- Place: D2 LAB 344H
- Date: July 13 and 14, 2023
- Time: 9H30 – 12H30

For students not previously enrolled at UJ, the enrolment will be faster if you fill in the institution's online application form in advance and get a student number.

First lecture:

- Date: July 18, 2023
- Time: 13H00
- Place: D3 LAB 332 or remotely via the internet

Mode of lecture:

- Lectures and practical sessions will take place in-person offered on campus considering the nature of the course.

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL MANAGEMENT AND ENERGY STUDIES

REGISTRATION FORM FOR GEO-INFORMATICS 2: REMOTE SENSING AND IMAGE PROCESSING (S2RSEQ2) FOR CERTIFICATE PURPOSES IN 2023 (Second Semester, Part Time)

SURNAME: _____   **Title:** _____   **ID Number:** _____

NAMES: _____

Courses previously done at UJ? Yes/No_____   **UJ Student Number:** _____

Name(s) of course(s) and date: _____

ACADEMIC QUALIFICATIONS (PLACE THE NAME OF THE INSTITUTION AT THE END IN BRACKETS):
_____

_____

HOME ADDRESS: _____| **(PROVIDE POSTAL ADDRESS IF IT IS DIFFERENT FROM HOME ADDRESS)**

_____| _____

_____| _____

TEL. NO: (_____) _____

WORK ADDRESS: _____

_____

TEL. NO: (_____) _____

FAX NO: (_____) _____

I, _____, hereby declare that I will adhere to the regulations of the university and the Department of Geography, Environmental Management and Energy Studies. I also declare to pay the required course fee in full at registration <u>after I have been accepted and an official student number has been allocated to me.</u>

NB!!   All payments must be made with reference towards your student number.

Student

_____   _____
SIGNATURE (Student)   DATE

_____   _____
SIGNATURE   DATE
(Prof S.G. Tesfamichael: COURSE COORDINATOR)