1	Course Code:	CIVL4100T
2	Course Title:	Applications of Artificial Intelligence in Remote Sensing
3	Course Credits:	3
4	Class Quota:	30
5	Duration / Offering Term:	Spring 2023
6	Lecture/tutorial/lab hour per week	170 mins per week, 12 weeks/Spring
7	Targeted Student Group:	Final year UG and first year PG students
8	Prerequisite (if any):	PHYS1112 and MATH2350 and COMP1021
9	Exclusion (if any):	N.A.
10	Corequisite (if any)	N.A.
11	Instructor:	Prof. Hui SU
12	Enrollment requirement (e.g., Instructor's approval is required):	N.A.
13	Course Description: (within 150 words)	Remote sensing from space is a powerful technique to gather information about the Earth's land, water, and air over wide areas and continuously in time. It is used extensively in civil and environmental engineering for site investigation, resource exploration, urban growth monitoring, detection of natural hazards (e.g., landslides, floods, earthquakes, etc) and other applications. Artificial intelligence (AI) is critically needed to extract meaningful information from the vast amounts of diverse datasets generated by satellite remote sensing. This course introduces applications of AI in remote sensing. It covers the principles underlying remote sensing, various remote sensing technologies, satellite data preparation for AI analysis, and common AI techniques for remote sensing research and applications in civil and environmental engineering.
14	Tentative course structure:	The course will cover the following topics. 1. Overview of AI for satellite remote sensing 2. Principles underlying satellite remote sensing 3. Types of remote sensing and platforms 4. Satellite data characteristics 5. Examples: optical and SAR data 6. Objective-based image analysis for urban feature extraction 7. Basics of artificial intelligence, machine learning and deep learning 8. Training and validation of a model 9. Class imbalance and data augmentation 10. Artificial neural network and convolutional neural networks (CNN) 11. A case study: CNN for landslide binary classification 12. Future perspectives: "smart" sensing with on-board AI in space
15	Intended learning outcomes (ILOs) of the course:	On completion of this course, the student will be able to 1. Understand the principles of remote sensing techniques 2. Gain knowledge of available remote sensing technologies 3. Convey the importance of remote sensing in monitoring global environmental change 4. Obtain basic skills to develop machine learning algorithms to analyze satellite data 5. Be aware of future opportunities of AI in remote sensing

16	Rationale for introducing the course:	Satellite remote sensing is an effective means to observe environmental changes on Earth. Rapid technology development in remote sensing has generated vast amounts of diverse data. Applications of AI to remote sensing can revolutionize the use of remote sensing data for advancing science and assisting decision-makings in combating climate change and civil and environmental engineering. This course introduces the principles of remote sensing and applications of AI in remote sensing data analysis. It will prepare students to take advantage of the explosive growth of AI in remote sensing big data analytics.
17	Textbook / Reference books:	Lecture notes will be provided. • A First Course in Atmospheric Radiation, by Grant W. Petty • Artificial Intelligence Applied to Satellite-based Remote Sensing Data for Earth Observation, edited by Edited by Maria Pia Del Rosso, Alessandro Sebastianelli and Silvia Liberata Ullo
18	Grading Scheme	10% participation, 30% homework, 60% final project and presentation
19	Grading Type (PP/P/F/Letter)	Letter
20	With endorsement of UG coordinator	