1	Course Code:	**CIVL3910** (Spring 22-23)
2	Course Title:	Smart Infrastructure Sensing and Data Analytics
3	Course Credits:	3
4	Instructor:	Shenghan Zhang, Jize Zhang
5	Duration / Offering Term:	Spring semester
6	Lecture/tutorial/lab hour per week	Two 1.5-hour lectures per week; one tutorial/lab session per week (to be determined)
7	Prerequisites (if any):	COMP1021 OR COMP1022P OR COMP2011
8	Corequisite (if any)	
9	Enrollment requirement (e.g., Instructor's approval is required):	
10	Course Description: (within 150 words)	This course contains two modules. For the sensing part, this course will cover basic sensing technologies in structural engineering. The student will learn about traditional (e.g., accelerometers) as well as state-of-art sensing technologies (e.g., fiber optic sensing) and their practical applications in civil engineering. This course will also cover vibration-based structural health monitoring. The students will learn about the fundamentals of structural behavior, and analysis in the time and frequency domain. For the data science part, this course will introduce fundamental knowledge and practical applications of data science and machine learning in the structural engineering context, primarily from understanding and extracting informative patterns from structural sensing data. Students will also learn about the use of relevant software & toolboxes (MATLAB, Python) to apply the discussed data science concepts on structural sensing datasets.
11	Intended learning outcomes (ILOs) of the course (CILOs):	On successful completion of this course, students are expected to be able to: CILO-1. Describe the typical sensing technologies used in structural health monitoring CILO-2. Understand the fundamentals of fiber optic sensing technologies CILO-3. Understand structural behavior in frequency domain CILO-4. Understand the basic concepts of data science and machine learning CILO-5. Apply data science for practical structural engineering problems through the use of MATLAB and/or Python
12	Contribution of Learning Outcomes to Programs of Study	PO1. Acquire fundamental knowledge in mathematics and science on which civil engineering research and practice are based Achieved through CILO-1, CILO-4, CILO-5 PO2. Understand fundamental principles of engineering science relevant to civil engineering disciplines Achieved through CILO-4, CILO-5

		PO4: Acquire an ability to apply modern engineering and IT tools effectively and efficiently for engineering analysis, design and communication Achieved through CILO-2, CILO-4 PO5. Develop an ability to identify and formulate civil engineering problems, and propose feasible solutions with an appreciation of their underlying assumptions, uncertainties, constraints, and technical limitations Achieved through CILO-3, CILO-5 PO10: Recognize the importance of seeking further specialization within civil engineering and the need for life-long learning Achieved through CILO-2, CILO-4 PO12: Develop an ability to stay abreast of contemporary issues, both nationally and internationally, and the awareness of the impact of engineering in these areas Achieved through CILO-1, CILO-5
13	Textbook / Reference books:	FRADEN, Jacob. Handbook of modern sensors: physics, designs, and applications. 2010. EMC Education Services. Data science and big data analytics: discovering, analyzing, visualizing and presenting data. Wiley, 2015.
14	Grading Scheme	Assignments (20%) Mid Term Exam (30%) Final Exam (50%)
15	Grading Type (PP/P/F/Letter)	Letter
16	With endorsement of UG coordinator	