Hong Kong University of Science and Technology
Department of Civil and Environmental Engineering

Rubric Title of course Instructor	CIVL 3510 Hydrosystems Engineering Prof. Mengqian LU
Prerequisites Credit	CIVL 2510 3
Textbook(s) and/or Other materials	**Reference Textbook:** Marlyn L. Shelton, **Hydroclimatology: Perspectives and Applications**, Cambridge University Press Frank M. White, (8th edition), **Fluid Mechanics**, McGraw-Hill Education
Course Objectives	1. Describe global water cycle, sub-cycles, and their inter-relations with living environments; 2. Understand fundamental principles of engineering hydrology & hydraulics governing the flow process in each element of water cycle; 3. Provide students with the tools and develop in them the ability for synthesis and analysis of hydro-systems, treatment of uncertainties, and economic principles for design and decision making; 4. Provide experience to understand fluid flow behavior and the analysis and interpretation of data
Topics	1. Hydrologic cycle and climate 2. Atmospheric water and precipitation; 3. Hydrologic losses (evaporation, transpiration, and infiltration) 4. Streamflow analysis and rainfall-runoff modeling; 5. River and reservoir routings; 6. Open channel flows; 7. Pressurized flows; 8. Sustainable water infrastructure and management.
Computer usage	
Lab Projects	No lab work is required
Class/lab schedule	Two 80-minute lectures with an additional 50-minute tutorial per week
Contribution to the professional component	80% Engineering topics 20% Engineering management
Intended Learning Outcomes (ILOs) of this course	I. Ability to appreciate (1) the interactions of different components within water cycle and their relation with living environments as well as man-made hydrosystem infrastructures; (2) fundamental principles of flow processes in water cycle is essential for the design of hydro-infrastructural systems to enhance sustainability of water resources and environments; and (3) interdisciplinary nature of hydrosystems engineering and management; II. Utilize mathematical or quantitative methods to model and analyze flow processes in a variety of complex, real-life urban water systems; III. Apply key engineering principles and modeling skills to hydrosystems

	engineering design and management.
Relationship to the program objective	*PEO1: Provide students with professional skills in the design, construction and management of the civil infrastructure, as well as an awareness of environmental sustainability.* Students will develop an ability to apply fundamental principles of flow processes in water cycle for the design of hydro-infrastructural systems to enhance sustainability of water resources and environments (ILO #III) *PEO3: Challenge students with research-type and open-ended design problems to stimulate self-learning and innovative problem solving skills.* Students will develop an ability to work on challenging design problems that requires a good understating of the principles involved (ILO #I, II, and III) *PEO4: Expose students to real world engineering projects as well as cutting edge research to improve their understanding of the profession and technological advancements that can improve current practice* Other than imparting the current state-of-the-art knowledge and practice for tackling hydrosystem engineering problems, research challenges relating to course subjects will also be highlighted (ILO #III)
Relationship to program outcome	*PO1: Acquire fundamental knowledge in mathematics and science on which civil and environmental engineering research and practice are based* - ILO #I *PO2: Understand fundamental principles of engineering science relevant to civil engineering disciplines* - ILO #I *PO3: Acquire an ability to conduct experiments, analyze and interpret results, and appreciate the importance of experimental data in establishing empirical relationships and parameters for analysis and design* -ILO #II *PO4: Acquire an ability to apply modern engineering and IT tools effectively and efficiently for engineering analysis, design and communication* - ILO #II *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* - ILO #III *PO6: Develop technical competency to design civil engineering components and systems, with an understanding of the principles behind the design methodologies* - ILO #III *PO7: Develop an appreciation of the breadth of civil and environmental engineering, and acquire basic knowledge in several disciplines to enable effective performance within a multidisciplinary work environment* - ILO #I *PO8: Obtain in-depth knowledge in at least one major area of specialization within civil engineering* - ILO #I and III *PO10: Recognize the importance of seeking further specialization within civil and environmental engineering and the need for life-long learning* - ILO #I and III

	PO11: Instill a deep sense of professional responsibilities and the importance of ethical and societal considerations, including public health, safety, environmental conservation, welfare etc. - ILO #I (students will appreciation of conflict and tradeoff in urban water development objectives (e.g., flood damage reduction - project cost - safety) and understand their responsibility and challenges in resolving these conflicts.) *PO12: Ability to stay abreast of contemporary issues,* - ILO #I
Assessment of Outcomes	1. Exercises are given to facilitate students' learning of the subjects (ILO #I, II, and III) 2. Midterm (35%) and final (65%) examinations are conducted to assess students' understanding of the subjects (ILO #I, II, and III)
Prepared by	Prof. Mengqian LU
Date	August 2023