CV4121 Inland and Coastal Flood Management

Academic Year	2023-24	Semester	1
Course Coordinator	A/P Qin Xiaosheng		
Course Type	Major Prescribed Elective		
Pre-requisites	CV2020 Water Resources Engineering		
AU	3		
Grading	Letter Grading		
Contact Hours	39 (Lecture: 26 hours; Tutorial: 13 hours)		
Proposal Date	7 December 2022		

Course Aims

This is a final year course on inland and coastal flood management. The course provides the understanding of inland hydrological analysis, drainage system design, climate change effect, coastal water fluctuations, flood risk assessment, shoreline management and protection measures, and groundwater and geotechnical considerations. It also covers the related coastal management design knowledge and understandings, including levees and sea walls, and polders, together with ecological considerations.

Intended Learning Outcomes (ILO)

By the end of this course, student will be able to:

1. Quantify flood risks for engineering designs
2. Perform hydrological analysis for inland rainfall, runoff, and drains
3. Analyse coastal sea level fluctuations and compound flooding
4. Comprehend available measures for coastal and shoreline protection
5. Understand the role of ground water seepage in flood management
6. Incorporate geotechnical considerations for design and construction of dam, sea wall, or other flood-related infrastructures

Course Content

S/N	Topic	Lecture Hrs	Tutorial Hrs
1.	Quantification of flood risks (flood frequency and risk assessment)	4	2
2.	Hydrological analysis (rainfall design, climate change, inland flood control infrastructure)	6	3
3.	Coastal water level fluctuations (tide, storm surge, sea level rise, wave runup, compound flooding)	4	2
4.	Shoreline management and protection measures (bank protection, levees, seawalls, ecological considerations)	4	2
5.	Groundwater considerations (concepts, seepage management, applications)	4	2

6.	Geotechnical considerations (site investigation, geotechnical design, soil improvement)	4	2
	Total:	26	13

Assessment (Includes both continuous and summative assessment)

Component	ILO Tested	EAB Graduate Attributes	Weightage	Team / Individual	Rubrics
1. CA1: Quiz 1	1, 2 & 3	SLOs (a), (b), (c) and (l).	20%	Individual	N.A.
2. CA2: Quiz 2	4, 5 & 6	SLOs (a), (b), (c) and (l).	20%	Individual	N.A.
3. Final Examination	1, 2, 3, 4, 5, 6	SLOs (a), (b), (c) and (l).	60%	Individual	N.A.
Total			**100%**		

* SLO = Student Learning Outcomes (as per EAB Student Learning Outcomes (subset of 12 points))

EAB Graduate Attributes[1]	
a)	**Engineering Knowledge** Apply the knowledge of mathematics, natural science, engineering fundamentals, and an engineering specialisation to the solution of complex engineering problems.
b)	**Problem Analysis** Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
c)	**Design / Development of Solutions** Design solutions for complex engineering problems and design systems, components or processes that meet the specified needs with appropriate consideration for public health and safety, cultural, societal, and environmental considerations.
d)	**Investigation** Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
e)	**Modern Tool Usage** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
f)	**The Engineer and Society** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
g)	**Environment and Sustainability** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable

[1] *Reference: EAB Accreditation Manual*

	development.
h)	**Ethics** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
i)	**Individual and Team Work** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
j)	**Communication** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
k)	**Project Management and Finance** Demonstrate knowledge and understanding of the engineering management principles and economic decision-making, and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
l)	**Life-long Learning** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Formative Feedback

1. Feedback will be through dissemination of your performance in quizzes as well as review of the quiz questions in class. Follow-up consultation will be arranged as needed.

2. Besides having interactive discussion during tutorial, we encourage you to initiate individual consultation sessions on your particular learning needs.

Learning & Teaching Approach

Class meets thrice per week with 2 hours of lectures and 1 hour of tutorial.

Approach	How does this approach support students in achieving the learning outcomes?
Lecture	Formal lectures on the topics with examples
Tutorial	In depth discussion of tutorial problems with step-by-step solution process discussion.

Readings & References

References:

1. Coastal Engineering: Processes, Theory and Design Practice, by D. Reeve, A. Chadwick, and C. Fleming. Spon Press, 2004

2. Engineering Hydrology, by K. Subramanya, McGraw Hill, International Edition, Third Edition, 2009.

3. Geotechnical Engineering of Dams, by Robin Fell, Patrick MacGregor, David Stapledon, Graeme Bell, Mark Foster, CRC Press, Second Edition, 2015.

4. Introduction to Coastal Engineering and Management, by J. William Kamphuis, World Scientific, 2002

Course Policy & Student Responsibility

(1) General

Students are expected to complete all assigned pre-class readings and activities, attend all classes punctually and take all scheduled assignments and tests by due dates. Students are expected to take responsibility to follow up with course notes, assignments and course-related announcements for seminar sessions they have missed. Students are expected to participate in all seminar discussions and activities.

(2) Absenteeism

Absence from quizzes without a valid reason will affect your overall course grade. Valid reasons include falling sick supported by a medical certificate and participation in NTU's approved activities supported by an excuse letter from the relevant bodies.

Academic Integrity

Good academic work depends on honesty and ethical behaviour. The quality of your work as a student relies on adhering to the principles of academic integrity and to the NTU Honour Code, a set of values shared by the whole university community. Truth, Trust and Justice are at the core of NTU's shared values.

As a student, it is important that you recognise your responsibilities in understanding and applying the principles of academic integrity in all the work you do at NTU. Not knowing what is involved in maintaining academic integrity does not excuse academic dishonesty. You need to actively equip yourself with strategies to avoid all forms of academic dishonesty, including plagiarism, academic fraud, collusion and cheating. If you are uncertain about the definitions of any of these terms, you should refer to the Academic Integrity Handbook for more information. Consult your instructor(s) if you need any clarification about the requirements of academic integrity in the course.

Course Instructors

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Planned Weekly Schedule

Week	Topic	Course ILO	Readings / Activities
1	Quantification of flood risks	1	Lectures and Tutorials
2	Quantification of flood risks	1	Lectures and Tutorials
3	Hydrological aspect of floods	2	Lectures and Tutorials
4	Hydrological aspect of floods	2	Lectures and Tutorials
5	Hydrological aspect of floods	2	Lectures and Tutorials
6	Coastal water level fluctuations	3	Lectures and Tutorials
7	Coastal water level fluctuations	3	Lectures and Quiz
8	Shoreline management and protection measures	4	Lectures and Tutorials
9	Shoreline management and protection measures	4	Lectures and Tutorials
10	Groundwater considerations	5	Lectures and Tutorials
11	Groundwater considerations	5	Lectures and Quiz
12	Site investigation and soil characterization	6	Lectures and Tutorials
13	Geotechnical design (bearing capacity, settlement, and slope stability, soil improvement)	6	Lectures and Tutorials