Course Name: HYDROMETEOROLOGY
Number of credits: 3 ECTs (equivalent to 2 Vietnamese Credits)

Period: Fall/spring semester

Cooordinator	Vietnam Maritime University
Credits	03 ECTS
Lecturers	Dr. Tran Duc Phu
Level	Bachelor
Host institution	Vietnam Maritime University
Course duration	1 semester (the classes will be scheduled in accordance with the university timetable)

Summary

The course Hydrometeorology provides basic knowledge of meteorology and hydrogeology. Besides, the course also equips learners with basic knowledge about rivers and river flow formation, main meteorological features, hydrological characteristics of basins and rivers, principles of surveying hydrological features hydrological calculation methods, calculating design hydrological features, knowing how to collect hydrological data, principles of tidal monitoring and forecasting.

Target student audiences

Students majoring in Maritime Safety Engineering, Waterway Construction Engineering

Prerequisites

Required courses (or equivalents): Studied course Hydraulic.

Aims and objectives

After studying the course, students will have concepts of rivers, major meteorological features, principles of surveying and surveying hydrological features, tidal awareness and tidal monitoring, especially The hydrological point of the river area is influenced by the tides.

Authentic Tasks:

The course provides basic knowledge of meteorology and hydrogeology in planing, designing and operating waterway and maritime constructions.

Desired learning outcomes:

By the end of the course, successful students will:

Knowledge	• Explain and distinguish the types of river nets, the formation of river flows, the hydrological features of the basins and rivers, the methods of hydrological calculation of the main meteorological features and calculation of basic features on the plan and cross-section of the river; • Know how to draw the water level-flow relationship, transfer the connection line from one section to another.
Comprehensive	• Understand methods to draw frequency lines of hydrological quantities.

Application	• Identify the tides and observe the tides, hydrological characteristics of the river affected by tides, determine and predict the tides for any area, calculate the necessary hydrological characteristics.
Analysis	•
Synthesis	•

Overview of sessions and teaching methods

The course will make most of interactive and self-reflective methods of teaching and learning and, where possible, avoid standing lectures and presentations.

Learning methods

- Video presentations
- Project Based Learning
- Literature review
- Brainstorming
- Puzzles
- Query
- Mind map
- Problem-based learning
- Team work

Literature

Compulsory

[1] *Lecture notes of Hydro-meteorology*, Division of Hydraulic Engineering, 2010

Recommended:

[1] Bùi Ngọc Tài. *Thuỷ văn công trình*. Đại học Hàng hải, 1974.
[2] Lê Trần Chương. *Thuỷ văn công trình*. Nhà xuất bản Khoa học kỹ thuật. Hà nội 1996.
[3] KS. Nguyễn Sỹ Kiêm. *Khí tượng thủy văn Hàng hải*. Nhà xuất bản Xây dựng. Hà nội 2003.
[4] Nguyễn Ngọc Bích. *Hướng dẫn tính toán thủy triều*. Đại học Hàng hải 1996.

Course workload

The table below summarizes course workload distribution:

Activities	Learning outcomes	Assessment	Estimated workload (hours)
In-class activities (30 hours)			
Lectures	Understand theories, concepts, methodology and tools	Class participation	
Moderated in-class discussions	Understand the concepts and characteristics of hydrological phenomena and hydrological research methods; river systems and river flow formation; how to observe the water level, flow velocity, calculate the main hydrological features in the river, draw the water level-discharge relationship;	Class participation and preparedness for discussions	

	characteristics of the earth's atmosphere; main meteorological features; basic tidal concepts and classify tides according to tidal waves; how to observe and predict tides.		
In-class assignments, homework assignment	Draw the longitudinal section, cross-section of the river and calculate the hydraulic characteristics on the river cross-section; drawing frequency lines commonly used in hydrology; drawing a wind flower chart	Class participation and preparedness for assignments	
Reading and discussion of assigned papers for preparation for lectures	Familiarity with and ability to calculate harmonic constant from water level monitoring data for 30 days; the hydrological regime of the river affected by tides and calculate the design hydrological features.	Class participation, creative and active contribution to discussion	
Independent work (60 hours)			
Home work and Exercise	Identify calculation goals; analysis of monitoring data and determination of statistical parameters, methods of drawing experimental and theoretical frequency lines, determination of annual average flow volume and design flood flow.	Quality of individual assignments	
Total			

Course outline

Week	**Topic**
Week 1 & 2	Overview and outline of rivers and the formation of river flows
Week 3 & 4	Hydrological characteristics of basins and rivers
Week 5→7	Hydrologic methods
Week 8	Features of the Earth's Atmosphere
Week 9	Main meteorological features
Week 10	Basic concepts of tides and waves
Week 11&12	Tidal observing and forecasting
Week 13&14	Estimate harmonic constant from 30-day observed water level data
Week 15	Calculation of hydrology in river areas affected by tides

Course Schedule

Topic 1&2. Overview and outline of rivers and the formation of river flows	
Learning objectives	• Explain and distinguish the types of river nets, the formation of river flows
Learning outcomes	• Explain the concepts and characteristics of hydrological phenomena and hydrological research methods; • Explain river systems and river flow formation; • Draw the longitudinal and cross-sections of the river and calculate the hydraulic characteristics on the river cross-section.
Student deliverables	Exercise: • Redraw the river basin growth chart for the river basins in Vietnam: Thai Binh River, Mekong River, Red River. • Draw the longitudinal and cross-sections of the river and calculate the hydraulic characteristics on the river cross-section.
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	1.1. Contents and tasks of the subject of Hydro-meteorology. 1.2. Features of hydrological phenomena and research methods. 2.1. The river system. 2.2. River basin and river basin characteristics. 2.3. Rivers and river flow formation. 2.4. Basic concept of river flow formation.
Topic 3. Hydrological characteristics of basins and rivers	
Learning objectives	• Explain and distinguish the hydrological features of the basins and rivers
Learning outcomes	• Explain how to monitor the water level, flow velocity, calculate the main hydrological features in the river; • Draw the water level - discharge line.
Student deliverables	Exercise: • Calculation of hydrological features of basins and rivers • Collect data on water level and discharge on the sections of Cam river, Lach Tray river, Van Uc river • Build a water level connection line for these river sections • Switch the water level-discharge relationship from one section to another when knowing the distance and water surface slope between the two sections.
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	3.1. Main hydrological features of the river. 3.2. Line of water level - flow connection. 3.3. The problem of prolonging the water level-flow connection. 3.4. Transfer the water-flow relationship from one section to another.
Topic 4. Hydrologic methods	

Learning objectives	• Explain and distinguish the methods of hydrological calculation of the main meteorological features, the calculation of basic features on the plan and cross-section of the river
Learning outcomes	• Explain and distinguish methods and draw frequency lines commonly used in hydrology.
Student deliverables	Exercise: • Draw the line of water level frequency by month and year for hydrological stations in Vietnam based on the "tide calendar" according to the above methods • Correlation analysis of these data
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	4.1. Summary of some concepts of statistical probability theory. 4.2. Method of plotting the experimental frequency line. 4.3. Statistical parameters commonly used in hydrology. 4.4. Theoretical frequency lines are commonly used in hydrology. 4.5. The method of plotting the frequency line is commonly used in hydrology. 1- Test Method 2- The 3-point method. 4.6. Correlation analysis.
Topic 5. Features of the Earth's Atmosphere	
Learning objectives	• Understand the characteristics of the earth's atmosphere
Learning outcomes	• Explain the characteristics of the earth's atmosphere
Student deliverables	Exercise: • Collect data on wind maps, temperature maps, rainfall maps in Vietnam
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	5.1. Composition of the earth's atmosphere 5.2. Atmospheric structure 5.3. Typical atmospheric parts and weather in them
Topic 6. Main meteorological features	
Learning objectives	• Understand main meteorological features
Learning outcomes	• Explain and distinguish the methods of hydrological calculation of the main meteorological features and calculation of basic features on the plan and cross-section of the river • Understand the main meteorological features and draw a wind rose chart
Student deliverables	Exercise: • Calculation of rainfall using Thiessen polygon method

	• Draw a wind rose chart based on wind measurement data of Phu Lien-Kien An station
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	6.1. Air temperature and mattress surface temperature 6.2. Air pressure 6.3. Wind 6.4. Storm 6.5. Air humidity 6.6. Rain 6.7. Vaporize 6.8 Meteorological foresight
Topic 7. Basic concepts of tides and waves	
Learning objectives	• Understand main meteorological features; basic tidal concepts and classify tides according to tidal waves
Learning outcomes	• Explain the basic concepts of tides and classify tides according to tidal waves
Student deliverables	Exercise: • Collection of tidal data along the coast of Vietnam, tidal patterns • Collect animations that simulate the earth-moon-sun relationship about the formation of tides
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	7.1. Definition of tides 7.2. Basic Tide Nouns and Symbols 7.3 Theories of tidal formation 7.4 Using tidal statics theory to explain some tidal phenomena 7.5. Tidal waves and tidal classification according to tidal waves 7.6. Some tidal characteristics along the coast of Vietnam
Topic 8. Tidal observing and forecasting	
Learning objectives	• Understand how to observe and predict tides.
Learning outcomes	• Explain how to observe and predict tides
Student deliverables	Exercise: • Calculate the distance between tidal observation stations in reality, for example: the distance between 2 stations Hon Dau station-Hai Phong and Ha Long station-Quang Ninh.
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	8.1. Mean water surface, depth reference surface. 8.2. Calculate the distance to build the tidal testing station 8.3. Choose a location and build a tidal testing station.

	8.4. Leveling landmark, measuring water level at tidal testing station 8.5. Tidal monitoring 8.6. Tide data correction 8.7. Tide forecast 8.8. Tidal monitoring and forecasting in Vietnam
Topic 9. Estimate harmonic constants from 30-day observed water level data	
Learning objectives	• Familiarity with and ability to calculate harmonic constant from water level monitoring data for 30 days; the hydrological regime of the river affected by tides and calculate the design hydrological features.
Learning outcomes	• Calculate the harmonic constant from the water level monitoring data for 30 days
Student deliverables	Exercise: • Collecting tidal characteristics of tidal-influenced river sections
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	9.1. General theory. 9.2. Split the wave, choose the appropriate number of days 9.3. Calculate R and 9.4. Calculate the average water surface A0, A and B. 9.5. Coefficient increased (amplified). 9.6. Find (v0+u) and f. 9.7. Calculate the harmonic constant and check the calculation. 9.8. Check calculation. 9.9. Calculate the average of the tidal harmonic constant
Topic 10. Calculation of hydrology in river areas affected by tides	
Learning objectives	• Understand the hydrological regime of the river affected by tides and calculate the hydrological features.
Learning outcomes	• Explain the hydrological regime of the river affected by tides and calculate the hydrological features.
Student deliverables	Exercise: • Calculation of designed hydrological characteristics for rivers in Hai Phong area: Van Uc River, Cam River, Lach Tray River.
Topic materials	• Lecture notes of Hydro-meteorology • Video
Outline	10.1. The hydrological regime of the river is influenced by tides. 10.2. Calculation of design hydrological features.

Course Assignments

Course assignments will constitute a multi-part project:

- Assignment #1 - (in-class)
- Assignment #2 - (home work)

Grading

The students' performance will be based on the following:

Assessment	• Progress assessment (10%): - Class attendance • Semi- Final examination (40%): - Exercise (20%): - Homework (15%): • Final assessment (50%): - Final examination (50%)
Evaluation	A (8,5 – 10) B (7,0 – 8,4) C (5,5 - 6,9) D (4,0 – 5,4)