Example form for Module Handbook (Đề cương tổng quát môn học)

A **Module Handbook or collection of module descriptions that is also available for students to consult** should contain the following information about the individual modules:

Module designation (Tên môn học)	***Environmental Modelling*** *(Mô hình hóa môi trường)*
Semester(s) in which the module is taught (Học kỳ giảng dạy)	*Semester 5* *(Học kỳ 5)*
Person responsible for the module (Giảng viên)	***Assoc. Prof. Bui Ta Long*** *(PGS. TSKH. Bùi Tá Long)*
Language (Ngôn ngữ)	*Vietnamese, and English* *(Tiếng Việt và Tiếng Anh)*
Relation to curriculum (Các môn học liên quan)	*- Environmental Hydrology (Compulsory);* *- Air Pollution Control (Compulsory);* *- Water and Wastewater Treatment Technology (Compulsory);* *- Numerical Methods (Elective);* *- Fluid Mechanics (Elective).*
Teaching methods (Phương pháp giảng dạy)	*Lecture, lesson, laboratory works, and seminar.*
Workload (incl. contact hours, self-study hours) (Thời lượng làm việc)	*- Total workload hours: 60;* *- Total theory lecture hours: 30;* *- Total exercise, laboratory works, and seminar hours: 30.*
Credit points (Số tín chỉ)	*3 (2.2.5)*
Required and recommended prerequisites for joining the module (Những yêu cầu kiến thức trước khi học)	*- Numerical methods and mathematical models;* *- Knowledge of environmental processes;* *- Analysing, mining, and visualizing data;* *- Application of GIS and remote sensing for model.*

Module objectives/ intended learning outcomes (Mục tiêu môn học, yêu cầu CĐR)	***Module objectives:*** *- Knowledge: this course will provide students with basic knowledge and advanced applications of the mathematical model, the environmental modelling techniques in solving a huge urgent environmental problems, pay attention to the mathematical models appearing in water supply, wastewater, solid waste, air pollution simulation;* *- Skills: know how to use plenty of software that calculates the transmission and diffusion of environmental pollutants consisting of ModelMaker (kinetic equations), CAP (air environment), ENVIMAP (air environment), Streeter (water environment), QUAL2K (water environment) , MIKE11 (water environment);* *- Competences: Guide students to logical thinking skills, creativity, through the decision thinking, rational, responsible educational experience about the possible consequences when adopting decisions.* ***Intended learning outcomes:*** *- Modeling with the aid of information technology in current times has become a crucial branch of modern science and is a merely powerful tool to uncover the world. Research, modeling and applications on the computer opens up new horizons to identify the dependence of the mathematics and computer science and other disciplines - both natural and social;* *- Subject environment modelling provides a theoretical basis and practical construction as well as application of mathematical models for environmental protection. The basic concepts such as modeling, environmental modeling, modeling the environmental issues of air, surface water, ground water is presented. Furthermore, it also devoted special attention to the specific application of environmental problems in our country.*

Content (Nội dung)	***- (1) Introduction:*** *+ Modeling natural processes including physical model, mathematical model, role of mathematical models, key attributes of the model;* *+ Environmental Modeling including why have environmental modeling?, definition of environmental modeling, principles of environmental modeling, role of the environment forecast model, model classification by space and time.* ***- (2) The basic concepts of environmental modelling and measurement systems for modelling service:*** *+ The basic concepts of environmental modelling;* *+ The measurement system serves for environmental modelling;* *+ The first example of mathematical models and mathematical models of environmental processes.* ***- (3) The meteorological factors affecting the dispersion of pollution:*** *+ The emission of air pollutants in the atmosphere;* *+ The condition affects the dispersal of atmospheric gases;* *+ Steady state of the atmosphere.* ***- (4) Modelling air pollution according the Gauss approach:*** *+ Basic equations describing the transmission and diffusion of pollutants;* *+ Basic Gauss model and estimate change dispersion of pollutants;* *+ Calculate the average air pollution level over time;* *+ Exercises in terms of simulation applying Gauss method.* ***- (5) Modeling air pollution Berliand approach:*** *+ The approach to estimate the air pollution dispersion;* *+ Berliand model for calculating dispersion of pollution;* *+ The steps automated calculation of air pollution in the model.* ***- (6) Model of Streeter in simulating river water quality:*** *+ The basic concepts associated with the Streeter model;* *+ The equation decomposes organic matter superlative;* *+ The phenomenon of gas permeability & gas permeability modeling;* *+ Establishing the Streeter equation;* *+ Solutions the Streeter equations and calculate for the specific case;* *+ The extended Streeter model;* *+ Exercises in terms of applying the Streeter model.* ***- (7) Qual2K Model:*** *+ Overview of QUAL2K model;* *+ The segment in QUAL2K model;* *+ Balancing flow;* *+ The hydraulic properties;* *+ Moving time;* *+ The formula for calculating the coefficient of dispersion in the direction of flow;* *+ Temperature model;* *+ Model calculations for the element;* *+ Software ENVIMQ2K applying GIS to simulation river water quality;* *+ Exercise ENVIMQ2K software applications to simulation river channel water quality by discharge sources.*
Exams and assessment formats (Hình thức kiểm tra và thi)	*- Take-home written assignments;* *- Mid-term test: written examination, time: 45 minutes;* *- Final exam: written examination, time: 90 minutes.*

Study & examination requirements (Tỉ lệ đánh giá học tập)	***The final grade in the module is composed of:*** *- 10% in-class participation: students need to attend a minimum of 80% hours of coursework;* *- 20% take-home assignments: report must be submitted by the student group;* *- 20% performance on mid-term test;* *- 50% performance on final exam.*
Reading list (Tài liệu)	***Names of textbooks****:* *- Environmental Modelling (2014);* *- Practical Exercises for Environmental Modelling (2014);* ***Names of reference books****:* *- Fundamentals of Ecological Modelling, 4th Edition (1994);* *- Environmental Modeling: Fate and Transport of Pollutants in Water, Air, and Soil (1996);* *- Surface Water-Quality Modeling (1997);* *- Air pollution and exhaust gas treatment: Volume 1 - Air Pollution and Computation for Pollutants Diffusion (2002);* *- Geodesy and Revise Hydrological Data (2003).*