Research Design: Theory and Practice

**Fall semester, 2019-2020**

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| Coordinator | **Van Dieu Anh** |
| Credits | 1.5 ECTS (optional course), 15 in-class hours |
| Lecturers | **Van Dieu Anh** (Hanoi University of Science and Technology, Vietnam)  **Ly Bich Thuy** (Hanoi University of Science and Technology, Vietnam) |
| Level | Doctoral students |
| Host institution | **Hanoi University of Science and Technology**, School of Environmental Science and Technology |
| Course duration | October 19 – November 23, 2019 |

### Summary

This course will provide students with concepts and advanced tools of research design. The course will also cover principles and practice in experimental design and data analysis applied in environment studies. Through the course student will be also assisted in setting up a high quality and well-designed plan for their dissertation through the presentations of the individual projects and the ensuing group discussions on how to improve them.

### Target student audiences

Doctoral students in the fields of:

* Environmental Engineering
* Environmental Science
* Natural resources and environmental management
* Chemical Engineering

### Prerequisites

Required courses (or equivalents):

* Not require.

### Aims and objectives

The main course objective is to provide students with the basic elements of research design and to enhance their skill to apply appropriate research paradigms, research methodology to facilitate good research studies. The steps of experimental design will be described and the principles and statistical software for data analysis will be introduced.

### General learning outcomes:

By the end of the course, successful students will:

* Understand the major models of research design and the notion of research paradigms, research methodology and research methods
* Understand the principle of experimental design and grasp data analysis techniques
* Develop an appropriate experimental research design for an environment case study
* Design and plan a research proposal setting out the key features of requirements appropriate to the discipline practice and to PhD dissertation.

### Overview of sessions and teaching methods

The course will try to make use of interactive and self-reflective methods of teaching and learning including video show, video conference (if possible), course assignment/project and their presentations and discussions. It will start with an introduction about fundamental of models of research design, research paradigm, research methodology and research methods. The second part will introduce about experimental design and data analysis that are used in environmental studies. The third part will discuss design and plan a research proposal setting out the key features required for PhD dissertation.

### Course workload

The table below summarizes course workload distribution:

|  |  |  |  |
| --- | --- | --- | --- |
| **Activities** | **Learning outcomes** | **Assessment** | **Estimated workload (hours)** |
| **In-class activities** | | | |
| Lectures | Understanding theories, concepts, methodology. | Class participation | 15 |
| Moderated in-class discussions | Understanding strategies/techniques that are used in environmental studies | Class participation and preparedness for discussions | 10 |
| **Independent work** | | | |
| Group work:   * Contribution to the group case-study projects * Contribution to the preparation and delivery of individual presentation | Ability to develop an experimental design and research proposal | Quality of group assignments and individual presentations | 20 |
| ***Total*** |  |  | ***45*** |

### Grading

The students’ performance will be based on the following:

* Process assessment: 40% including:
  + Level of preparedness for participation in class discussions and seminars (10 %) (from 100 % for active participation and demonstrated familiarity with the course readings to 0 % for completely ignoring in-class discussions);
  + Group assignments (15 %) (from 100% for clearly demonstrated input to 0 % for non-participation);
  + Mid-term exam (15%)
* Final exam: 60%

### Course schedule

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| --- | --- | --- | --- |
| **Day**  **(Tentative)** | **Time** | **Topic** | **Lecturer** |
| October 19, Saturday | 08:00-09:30 | Introduction: The nature of research, research problems, questions and hypothesis | Van Dieu Anh |
| 09:45-11:15 | Fundamental of models of research design, research paradigm | Van Dieu Anh |
| 11:30-12:15 | Research methodology and research methods | Van Dieu Anh |
| October 26, Saturday | 08:00-09:30 | The Trustworthiness Process | Van Dieu Anh |
| 09:45-11:15 | Principles and concepts of experimental design | Van Dieu Anh |
| 11:30-12:15 | Methods for hypothesis testing | Van Dieu Anh |
| November 2, Saturday | 08:00-09:30 | Experimental design and data analysis applied in environmental studies | Van Dieu Anh |
| 09:45-11:15 | Experimental design and data analysis applied in environmental studies | Van Dieu Anh  Ly Bich Thuy |
| November 9, Saturday | 08:00-09:30 | Design and plan a research proposal | Van Dieu Anh  Ly Bich Thuy |
| 09:45-11:15 | Design and plan a research proposal | Van Dieu Anh  Ly Bich Thuy |

### Course assignments

Course assignments will constitute a multi-part project:

* Assignment #1 (mostly in-class) – General facts about research design
* Assignment #2 – Development an Experimental Design
* Assignment #3 – Development a Research Design of Dissertation Proposal or Research Design of a Proposed Research Study.

To complete the assignments, the class will be divided into several groups (if possible). **Assignment #1** will help students to understand the general content of the course. The outcome will be evaluated by paper test.

**Assignment #2&#3** will require a greater level of dealing with real work from students. Partly based on Assignment #1, it requires students to develop an appropriate experimental design or research proposal to the discipline practice.

**Literature**

Creswell, J. W. *Research Design (4th ed.).* Sage Publication, 2014.

Creswell, J. W.*Educational research: Planning, conducting, and evaluating quantitative and qualitative research (5th ed.)*. Pearson, 2012.

Johnson, B., & Christensen, L.*Educational research: Quantitative, qualitative, and mixed approaches (5th ed.)*. Sage Publication, 2015.

Keppel, G., & Wickens, T. D. *Design and analysis: A researcher’s handbook (4th ed.)*. Englewood Cliffs, NJ: Prentice Hall, 2003.

Quinn, Gerry P., Keough, Michael J. *Experimental design and Data analysis for Biologist.* Cambridge University Press, 2002.