Development and Implementation of a Postgraduate Course on **Research Methodology** for Engineers and Scientists

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The focus of the paper

Development and implementation issues of the course

- Operated by the Civil Engineering Department, AUTh
- Compulsory for all new doctoral students (1st year - 2nd semester)
- Aiming at preliminary provisions of knowledge and skills training
- Complementing the indisputable role of the PhD’s supervisor

Design and organisation of the course

Aims and objectives

- The familiarisation with basic issues/principles of research
- The development of necessary related skills and competencies

Learning outcomes

- Knowledge outcomes
- Skills outcomes

Design and organisation of the course

Learning outcomes

- Knowledge outcomes
  - knowledge of basic concepts and their mutual relationships
  - understanding the principles of ethical conduct of research
  - apprehension of research process
  - familiarisation with research activities in sciences and engineering
  - recognition of concepts, principles and sources of technical terminology
  - acquaintance with ways and forms of communicating research results
- Skills outcomes
  - research design and organisation (recognise/validate problems)
  - research environment (conduct, ethics, rights, exploitation)
  - research management (identify/access bibliography sources, use information technology tools)
  - communicating research (effective use of forms and levels, written, oral and supporting material)
  - teamworking (working relations, personal behaviours)

Design and organisation of the course

Educational methods and material

Educational method

- lectures
- creative activity
- active learning
- self-education

Educational material

- lectures' PPT's
- informative material
- guidelines & examples
- completed assignments

Assignments

- one general assignment (teamwork)
- two specific assignments (personal work)

Students' evaluation

- overall presence & activity
- contribution in general assignment
- performance in specific assignments

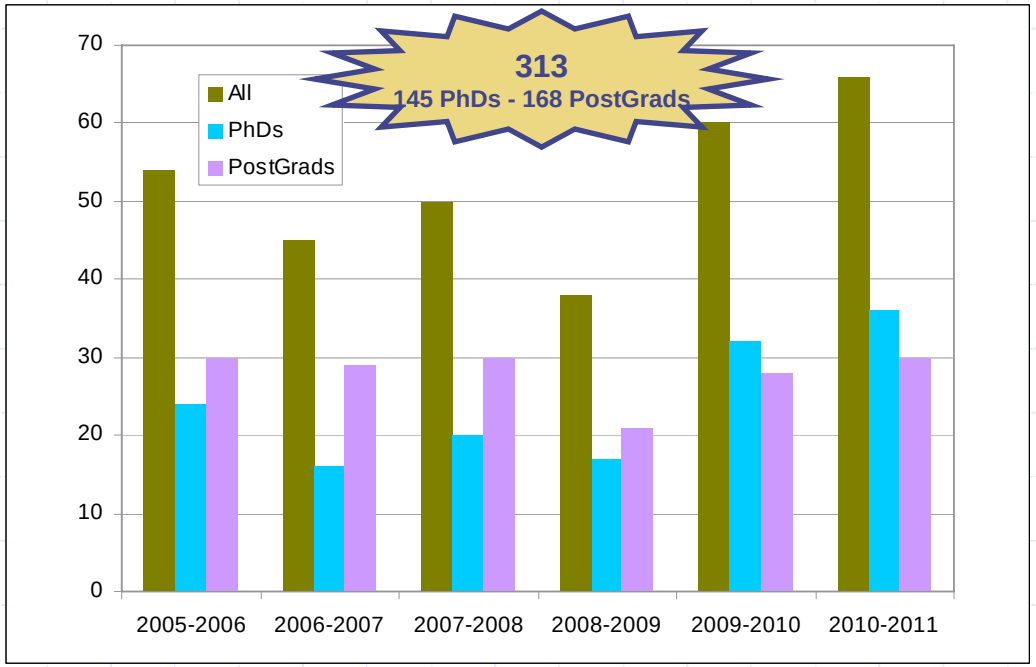
Implementation of the course

Class participation and attendance

- joint teaching: PhD's & MSc's (PostGrads)
- an interesting educational form
- two students' participation characteristics

(a) class composition
PhD's / MSC's

a manageable class
of 38-66 students
(annual average: 52) and
of two equivalent groups
(PhDs & MSc's)



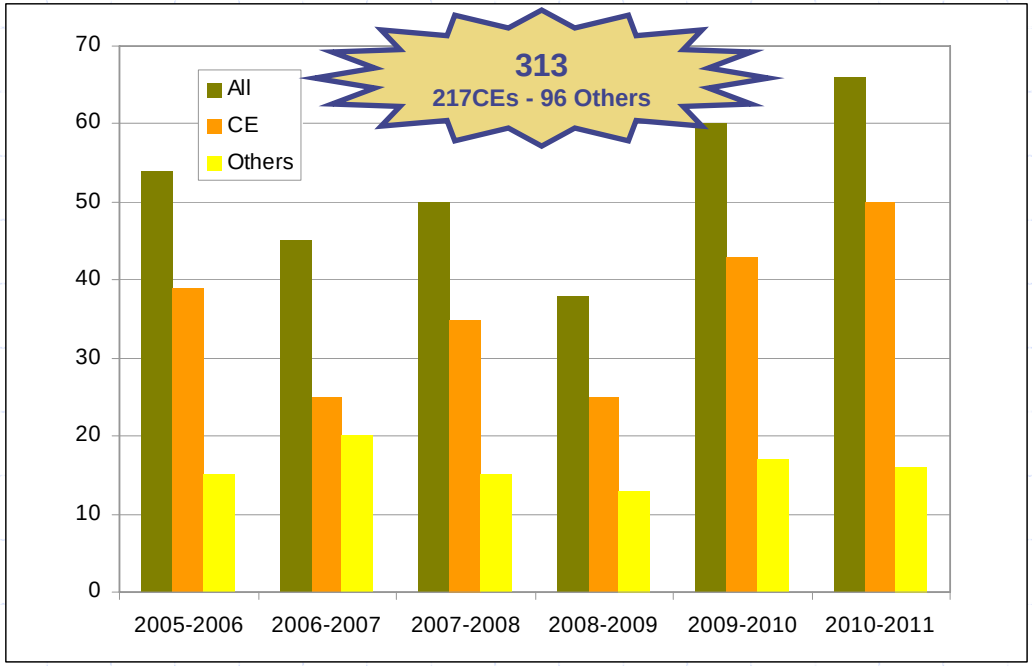
Implementation of the course

Class participation and attendance

- joint teaching: PhD's & MSc's (PostGrads)
- an interesting educational form
- two students' participation characteristics

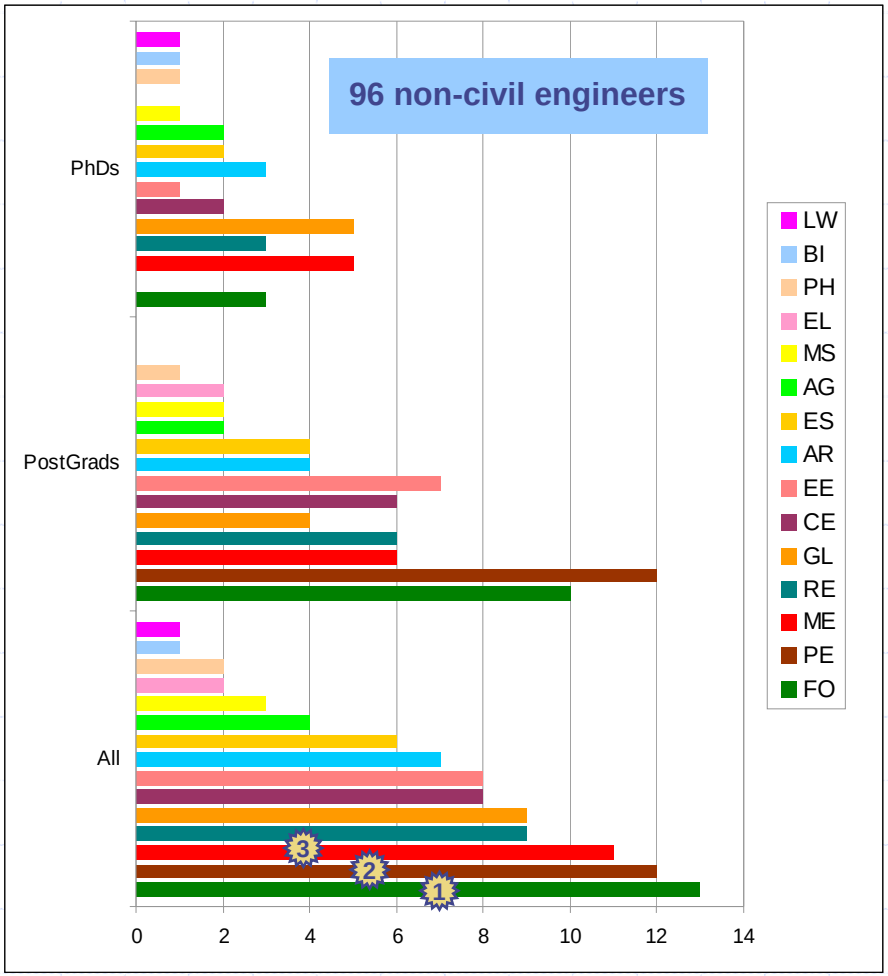
(b) class composition
CE's / Others

the proportions of the two groups are more or less conditioned on specific enrollment regulations



Implementation of the course

Class participation and attendance



- Engineering specialisations
  - PE Planning and Regional Development (2)
  - ME Mechanical (3)
  - RE Rural and Surveying
  - CE Chemical
  - EE Environmental
  - AR Architecture
  - EL Electrical
- Other disciplines
  - FO Forestry (1)
  - GL Geology
  - ES Environmental Studies
  - AG Agriculture
  - MS Marine Sciences
  - PH Physics
  - BI Biology
  - LW Law

Implementation of the course

Course schedule

Week	Event / Topic	Student Assignment / Activity
1	**Lecture 1** Introduction – Basic concepts	
2	**Lecture 2** Research methodology and ethics	**General assignment**
3	**Lecture 3** Literature review and management	
4	**Lecture 4** Technical terminology	**Specific assignment A**
5	**Lecture 5** Quantitative research methods	
6	**Lecture 6** Oral presentations	
7	**Students activity 1** Oral presentations of paper critiques	Presentations and discussion of the critiques of journal papers
8	**Lecture 7** Posters and diagrams	
9	**Lecture 8** Scientific writing	**Specific assignment B**
10	**Students activity 2** Conference	Formal presentations (oral with PPTs) and poster presentations

Implementation of the course

Course assignments

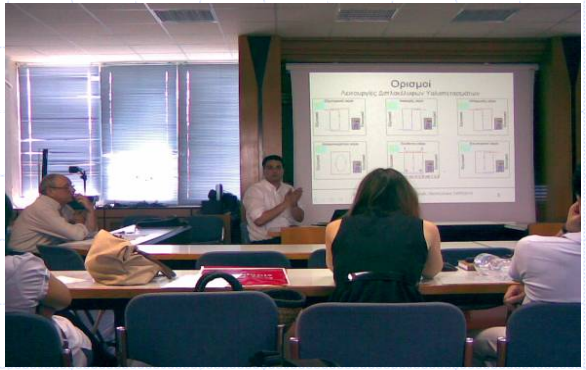
- General assignment
  - Paper critique
    - literature search/paper selection
    - critical analysis/evaluation
    - oral presentation of critique
  - Paper presentation
    - reverse use of paper
    - oral presentation of paper
  - Poster preparation & presentation
    - poster presentation of paper
- Specific assignment A
  - technical terminology in research (principles, sources, proper use)
  - elaboration of selected terms (term and definition evaluation, translation)
- Specific assignment B
  - preparation of a conference paper (on current personal research issues)
  - multiple evaluation criteria (scientific merit, content, complying with formatting requirements)

Implementation of the course

The conference

- The concluding activity of the course

- various roles
  - chairpersons
  - speakers
  - poster presenters
  - audience



- more benefits
  - presentation and discussion of various scientific issues

Conclusions

- Restructuring doctoral studies
  - a dynamically changing educational issue
- Doctoral education aims
  - research-related knowledge acquisition
  - specific skills development
- The presented course
  - an integrated educational form
  - a flexible/modifiable assembly of sub-courses
  - specifically designed for civil engineering
  - suitable for PhD's at early stages
  - additional coursework and personal supervision required at later stages