Research Methods and Project Management

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Course title & identity

- Title: ***Research Methods and Project Management***
- Objectives
  - ***Primary*:**
    - ✓ Understanding the research process in Informatics Engineering and
    - ✓ Develop the ability to choose the methodology that best suits the type of investigation being conducted & appropriate to the research objectives;
  - ***Secondary*:**
    - ✓ Understanding key concepts and methodologies of successful project management.
- Focus
  - The scientific process, Research methods, effective project management;
- Members of staff
  - Prof. Manolis Tsiknakis

About this course

- A PhD or master's level research project is an enormous undertaking, and you might find yourself a bit uncertain about the process or how to achieve the desired outcome.
- In this course, you will learn the underlying principles that are needed to conduct research from an engineering perspective.
- The objective of the course is to translate current research methods, which are mostly from a social science perspective, into something more relatable and understandable to engineers.
- The methods taught in this course will equip you with the knowledge needed to design, plan and construct your own research process.

Scope and Objectives

- Research Methods introduces graduate students to basic ideas about conducting a personal research program.

- The focus will be on the application of the Scientific Method
  - reading technical papers
  - designing and conducting reviews of literature
  - devising research questions and formulating hypothesis
  - planning research, testing hypothesis
  - analyzing experimental results and
  - writing scientific documents & synthesizing broader theories.

Structure and methods

- The course will be structured around three activities:
  - lectures on research strategy and tactics, experimental design and statistical methods;
  - discussions of technical papers;
  - and preparation and review of written assignments.

- Significant reading, reviewing, and writing will be required, and
- students will be expected to participate actively in class discussions.

Detailed look into the Syllabus

- The course contains three fundamental sections:
  - The first section pertains to knowledge relating to understanding the research process in Informatics Engineering & Computer Science.
  - In this section, lectures
    - ✓ will address and hone into **research categories** (fundamental research, applied research, experimental, mixed methods, etc),
    - ✓ will discuss the **foundational knowledge** demanded in each category,
    - ✓ will reveal the **working assumptions** and basic themes for research.
    - ✓ Main focus is to **understand the Scientific Method** itself

Detailed look into the Syllabus (cntd)

- The second section covers existing methodological approaches and the design of research
  - Formal methodologies using statistical techniques;
  - Design of Experiments (DoE) for Hypothesis Testing;
  - (Selected) Methods for Data Analysis and
  - Reporting of Research results.

- Finally, since research is a process in which a variety of methodologies are employed, the third part of the course will focus on issues related to the **management** of the research process.
  - Understanding key concepts and methodologies of successful **project management**.

Learning objectives

- By the conclusion of the specified learning activities, participants of this course will demonstrate their ability to:
  - Understand the process of scientific research - the scientific process;
  - Differentiate between the different types of research and be able to select the most appropriate for their research task;
  - Choose sources of information appropriate for the type of research being conducted;
  - Choose the methodology that best suits the type of investigation being conducted & appropriate to the research objectives;
  - Make research proposals, taking pertinent factors into account;
  - Understand key concepts of successful Project Management;
  - Identify appropriate roles in research project management & produce realistic planning;

Approach

- Lectures *(2-3 hours / week)*
  - Recap, new topics, paper presentations, discussion
- Laboratory classes *(2 hours from week 9-10 onwards, if required)*
  - Study specific topics through student's group presentations
  - Focus on experimentation with specific PM tools and concepts
- Assignments *(Delivered on: weeks 3, 6, 9)*
  - Individual work
- Project
  - One (large) project *(team project, due at the end of the semester)*
- *Homework :*
  - appr. 2 - 3 small Homework exercises
- Final assessment (*week to follow last lecture)*

Grading

Assignment	Percentage of total grade
1st Assignment	10 %
2nd Assignment	10 %
3rd Assignment	10 %
Class participation & Homework	20 %
Large Project	40 %
Final presentation & examination of the Project	10 %

Specific details

- Lecturing strategy
  - Professor lectures about half the time; rest of the time is devoted to:
    - ✓ Student led presentations and discussions of pre-assigned research papers
      - Everybody studies all papers;
      - One student starts discussion by summarizing the paper;
- Learning material
  - Lecture notes
  - Extended on-line material (e-books, multimedia lectures and short presentations, white papers, …);
  - Selected research papers;

(all learning material will be available through e-class)

Other specific requirements

- Pre-requisites
  - ***Good written (and spoken) English***
  - ***Introductory Statistics***
  - No programming skills required
- Expected weekly workload
  - 6-8 hours *(average workload including class attendance).*
  - Not evenly distributed *(considerably smaller at first, tends to increase towards the end of the semester).*

Q & A