Research Abroad Syllabus

Students have the flexibility to choose from a list of research projects, which varies each semester and is published on our website. Throughout the semester, students work primarily with a designated faculty supervisor and, depending on the nature of the project, may also collaborate with fellow researchers. The Research Track emphasizes literature review, research design, experimentation, collaborative problem-solving, and scientific communication, culminating in a substantial research project presented at the end of the semester.

The total workload for the Research Track is approximately **25 hours per week (360 hours in total)**. To facilitate credit transfer with partner institutions, the **12-credit Research Track is administratively divided into three 4-credit courses**:

- **Research Methods and Project Design (4 credits)**
- **Research Implementation and Experimentation (4 credits)**
- **Advanced Research Project and Scientific Communication (4 credits)**

Important: These three courses are strictly co-requisites. They are not available as individual modules and must be taken together as a single, comprehensive Research Track.

Detailed syllabus
View PDF

Duration: 14 weeks

Credit load: 12 credits (360 hours of work)

Aim of the course

The objective of the course entails the synthesis of all coursework into a comprehensive report, as detailed below, and preferably, the production of a research paper, although the latter is not mandatory due to time constraints. Participation in the research course holds the potential to markedly bolster the early stages of a scientific career in research, with outcomes possibly presented at national undergraduate gatherings, seminars, or international scientific symposiums, contingent upon the level of progress achieved.

Prerequisites

Strong Academic Background: Applicants should have a solid academic record in computer science, data science, mathematics, or related fields.

Programming Skills: Proficiency in at least one programming language such as Python, Java, C++, or R is essential.

Mathematical Foundations: A good understanding of mathematical concepts including calculus, linear algebra, probability, and statistics is crucial.

Some projects may have **specific academic prerequisites** or coursework requirements that applicants need to fulfill before being eligible for those projects. Please read the detailed Research project description carefully.

Method of instruction

Students will become participating members of a research group, will formulate research goals, and devise experimental strategies under the guidance of their professors that includes:

- Participation in Diverse Activities - Engaging in study design, model evaluation, data analysis, findings communication, and application of scientific techniques and methods;
- Hypothesis Generation and Research Direction - Students, assisted by their supervisor, actively generate hypotheses and have the freedom to choose the direction of their research;
- Methodological Autonomy - With guidance from their supervisors, students determine the most effective methods for answering their research questions, whether by developing new approaches or selecting from existing methodologies;
- Literature Review - Students conduct a comprehensive review of the literature to understand the current state of knowledge related to their research topics;
- Continuous Learning and Adaptation - Students consistently build upon their knowledge and critically reassess procedures, modifying them when necessary;
- Results Sharing - Students present their findings at the Week 3, Week 7, and Week 13 workshops, offering insights beyond the lab where the project originated; and
- Collaborative Environment - Students actively collaborate with other researchers in the lab, fostering a dynamic and cooperative research atmosphere.

Structure of the course

The program requires continuous structured individual research and group work throughout the entire duration of the semester. Aiding students to complete their research goals, regular weekly meetings are scheduled with the supervisors. Besides the weekly meetings, the semester consist of the following activities:

Week 1 – Academic Research Workshop:

- Overview of the research process, covering steps from problem identification to reporting discoveries;
- Exploration of the qualities that define a 'good researcher'; and
- Insights and tips for navigating scientific publications.

Week 3 – Kick-off Mini Workshop:

- The initial two weeks involve discussing, gathering, and studying background information for individual projects.
- During the third week, each research student or group presents their project problem in a concise 10-minute talk at a mini workshop attended by fellow participants, professors, and other interested individuals.

Week 7 – Mid-term Workshop (Research communication workshop + status reports):

The mid-term workshop has two main parts:

1. **Status report:** Students provide a mid-term status update.
2. **Research communication workshop:** Knowing how to effectively communicate research with non-experts requires a certain skill set that can be learned and developed with practice. This training will provide the students with the core tools and techniques to help communicate any piece of research, published or unpublished, to a variety of different audiences. It covers the essential steps, including identifying communication goals, understanding different audiences, and crafting a key and sticking message. The workshop also explores the different communication methods and channels available.

Week 13/14 – Final Workshop:

- Final presentations by students; and

- Deadline for submitting the comprehensive report summarizing the semester's work.

Result Write-Up:

- If the obtained research results are substantial, and students are interested in drafting a paper of publishable, quality then the drafting process will go continuously throughout the semester, and possibly extending beyond the term.

Grading

Research work is assessed on an A-F scale. Official transcripts are issued in the ECTS credit system by the Budapest University of Technology and Economics.

The final grade is based on four components: 10% for participation in group projects, 30% for individual research, 30% for the midterm and final workshop results, and 30% for the result write-up.