

## **Title**

Research Methods in Financial Computing

## **Summary and Course Description**

Research in financial computing requires the adoption of a unique set of skills, paradigms and multidisciplinary knowledge and approaches in order to fully appreciate the interplay on how data, computing and artificial intelligence technologies can be used and developed to deliver value in organisations with finance, risk and decision-making related digitalisation from both technology and business perspectives. However, academics and practitioners are rarely equipped with the required skills and techniques to effectively conduct research in financial computing matters.

The aim of this course is to fill this gap, by contributing to the existing teaching portfolio offered by the School of Informatics by equipping students with the necessary theoretical, conceptual and applied skills to be able to critically and effectively design, carry out, report, read, evaluate and ultimately propose research projects in the realm of financial computing. This course will provide students with an opportunity to develop the necessary theoretical and practical foundational skills that are specifically relevant to conduct financial computing oriented research that can be deployed in academic and commercial environments.

Students will demonstrate their ability to explore relevant academic literature to critically evaluate knowledge gaps, to develop interesting contemporaneous concepts and/or hypotheses into proposals appropriate for an academic research or implementation-based projects, and demonstrate their ability to identify legal, social, ethical, practical, theoretical and professional issues and opportunities.

This course is readily relevant for MSc students from the Advanced Technology in Financial Computing (ATFC) as it provides them with a strong foundation to prepare them to carry out their MSc dissertation/research projects. Students from other disciplines at the MSc or PhD level, who are interested in developing a solid background in research methodologies and skills to effectively conduct research in financial computing will also greatly benefit from this course. This course also has the potential of becoming a compulsory module for the Doctoral Training Centre in Artificial Intelligence and FinTech (currently under approval process).

## **Learning outcomes**

This course is designed to provide a thorough introduction to the principles and practice specific to financial computing research. On completion of this course, the student will be able to propose and carry independent research, as per the following learning outcomes of this course:

- Critical skills in identifying, interpreting and evaluating academic literature in financial computing studies;
- Provide the understanding and knowledge of the research process to allow the development of structured research project proposals by enabling students to define coherent research questions supported by strong theoretical arguments to address specific research gaps in the theoretical debate and that inform their own chosen research topic;
- Critically evaluate academic literature on various financial computing issues or other prior work appropriate for their chosen research subject, and enable students to select and justify choices on the most appropriate methodological and philosophical frameworks, experimental designs, and theoretical goals to carry out their own research;
- A solid understanding of the core quantitative, qualitative and mixed methods approaches used to conduct research in the realm of financial computing;

- Enable students to recognise the availability, strengths, and limitations associated with primary and secondary data, as well as recognising the required instruments and databases to collect the necessary data to conduct research.

### **Course Assessment**

The assessment will consist of two distinctive course work reports:

1. 30% Coursework: Delivery of a report covering a critical review on financial computing related academic literature, clearly defining (i) a topic of interest supported by academic literature gaps, by discussing and suggesting areas of improvement on the literature covered to contribute to the knowledge on a particular area of interest; (ii) identify and discuss key methodologies, theoretical frameworks and methods employed in the area of interest; (iii) critically assess the strengths/weaknesses from the literature covered and design relevant research questions.
2. 70% Coursework: Delivery of a project proposal in a computational finance topic, including a critical discussion on research background, motivation, and the identification of appropriate methodological and theoretical frameworks, data requirements, and expected contribution to the body of knowledge. A good proposal might be organised as follows:
  - a. Purpose: a statement of the problem to be addressed, with relevant research questions supported by relevant literature.
  - b. Background: a short description of how previous work addresses (or fails to address) the identified problem, and motivation on the importance to the body of knowledge of addressing the topic.
  - c. Methodological Considerations: A critical discussion to substantiate the methodological and theoretical frameworks to enable the pursuit of knowledge and evidence to address the proposed research questions, identification of the methods and techniques to be used as supported by relevant scientific or engineering grounds.
  - d. Data: Identification of data requirements to enable the investigation of the proposed research questions.
  - e. Evaluation: Details of the metrics or other methods by which the outcomes will be evaluated.
  - f. Consideration of legal, social, ethical or professional issues particular to the project.
  - g. Planning and organisation: Reflect and set attainable objectives, priorities, action plans and schedules of work to achieve objectives.