

# **MSC IN BIOINFORMATICS AND COMPUTATIONAL BIOLOGY**



**GUIDELINES FOR PREPARATION AND SUBMISSION OF A MASTER'S THESIS**

## **1. Introduction**

As you complete the research component for your MSc degree, you should be thinking about what the University, project supervisor and academic advisor require of you to ensure your research thesis is submitted on time.

Because your thesis must meet the highest standards for scholarly publishing, you must ensure that your written work meets peer-review standards for originality, documentation and writing style under the guidance of your thesis supervisor and academic advisor. You, your supervisor and academic advisor are responsible for the academic content, and ensuring that the spelling, grammar and syntax are appropriate for a published scholarly document. The document must also be reviewed to ensure that the formatting of the document meets the standards for archiving in the University library.

*If you complete your research project in an industrial setting you must obtain the company's approval for the contents of your research thesis. It is important that the student protects the company's confidential information. If such information has to be included in your thesis, please advise your Industrial supervisor that this information will not be made generally available to UCC staff or students.*

## **2. Copyright and Academic Integrity**

In preparing your thesis, it is important that your writing is your own. Where the work of others is incorporated the source should be acknowledged carefully and accurately according to accepted practices for scholarly publishing. In academic communities, the ethics of research demand that writers be credited for their work and their writing. Not to do so is to plagiarize, to intentionally or unintentionally appropriate the ideas, language, or work of another without sufficient acknowledgement that such material is not one's own. Whenever you quote, paraphrase, summarize, or otherwise refer to the work of another, you are required to cite its source. The reproduction or modification of Figures from other papers or websites also requires proper attention and referencing. Students are responsible for obtaining written permission for the use of copyrighted images, tables, etc. and are required to submit copies of permission letters with the thesis. For more guidance in appropriate use of copyrighted material and avoiding plagiarism, please check the information provided by University College Cork Graduate Studies Office <https://www.ucc.ie/en/exams/procedures-regulations/>.

## **3. Subject**

The topic and subject matter of the Masters in Bioinformatics and Computational Biology thesis must be related to the scientific aspect of Bioinformatics. This includes, but is not limited to, all the research fields of the College of Science, Engineering & Food Science and many in the College of

Health and Medicine. Non-science issues such as business, law, ethics, can be included, but only as a small portion of the chosen thesis area. They should not be the main, or the only, theme of the thesis.

#### **4. Format**

**Option 1:** Scientific & data based thesis. For students that perform an independent research project, the thesis should focus on the topic of research and data obtained during the research project. The general format should follow the style of a high calibre peer-reviewed research article, for example, Nature Biotechnology, Journal of Biological Chemistry or Journal of Neuroscience. In general the thesis should have a much more extensive introduction section.

**Option 2:** The thesis can take the form of a Review article with strong "discussion" and "future perspective" sections. The thesis must provide an in-depth review and evaluation of the chosen topic, including the history, current status, and future directions.

#### **5. Thesis Supervisor and Advisor**

Any University College Cork faculty members can serve as thesis supervisor. The involvement of the faculty member can range from "day-to-day supervision and advice" to just reading the final draft, depending on the agreement between the student and the supervisor. If you would like to have a non-UCC supervisor, you need an additional University College Cork faculty member to act as thesis advisor, to read your thesis and to approve the thesis for submission and examination.

Most people, advisor and advisee alike, find it helpful to have at least some ideas about what and how you plan to write before approaching somebody for advice. You must have at least one faculty advisor who will read your final draft critically. In order not to overwhelm research faculty with reading commitments, we will limit the number of thesis for which each faculty can be asked to advise upon. Please inform your advisor of all rules and deadlines, keeping in mind advisors summer holidays.

#### **6. Layout and Content of Thesis**

Title Page	Required
Table of contents	Required
Abbreviations	Required
Acknowledgements	Optional
Abstract	Required

Aim	Required
Introduction	Required
Main body of thesis [materials & methods, results, graph etc]	Required
Discussion & Future Perspectives	Required
Bibliography	Required
Appendices	Optional

One purpose of the thesis is to train students in how to write in a concise manner, which is appropriate to a scientific publication, to develop experimental skills, to undertake a literature review and to critically analyse and discuss the results. Thesis format guidelines are intended to ensure that University College Cork theses follow scholarly publishing traditions and can be archived accordingly.

#### **(a) General Specifications**

These guidelines primarily address readability and clarity.

**Font size and style:** The thesis should be typed in a font not smaller than 11 point. Fonts such as Arial or Times New Roman are recommended. Except for purposes of creative expression, the same font size and style should be used throughout the thesis.

**Text spacing:** One-and-a-half or double-spaced in the body of the text.

**Page numbering:** Preliminary pages (all pages before the text begins). Use **lower case Roman numerals** for preliminary pages. Beginning the page count with the title page, but do not display numerals on the title, copyright, and abstract pages. Display the Roman numerals on the acknowledgement, table of contents and list pages. For the main text, use **Arabic numerals** starting with page one of the text.

**Figures, Illustrations etc.:** Figures and tables should, preferably, be inserted on a separate page at the appropriate positions in the thesis, usually following the page of first reference in the text (appendices should be reserved for presenting supplementary data). Each Figure should be clearly numbered with a detailed figure legend, positioned below the figure.

The overall length should not exceed 100 pages and should consist of: a Title page (see below), Abstract, Table of Contents, List of Abbreviations, Introduction, Materials and Methods, Results, Discussion & Future perspectives, Acknowledgements, References and, if necessary, Appendices.

#### **(b) Title Page**

There must be a title page, which shall give the following information:

- The full title of the thesis and the subtitle, if any. The title should describe the content of the thesis accurately and concisely.
- The full name of the author, followed, if desired, by any qualifications.

- The qualification for which the thesis is submitted. 'Project Thesis in partial fulfilment for the degree of Masters in Bioinformatics and Computational Biology'.
- The name of the institution to which the thesis is submitted - University College Cork.
- The department or organisation in which research was conducted.
- The Month and Year of submission.
- Name of the supervisor of the research.

**(c) Table of contents**

The table of contents shall immediately follow the title page

**(d) List of Abbreviations**

The list of abbreviations should include all abbreviations used in the thesis text and figures.

**(e) Abstract:** This should provide a concise summary of the objectives, methodology, key results, and major conclusions of the study in not more than 350 words on one-side of A4.

**(f) Introduction:** This should include a concise but thorough review of the relevant literature. This should be sufficient to explain the background to the project, what hypotheses are being tested and why the particular methods have been chosen to investigate the question. It should be about 20-25 pages.

**(g) Materials & Methods:** The detail should be sufficient to allow a qualified investigator to repeat the research. Reference should be made to published procedures and modifications wherever possible. The sources of all materials used should be given.

**(h) Results:** This section should present clearly but succinctly only those experimental findings which are discussed further in the Discussion and which are essential to establish the main conclusions of the work. Tables, figures and photographs should be numbered and inserted, with their legends, at the appropriate place in the text. The legends should include sufficient detail to make them intelligible without reference to the text. The text should not simply repeat the data in figures but draw attention to the main findings. Remember that negative results are as valuable as positive results, provided that the experiments have been designed and carried out properly. With the same proviso, you will not be penalised if experiments have not worked and if it can be shown that sensible strategies have been adopted to achieve success. The results should not be discussed in this section. It is important that statistics are used correctly. Some advice is available at websites <http://onlinestatbook.com/rvls.html>.

**(i) Discussion:** The discussion should commence with a brief statement of the principal findings. This should be followed by a discussion of the validity of the observations (e.g., a consideration of methodological limitations). Interpretation of the results should then be discussed in the light of other published research dealing with the same or closely related subjects. The section should conclude with a statement of the possible significance of the work, any future work that might arise out of the project, and a final brief summary paragraph. Explicit mentioning of whether the initial goals were met should also be included

here. The ideas expressed in the conclusion must be warranted by the data obtained and presented in the Results section.

- (j) **References:** Students should double check that all in-text citations are in the reference list and that all references on the reference list have at least one corresponding in-text citation. References should be given in the style used by the Journal of Neuroscience and listed in alphabetical and chronological order. That is: Only published and "in press" references should appear in the reference list at the end of the report. Manuscripts submitted for publication and personal communications should be cited only in text and in the following form: A. B. Smith, C. D. Johnson, and E. Greene, unpublished observations; F. G. Jackson, personal communication. References should be cited in the text as follows: "The procedure used has been described elsewhere (Green, 1978)," or "Our observations are in agreement with those of Brown and Black (1979) and of White et al. (1980)," or with multiple references, in chronological order: "Earlier reports (Brown and Black, 1979, 1981; White et al., 1980; Smith, 1982, 1984).... ". In the reference list, papers should be given in alphabetical order according to the surname of the first author. In two-author papers with the same first author, the order is alphabetical by the second author's name. In three-or-more-author papers with the same first author, the order is chronological. The name of the author(s) should be followed by the date in parentheses, the full title of the paper as it appeared in the original together with the source of the reference, the volume number, and the first and last pages. The following illustrate the form to be used:

*Journal article:* Hamill, O.P., Marty, A., Neher, E., Sakmann, B. and Sigworth, F. (1981). Improved patch-clamp techniques for high-resolution current recordings from cells and cell free membrane patches. *J Physiol.* 116:497-506.

*Book:* Hille B (1984) Ionic channels of excitable membranes. Sunderland, MA: Sinauer.

*Chapter in a book:* Stent GS (1981) Strength and weakness of the genetic approach to the development of the nervous system. In: *Studies in developmental neurobiology: essays in honor of Viktor Hamburger* (Cowan WM, ed), pp 288-321. New York: Oxford UP.

**(k) Appendix to Thesis**

To include any reports, diagrams, pictures, analysis that you think appropriate.

## **7. Formatting and Style**

Follow the requirements and guidelines exactly. It not only makes a better-looking thesis, but also prevents a thesis from being rejected due to technicalities. This thesis will be the first of many reports that you will write in your career. Good written communication skills are essential for science professionals.

- (c) **Style:** The text must be either printed, typewritten or otherwise reproduced on good quality size A4 paper, with a left-hand margin 4 cm. Double or one-and-a-half spacing is recommended. Copies must be bound or otherwise securely fastened and numbered consecutively, page numbers to be located centrally at the bottom of the page. Students are

encouraged to download the free book *The Elements of Style* by William Strunk. This book provides excellent insights into English composition and is available at [www.bartleby.com/141/](http://www.bartleby.com/141/). Alternatively, students can buy it at a bookshop and keep it for long-term reference. Another good source for information on how to write a thesis is: Robert Barrass (2002). *Scientists Must Write*. A guide to better writing for scientists, engineers and students. Routledge Study Guides. Second Edition. Taylor & Francis Group.

(d) **Binding:** Two softbound copies of the thesis must be presented for examination.

## 8. Thesis Submission and Deadlines

It is important that the deadline is adhered to in order for the Supervisor and examiners to read and mark the thesis before the deadline imposed by the Examination Board.

- Research projects commence in early June and finishes in late September.
- Write up your Research Thesis and get it read and approved by your Industrial and/or Academic Supervisor & Advisor before you finish your research project.
- ***Submit two softbound copies of your Research thesis to the School of Microbiology Administration Office before the end of the current academic year, usually at the start of October.***
- Oral presentation and examination of thesis will normally be held before the end of October.

It is the students' responsibility to meet all deadlines. The closing date for receipt of theses does not change so plan to submit the thesis as early as possible, allowing time to account for unforeseen delays [computer problems; printing and binding time].

- ***Submission in a subsequent Academic year:*** Candidates presenting for Master's Degrees must be registered students of the National University of Ireland, Cork in the academic year in which they are presenting their thesis for examination.
- Students who have completed their research and who are not availing of University facilities can register for "Submission of a Master's Thesis" by submitting an Application form for Registration for Submission Only of a Master's Thesis to the Student Records and Exams Office. Associated Fee approx €800.

When submitting a candidate is required to present two soft bound copies of the thesis and a completed 'Submission of a Minor Master's Thesis' form to the School of Microbiology Office.

## 9. Contacts

Contact your Academic Supervisor/Advisor or if you have any concerns relating to your project. If you have questions pertinent to the MSc Programme, please contact the Programme Director.

**Prof Marcus Claesson**

Director, Bioinformatics Programme

Tel: 021 490 1390 E-mail: [m.claesson@ucc.ie](mailto:m.claesson@ucc.ie)

**Michelle O'Leary / Eithne Egan**

Secretary, School of Microbiology

Tel: 021 490 2392 E-mail: [microbiology@ucc.ie](mailto:microbiology@ucc.ie)