FACULTY OF MATHEMATICS AND INFORMATICS

DEPARTMENT of INFORMATICS

GUIDELINES for preparing, presentation and evaluation of the Bachelor and Master Theses

Academic year: 2020-2021

1 General Aspects

The Bachelor/Master thesis should reflect the fact that the student: *(1)* has knowledge of the thesis domain (theoretical and practical), *(2)* is able to select, extract and synthesize from the bibliographic materials the essential aspects of the problem addressed, *(3)* masters techniques and programming tools to realize specific applications in the chosen domain, *(4)* is able of writing a unitary material that will include own observations or results, *(5)* is able to present consistently the results obtained.

2 Types of Bachelor/Master Theses

The Bachelor / Master theses can be in one of the following categories: (1) scientific work; (2) survey paper; (3) predominantly practical work (technical report).

2.1 Scientific Paper

It is considered a **Bachelor/Master thesis scientific paper** a paper containing a scientific contribution already validated by the scientific community. Such work is based on an article published or accepted for publication in a journal, conference or workshop associated with a conference or other scientific event with reviewing process of the papers. The article published / accepted for publication and the proof of acceptance will be annexed to the work. The article may have only one author (candidate) or two authors (candidate and coordinator of the Bachelor/Master thesis).

Recommendation for the table of contents : Abstract, Introduction, Contributions, Problem Description, Related Work, Solution, Experimental Results/Simulations, Conclusions and Future Work (more details in Section 3).

Recommendation the for number of pages: 15-25 pages, excluding the title pages, abstract, table of contents, bibliography, annexes.

What needs to be highlighted: the degree of novelty of the proposed solution, the experiments and the simulations, the obtained results compared to other similar approaches.

2.2 Survey Paper

It is considered a **Bachelor/Master thesis survey paper** a paper that is based on a comparative study of several existing algorithms/technologies for solving a problem. The paper will include discussions about the advantages/disadvantages of the studied approaches, based on the experiments/simulations performed by candidate.

Recommendation for the table of contents: Abstract, Introduction, Contributions, Problem Description and the aim of the comparative analysis, Related Work, Experimental Results/Simulations, Description and discussion of the experiments/simulations, Conclusions and Future Work (more details in Section 3).

Recommendation for the number of pages: 30-40 pages, excluding the title pages, abstract, table of contents, bibliography, annexes.

What needs to be highlighted: the relevance of the comparative study, the methodology of the comparative study, the particularities of the implementation, the results of the experiments/simulations performed.

2.3 Practical/Applied Paper (Technical Report)

It is considered a **Bachelor/Master thesis practical/applied paper** a paper which mainly presents the way of building-up a software application. The paper will address the problem that led to the implementation of the application, compare the proposed application with other similar applications and will present in detail the architecture and functionality of the application.

Recommendation for the table of contents: Abstract, Introduction, Problem Description, Related Work, Application Architecture, Application Functionalities, Conclusions and Future Work (more details in Section 3).

Recommendation for the number of pages: 30-40 pages, excluding the title pages, abstract, table of contents, bibliography, annexes.

What needs to be highlighted: Application functionalities.

3 General Structure of a Bachelor/Master Thesis

3.1 Part 1: Introduction

Goal: summary of the problem, namely:

- problem motivation (context, informal description of existing related work);
- informal description of the solution, presentation of the author contributions, the structure of the paper;
- optional: running example, use case

Content: Short description of the motivation of the proposed topicproblem, objectives pursued and achieved, relevance of the results, usage of the application, structure of the thesis.
Qualitative requirements: the goal of the thesis and the obtained results must be clearly stated.

3.2 Part 2: Presentation of the problem addressed

Goal: detailed presentation, based on the study of the bibliography, of the problem approached, more precisely:

- formal description of the problem and of the solution (if it is the case, proofs of the solution properties);
- optional: exemplification of the running example.

Content: framing the problem in a more general context; presentation of the formal mathematical framework (if it is the case); review of existing approaches for solving the problem marking the advantages and disadvantages; decomposition into specific subproblems and presentation of the solving methods.
Qualitative requirements: the presentation should be clear and concise; the notations should be unitary; the aspects taken from the bibliography should be well synthesized and related to the topic; the bibliographic resources should be correctly described and referred to.

3.3 Part 3: Presentation of the Author Contribution

Goal: it depends on the type of the work (presentation of the theoretical results, of the proposed models, of the methodology of performing the comparative study, of the design and implementation of the software application).
Content: detailed description of the problem solving approach; it depends on the type of work:

- In the case of *scientific paper*, the focus will be on presenting in detail the results obtained/the proposed solution.
- In the case of *survey paper*, the emphasis will be on the presentation of the methodology for performing the comparative analysis and on the presentation and interpretation of the results.
- In the case of *applied/practical paper*, the emphasis will be placed on the presentation of the general structure of the application, the functionalities offered and the implementation details; the work must contain some use-cases.

Qualitative requirements: to present clearly the proposed solution/the methodology of comparative study/the design and implementation of the application.

The applied/practical theses should include a brief documentation of the application. Documentation is of two types:

- implementation manual (for "developers"): system architecture, technologies (motivation in their choice, if any), implementation details;
- user manual (for users): how to install and use the system.

3.4 Part 4: Discussion of the Obtained Results

Goal: comparison with existing approaches: different solutions to the same problem, different implementations; advantages and disadvantages.
Content: general structure of the application, functionalities offered, use cases, implementation details, other specific features.
Qualitative requirements: to be the concise and based on the results obtained in the paper, the comparative analyzes should be objective.

3.5 Part 5: Discussion of the Obtained Results

Goal: comparison with existing approaches: different solutions to the same problem, different implementations; advantages and disadvantages.
Qualitative requirements: it should be concise and based on the results obtained in the framework of the paper; the comparative analysis should be objective.

3.6 Part 6: Conclusions and Future Work

Goal:

1. summary of the results: what worked and what it did not; what were the difficulties and how were they overcome; what are the remaining issues;
2. future directions for the open issues

Qualitative requirements: it should be concise.

3.7 Part 7: Bibliography

Qualitative requirements: it should contain at least 5 bibliographic entries; they should be correctly and completely specified.

Observation Parts 2 and 3 may contain several chapters.

4 Observation on the Description of the Software Application

Most of the works in Computer Science include an application related to the topic approached. The application can be of the following types:

- design of a software system, possibly completed with a prototype implementation (if the resources/technologies involved are accessible);
- software implementation of algorithms/methods/techniques from scientific/technical domains.
- configuration and integration of certain software components already implemented in a processing flow problem specific.

In the case of the existence of a software implementation, this must be satisfy the following qualitative requirements: to be functional, if it has an user interface it should be easy to use, it should have a minimal help menu.
Depending on the application type, we recommend using a subset of the models below:

1. *System in context (external perspective)*:
   (a) use case diagram and sequence diagram;
   (b) description of external interfaces: APIs (functions and data structures transferred), GUI (screens);
   (c) system behavior in context - activity diagram (possibly swimlane) and/or state diagram and transitions diagram at system level.
2. *System model (internal perspective)*:
   (a) internal structure
      i. data model: internal data structures, database structures;
      ii. model of code units: class diagram (representation of classes or code modules);
      iii. the model of the execution units: subsystems, components (component diagram).

(b) *the model of internal interactions (between subsystem/components)*: sequence diagram.

(c) *relevant internal behavior model*:

- activity diagram - algorithm modeling (internal process); and/or
- state and transitions diagram.

5 Technical Editing of the Bachelor/Master Thesis

Observations: It is recommended to use LaTeX for this purpose. In this case, you can use the template available at https://www.info.uvt.ro/lucrari-licenta/.
The cover and *title page* include the following information:

- *header:* West University of Timişoara / Faculty of Mathematics and Computer Science / Department of Informatics;
- *central part:* title of the work, the name of the author, the name of the scientific coordinator;
- *footer:* Timişoara, year

Organization by chapters and units numbering:

- the work is organized into chapters, numbered from 1 to n;
- each chapter (i) consists of sections, numbered from $i.1$ la $i.m$;
- sections can be made up of subsections, numbered as $i.j.k$;
- if applicable, the subsections will be decomposed into subsections using the same rule numbering.

The table of contents is located at the beginning of the thesis and contains the titles of chapters, sections, subsections together with their corresponding number and the page number on which it starts.
Recommendations for page structure:

- left: 3cm
- text width: 15cm
- top: 3cm
- text height: 22cm

Observation. The chapters will start on the new page with the top edge of 5cm. The pages are numbered (footer section).
Numbering of figures, tables and relationships mathematical: figures, tables and mathematical relations will be numbered within a chapter (for example the second figure in Chapter 3 is numbered as 3.2).
Font size:

- the usual text will have the size 12pt;

- section titles and chapters will be larger (for example 14pt, respectively 16pt) and will be bolded.
- distance between lines is 1 line

Bibliography:

- Each element in the bibliography must have a justification for its presence in the bibliography. This justification is an explicit reference in the text of the paper. When citing a source, the reason why the source was used should be stated. The bibliographic sources must be valid sources (peer revieved or technical reports/manuals). References to Wikipedia are not recommended.
- The titles will be numbered and the reference within the text will use this order number;
- For each cited work will be specified:
  - author name(s)
  - title
  - identifiers:
    - if book: publishing house, apparition year;
    - if article: publication, volume, number, year of issue, pages;
    - if technical report / preprint: institution, number, year of appearance
    - if electronic document – the web address from which it was downloaded

6 Aspects Regarding the Presentation of the Bachelor / Master Theses

The presentation should be: *clear*, *concise*, *suggestive*. Emphasis should be put on own contribution. Scientific language will be used. It must reflect the student ability to present and support his/her ideas.
Presentation structure:

- description (possibly through examples) of the problem addressed;
- brief presentation of the state-of-the-art of the domain addressed (existing results/achievements, aspects which must be solved, etc.);
- motivation of the choice of thesis topic;
- description of the methods used / developed;
- exemplification of the obtained results and/or of the above using the using the application realized.

7 Ethics Rules in the Elaboration of the Bachelor/Master Thesis

1. The Bachelor/Master thesis should reflect the student own understanding of the topic in question. The practical results (if any) must be own contribution and, if compared with other results, the source of the latter must be specified correctly.

2. All ideas, results, data, graphical representations, images belonging to other authors and taken from books, articles, databases, web resources must be correctly quoted (title, publisher/magazine/web address, year, pages). The intentional or unintentional assimilation in his own work of ideas, key terms, results of other authors in the area without correctly specifying the source represents ***plagiarism***. In the current acceptance, plagiarism means:

   (a) The usage of paragraphs taken identically (word by word) or with minor modifications (replacing words with synonyms) in which the source (book, article, web document, etc.) is specified.

   (b) Gathering texts from various sources and placing sentences related to without adequately specifying the sources.

   (c) Copying figures, images, schemes without citing the source (book, article, web document, etc.).

   (d) Copying fragments, figures, images, schemes from the students theses from previous academic years without specifying the source.

   (e) Taking over programs belonging to other authors with minor modification of them (for example, comments or variable names) without modifying the logical / functional structure and presenting them as own achievements.

   (f) The translation of an entire part (taking over of the structure and the citations) of a work without citing it.

3. Rules to avoid unintended plagiarism:

   (a) Make your own sentences to express own ideas. Try to summarize the information obtained from the bibliographic sources and present them from your own perspective.

   (b) If you use phrases taken identically from another source, you must enclose between quotation marks and specify the source.

   (c) Specify the web addresses from which you took the information, images, schemes, etc.

   (d) Quote the source for all new notions, new ideas and techniques that you came across during the development of the thesis .

4. Any form of plagiarism is considered a violation of ethical rules and has the consequence of rejecting the license work.

8 Observations

1. The paper will be printed face to face in a single copy.

2. The paper must be written in the language of the study program, however, in special situations, writing in English is possible with the agreement of the scientific coordinator and with the obligation to submit the table of contents and the abstract in Romanian.

3. The members of the Bachelor/Master exam committee propose a grade based on the following criteria:

   - the structure, the content and the manner of writing the thesis;
   - relevance of the candidate own contributions, the degree of difficulty of the problem addressed, the functionality of the application and aspects related to its implementation, the way of comparing with the existing solutions for solving the problem addressed;
   - the way of organizing the presentation, the quality of the oral support (clarity, fluency, etc.)
   - how the student answers to the questions asked by other committee members.