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People's Democratic Republic of Algeria
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Scientific Research

University of Djelfa
Faculty of Science and Technology
Department of Mechanical Engineering

جامعة زيان عاشور الجلفة
كلية العلوم والتكنولوجيا
قسم الهندسة الميكانيكية

2nd year of Master's degree in Mechanical Engineering

Specialty: Energetics

Course handout

Documentary research and dissertation design

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PRESENTATION OF THE COURSE ON DOCUMENTARY RESEARCH AND DISSERTATION DESIGN

The master's program in mechanical engineering, as in any other discipline, concludes with the preparation and defense of a final cycle project. This final step before obtaining one's degree is of great importance in a student's education. It represents a particularly intense period in terms of workload as well as stress for those preparing their dissertation. The public defense is also a source of apprehension and anxiety for most students. It is therefore very important to be able to prepare one's dissertation methodically in order to succeed during this important period of student life.

This course is addressed to Master's 2 students in mechanical engineering, in the energetics option, who are about to prepare their final cycle project. Indeed, all Master's 2 students are concerned and need to acquire a good methodology to properly prepare their final projects.

The content of this course conforms to the official program issued by the Ministry of Higher Education and Scientific Research. Throughout the various chapters, the reader will be introduced to documentary research and will learn the steps, methodology, and techniques for writing and presenting a dissertation.

In summary, this course is designed to help students prepare their dissertations from start to defense and to guide them in adopting the appropriate approach.

It is worth noting that this course is also of great use to recent graduates entering professional life, as they will often be called upon to prepare projects and present them effectively, communicating in the best possible way in the workplace.

1. Scientific objectives of the course

The objectives of this course can be summarized as follows:

- Learn how to choose an appropriate topic for the final dissertation
- Define the research topic clearly and identify the work to be carried out
- Understand the process of conducting effective documentary research, the first step in preparing a dissertation
- Learn how to find information and evaluate its quality and relevance to the research topic
- Develop the ability to establish a work plan and manage time effectively to meet deadlines
- Learn how to prepare a bibliography in accordance with academic standards
- Become familiar with the different parts of a dissertation
- Acquire academic writing techniques and follow established standards

- Learn how to prepare an effective presentation and successfully defend the dissertation
- Understand how to avoid plagiarism

2. Pedagogical Objectives of the Course

From a pedagogical point of view, the main objectives of this course are:

- Choose a research topic that aligns with the learner's interests and can be completed within the given deadlines
- Acquire effective documentary research techniques
- Organize work over time to meet deadlines, avoid last-minute pressure, and reduce stress
- Plan and coordinate work with the supervisor by establishing a clear schedule
- Develop academic writing skills
- Develop oral and communication skills

3. Course Content

The course on documentary research and dissertation design is divided into two main parts:

- **Part I – Documentary Research:** This covers the definition of the subject, the locating and processing of information, and the writing of a bibliography. This part is divided into five lessons.
- **Part II – Dissertation Design:** This concerns the stages of a dissertation, writing techniques and standards, and the oral presentation during the defense. This part is also divided into five lessons.

OFFICIAL COURSE SYLLABUS

Semester: 3
Teaching Unit: UET 2.1
Subject 1: Documentary Research and dissertation design
Total Weekly Hours: 22h30 (Lecture: 1h30)
Credits: 1 | Coefficient: 1

Teaching Objectives

To provide the student with the tools needed to find useful information for better use in their final project. To help them navigate the different stages leading to the writing of a scientific document. To emphasize the importance of communication and to teach them how to present their work rigorously and pedagogically.

Recommended Prior Knowledge

Writing methodology, Presentation methodology.

Course Content

Part I – Documentary Research

Chapter I-1: Definition of the Subject (2 weeks)

- Title of the subject
- List of keywords related to the subject
- Gathering basic information (acquiring specialized vocabulary, meaning of terms, linguistic definitions)
- Information sought
- Taking stock of one's knowledge in the field

Chapter I-2: Selecting Information Sources (2 weeks)

- Types of documents (Books, Theses, Dissertations, Journal articles, Conference proceedings, Audiovisual documents…)
- Types of resources (Libraries, Internet…)
- Evaluating the quality and relevance of information sources

Chapter I-3: Locating Documents (1 week)

- Search techniques
- Search operators

Chapter I-4: Processing Information (2 weeks)

- Work organization
- Starting questions

- Synthesis of selected documents
- Links between different parts
- Final plan for documentary research

Chapter I-5: Presenting the Bibliography (1 week)

- Systems for presenting a bibliography (Harvard system, Vancouver system, mixed system…)
- Presentation of documents
- Citing sources

Part II – Dissertation Design

Chapter II-1: Dissertation Plan and Stages (2 weeks)

- Defining and delimiting the subject (Abstract)
- Research problem and dissertation objectives
- Other useful sections (Acknowledgements, List of abbreviations…)
- Introduction (Writing the introduction last)
- Literature review
- Hypothesis formulation
- Methodology
- Results
- Discussion
- Recommendations
- Conclusion and perspectives
- Table of contents
- Bibliography
- Appendices

Chapter II-2: Writing Techniques and Standards (2 weeks)

- Formatting. Numbering of chapters, figures, and tables.
- Cover page
- Typography and punctuation
- Writing. Scientific language: style, grammar, syntax.
- Spelling. Improving general linguistic competence in terms of comprehension and expression.
- Saving, securing, and archiving data.

Chapter II-3: Workshop – Critical Study of a Manuscript (1 week)

Chapter II-4: Oral Presentations and Defenses (1 week)

- How to present a poster
- How to give an oral presentation
- Defending a dissertation

Chapter II-5: How to Avoid Plagiarism? (1 week)

- Formulas, sentences, illustrations, graphics, data, statistics…
- Citation
- Paraphrase
- Providing the complete bibliographic reference

Assessment Method

Exam: 100%

Bibliographic References

M. Griselin et al., Guide de la communication écrite, 2nd edition, Dunod, 1999.
J.L. Lebrun, Guide pratique de rédaction scientifique, EDP Sciences, 2007.
A. Mallender Tanner, ABC de la rédaction technique, Dunod, 2002.
M. Greuter, Bien rédiger son mémoire ou son rapport de stage, L'Etudiant, 2007.
M. Boeglin, Lire et rédiger à la fac, L'Etudiant, 2005.
M. Beaud, L'art de la thèse, Editions Casbah, 1999.
M. Beaud, L'art de la thèse, La découverte, 2003.
M. Kalika, Le mémoire de Master, Dunod, 2005.

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Part II : DISSERTATION DESIGN

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Chapter II. Writing techniques and standards

Chapter III. Writing techniques and standards

Chapter IV. Oral presentation and defense

Chapter V. Plagiarism

Part I :

Documentary Research

Part I-Chapter I:

Definition of the Subject

Chapter Contents

PART I – DOCUMENTARY RESEARCH

CHAPTER I: DEFINITION OF THE SUBJECT

I.1 Introduction

Writing a final dissertation requires adherence to a set of fundamental guidelines. Some of these pertain to formatting aspects, including the number of printed copies, layout, binding, and similar considerations, all of which may differ from one department or faculty to another. It is therefore advisable to get acquainted with the specific requirements of your institution early on, before beginning the writing process.

Beyond formatting, each academic discipline carries its own writing conventions particular styles that aid comprehension within that field. A philosophy student, for instance, will approach their dissertation quite differently from a mechanical engineering student, both in structure and expression. Certain departments go even further by establishing their own dedicated formatting guidelines. The Mechanical Engineering Department at the University of Djelfa is one such example, where students are expected to follow a prescribed format throughout their work.

I.2 Subject Title

The title is the first element that appears in a dissertation. It fully reflects the content of the work. The title should be the summary of the dissertation summary. It is a very important part of the dissertation. If the student has difficulty choosing the title of their dissertation, they should summarize their abstract in a few words. The title must:

✓ Be as short as possible without being too short — otherwise it cannot inform the reader about the content. A title that is too long disengages the reader and is harder to understand. Repetition of words or articles should be avoided.

Example 1.1

"Study of a Gas Turbine" is too vague and does not adequately reflect the scope of the dissertation. The title should provide clearer information about the specific turbine under investigation, the nature of the study, and the methodology employed.

"Numerical investigation using a CFD code of the thermo-hydraulic mixing of non-Newtonian fluids in a passive and chaotic TLCCM-type micromixer": the title is too long and cumbersome. The reader has to read it several times to understand it.

«Numerical investigation of thermo-hydraulic mixing of non-Newtonian fluids in a TLCCM micromixer»: appropriate title. It indicates the work done and the method followed.

✓ Provide information about the subject's content

✓ Be attractive

The title should allow a reader conducting a search in the field to find the dissertation. There are different ways to choose the dissertation title:

✓ A title that defines the subject and working method: "Experimental study of heat transfer in a tubular heat exchanger"

✓ A title that poses a problem to be solved: "Emission reduction in Diesel internal combustion engines"

✓ Other titles: questions can be used as titles: "Does the type of steel affect the lifespan of a steam turbine rotor?"

I.3 List of Keywords

Keywords are among the most important elements of any academic work, as they represent the core concepts and themes developed throughout the dissertation. They must therefore be selected with great care and precision. Well-chosen keywords help readers quickly understand the subject of the study and enable them to locate relevant information efficiently when consulting databases or indexing systems. In this way, keywords play a crucial role in improving the visibility and accessibility of the dissertation.

In addition, keywords are essential tools for the student during the research process itself. By clearly defining the main terms associated with the topic, the student can conduct more focused and effective documentary research, identify relevant sources, and refine the scope of the study. Establishing a list of keywords at an early stage of the work is therefore highly recommended, as it helps guide the entire research and writing process.

To compile this list, it is advisable to identify the most significant technical terms and concepts that recur frequently in the dissertation. These terms should accurately reflect the content, methodology, and field of study. Once selected, the keywords are typically presented at the beginning of the thesis, allowing readers and researchers to immediately grasp the main focus of the work.

I.4 Gathering Basic Information

The search for information concerning a subject is defined as a thorough and applied investigation into all questions related to that subject. For this purpose, it is important to use the keywords and terms relevant to the subject. Start by searching for the exact definitions of all basic terms and write them down. Linguistic knowledge is very important at this stage. A student cannot gather information in a language they do not speak or know poorly.

They must work on the linguistic aspect and make efforts to improve their written and spoken language in the language they are working in and in which they will defend their work. Poor command of the language always gives a negative image of the candidate who makes mistakes, searches for words, and answers jury questions poorly.

The student must therefore make considerable efforts in this regard. Before beginning documentary research, it is necessary to meet with the supervisor to properly define the subject, the working method, and the resources to be used. The student must have a clear idea of what they are going to do. They can also propose other ideas to their supervisor or modify certain aspects. The topic should be feasible and important.

A topic is feasible if:

- ✓ There is a minimum of literature on it
- ✓ Data concerning it are available
- ✓ It allows the fundamental questions posed to be answered
- ✓ It is achievable within the imposed deadlines

A topic is important if:

- ✓ It touches on a current subject, or
- ✓ It touches on a subject of interest in the field

Dialogue with the supervisor is very important in preparing a dissertation. One must regularly meet with the supervisor, keep them informed of what is being done, and seek their advice on methodology and the steps taken. It is therefore important to establish a regular schedule of meetings with the supervisor. The student should ask for their availability hours.

It is also useful to note the points the student needs to discuss with the supervisor before each meeting to avoid forgetting anything. Once documentary research has begun, the supervisor must be kept permanently informed about the documentation used.

It is also very useful to ask oneself the following questions before starting:

- Are you motivated to work on the subject?
- Is the dissertation achievable within the deadlines and is the time required acceptable?
- Is there a minimum of documentation?
- Is the subject current?
- Does the subject raise ethical or moral issues?
- What needs to be done in this subject?
- What method should be adopted to obtain the desired results?

I.5 Information Sought

The search for information on the topic must be active and continuous. The student must be a good reader who reads continuously throughout dissertation preparation. Documents must be read and not simply copied verbatim. Ask the supervisor to guide certain searches in the literature or to recommend sources.

I.6 Taking Stock of One's Knowledge in the Field

It is very useful to gather one's knowledge in the field before beginning the search for documentation. The student can, for example, review the courses they have studied in the field during undergraduate modules that relate to their dissertation topic. Knowledge in the field increases through documentary research.

Part I-Chapter II:

SELECTING INFORMATION SOURCES

Chapter Contents

CHAPTER II: SELECTING INFORMATION SOURCES

II.1 Introduction

Documentary research is an essential and unavoidable part of thesis work. It allows one to collect the maximum amount of information that will serve to carry out the dissertation. It also makes it possible to situate the work in relation to other scientific work carried out previously, and thus to demonstrate the usefulness of the dissertation. It also allows for the construction of a theoretical basis and interpretation of results. Documentary research consists of finding the maximum amount of information that exists in the studied field.

II.2 Types of Documents

The first question a student asks is 'How and where to find documentation?' There are several types of documents. First, it is important to have a dictionary on hand to look up the meaning of words encountered in the literature, especially if the student does not master the language.

II.2.1 Books

The dissertation keywords allow the student to find different books on the subject. Books are important because they contain the necessary theoretical notions, generally in more detail than scientific articles. Books exist in both printed and electronic versions.

II.2.2 Scientific Publications

These allow the dissemination of scientific and technical information produced by researchers. They are texts published in journals through which researchers inform the scientific community of new results. Publications can be national or international. There is a national database containing all recognized scientific journals in Algeria, classified by importance into categories: exceptional, A+, A, B, and C.

There are two main types of publications:

- Research articles – presenting the results of a study
- Review articles – articles that present a bibliographic research, summarizing work done by various researchers in the field (state of the art)

II.2.3 Conference Proceedings

Researchers from different scientific and academic disciplines regularly meet and exchange ideas during conferences, symposia, colloquia, workshops, and other similar scientific events. These gatherings provide an essential platform for the dissemination of knowledge, the discussion of recent advances, and the establishment of collaborations between researchers from various institutions and countries. Depending on their scale and objectives, these meetings may be organized at a national level, bringing together researchers from within the same country, or at an international level, involving participants from around the world. During these events, researchers present the results of their work and ongoing studies in different formats. The most common forms of communication include oral presentations, where findings are explained and discussed in front of an audience, as well as poster sessions, which allow for more visual and interactive exchanges on specific topics. These presentation formats encourage scientific dialogue, critical feedback, and the refinement of research ideas.

After the conclusion of each scientific meeting, the organizing committee usually prepares and publishes a set of proceedings or a compilation of the presented contributions. These documents serve as an official record of the event and allow the wider scientific community to access the presented research, even if they were not physically present at the meeting.

II.2.4 Audiovisual Documents

Audiovisual documents, such as scientific reports, recorded lectures, documentaries, instructional videos, and experimental demonstrations, are widely used in the field of scientific communication. These resources cover a broad range of scientific subjects and may also illustrate the step-by-step progress of a scientific experiment, making complex concepts more accessible and easier to understand. They often combine visual and auditory information, which enhances comprehension and facilitates the learning process, especially for technical or experimental topics. For a master's student, these audiovisual materials represent valuable documentary sources that can complement traditional written references such as books and scientific articles. They allow the student to observe real experimental setups, laboratory techniques, and practical applications of theoretical concepts. In addition, they can help clarify difficult points, provide up-to-date information, and offer different perspectives on a given research topic. As a result, audiovisual documents can be effectively consulted and integrated into the research process to strengthen the quality and depth of academic work.

II.3 Types of Resources

In the context of documentary research, it is essential to identify and use different types of information resources in order to collect relevant, reliable, and diversified data related to the dissertation topic. These resources provide the necessary support for understanding the scientific background of the study, developing the theoretical framework, and comparing existing works in the field. They can be classified into several categories depending on their nature and mode of access. Among the most commonly used resources are libraries and the Internet, which play a complementary role in the research process.

II.3.1 Libraries

The library remains an important and reliable source of information, although few students currently make use of it. There is a Mechanical Engineering department library, a faculty library, as well as a university central library, all of which contain books, dictionaries, and more. The department library is stocked with hundreds of books across various specialties, some of which are very recent. Master's students must hold a reader's card in order to access these resources.

II.3.2 Internet

The Internet is currently an important source of documentation. Internet use is easy and fast, and any information can be found there. However, internet-based documentary research has some drawbacks:

- ✓ Not all information is always reliable and accurate. It must be verified before use.
- ✓ Students tend to 'copy and paste' content from websites without citing a reference, which is considered plagiarism and is punishable by law.
- ✓ Some books and articles are not freely available.

In Algeria, access to scientific articles and books is provided through SNDL (National Online Documentation Site). SNDL aggregates scientific databases for university students who can access them for free. Students simply need to register through their university's IT service.

II.4 Evaluating the Quality and Relevance of Information Sources

A common problem is an excessive amount of collected information that the student cannot synthesize. Finding too many sources and not knowing what to do with them is a frequent issue. This results from a lack of filtering and selection. Another problem is not knowing where to find information. Some simple tricks exist:

- It is not necessary to be interested in all sources on the subject. Only sources specific to the researched aspect should be retained.
- Information gathered should be filtered, keeping only that which has a direct connection with the subject.
- Keep the essentials without getting distracted.

Documentary research must meet two criteria: target the questions posed in the subject, and use the competencies acquired and those the student can acquire during dissertation preparation. To verify the reliability of information, consider the following criteria: the author and editor, the publication date, the URL, the website's stated purpose, the author's competencies, the target audience level, and the type of information provided.

Part I-Chapter III:

LOCATING DOCUMENTS

Chapter Contents

CHAPTER III: LOCATING DOCUMENTS

III.1 Introduction

Documentary research must begin as soon as the student has their dissertation topic, and not just before writing it. The first step is to search for basic information on the topic in order to understand the theory. The writing of the theoretical part of the dissertation can be done simultaneously with this step. The student must first have an overview of all the methods existing in their subject's field, and then specify current techniques. The search for empirical (experimental) data is essential to compare with numerical results in order to validate the working or calculation method.

III.2 Research Techniques

Research techniques can be summarized as follows:

- Search using keywords: the work's keywords serve as a starting point for documentary research. This is a very effective method.
- Start by building a theoretical base: regardless of the type of work (theoretical, numerical, or experimental), one must start by gaining a precise understanding of the theory, phenomena, and basic laws.
- Progressively move toward more specific documentation: foundational works contain references to more specialized articles.
- Use review articles: these reflect the state of the art in the field, summarizing the most important and recent scientific work.
- Follow scientific news in the field throughout dissertation preparation: new articles or books may appear.
- Consult the supervisor for documentary research: the supervisor can provide documentation on the research topic.

III.3 Search Operators

In documentary research, especially when using digital databases and search engines, it is essential to master search techniques that allow the user to obtain precise and relevant results. The effectiveness of information retrieval depends not only on the choice of keywords, but also on the way these keywords are combined and structured during the search process. For this purpose, several search operators are commonly used to refine queries and improve the accuracy of results. These operators help to broaden, narrow, or better target the search according to the research needs.

Among the most important search tools are Boolean operators, wildcards such as “?” and “$”, and expression-based search techniques, which will be presented in the following sections.

III.3.1 Boolean Operators

Boolean operators are logical connectors used in documentary research to combine or exclude keywords. The most commonly used Boolean operators are **AND**, **OR**, and **NOT**. By using these operators, researchers can improve the precision and relevance of the information they obtain.

- AND – a very precise search. Example: "Thermodynamic cycles AND Gas turbines ", the research is neither on thermodynamic cycles in general nor on gas turbines, but on both.
- OR – a very broad search. Example: "Frigorific machines OR Heat pumps", the research focuses on Frigorific machines and Heat pumps. There will be many results.
- NOT – a targeted search. Example: " Heat transfer NOT Conduction ", the research covers all Heat transfer modes except Conduction.

III.3.2 Wildcards ? and $

Wildcards are special symbols used in documentary research to replace one or more characters within a keyword in order to broaden or refine search results. The wildcard **“?”** is typically used to replace a single character, allowing the retrieval of different word variations with slight spelling differences (for example, "Steel?" will find "steel" or "steels"). The wildcard **“$”** is used in some databases to replace a group of characters or to account for multiple word endings, helping to capture different forms of the same root word. Example: "Geo$" will find Geography, Geographer, Geometry, Geologist, Geology, etc. These tools are particularly useful for increasing the flexibility and effectiveness of search queries.

III.3.3 Expression Search

Expression search is a search technique that involves entering a complete phrase or a group of words in a specific order in order to obtain more precise and relevant results. Unlike simple keyword searches, expression search allows the database or search engine to look for documents that contain the exact combination of terms as entered by the user. This method is particularly useful when the researcher is looking for a specific concept, title, or technical expression, as it reduces irrelevant results and improves the accuracy of the search. To further refine the search, expression search is often used with quotation marks, which indicate that the words must appear exactly in the same sequence. This technique is widely used in scientific databases and online search engines to target very specific information. By using expression search, the researcher can save time, avoid unnecessary results, and focus more effectively on relevant documents related to the dissertation topic.

Part I-Chapter IV:

PROCESSING INFORMATION

Chapter Contents

CHAPTER IV: PROCESSING INFORMATION

IV.1 Introduction

After collecting the various pieces of information related to the dissertation topic, these must be processed for maximum use. This stage must be fairly quick because the dissertation preparation deadlines are sometimes short, especially since time must be left for the practical or calculation part, which can be lengthy with sometimes unpredictable difficulties.

IV.2 Sources of information

Once the topic is clearly defined, you must choose the best sources of information to conduct your research. Generally, for a final year project (PFE), there are four main sources of information:

- ✓ Articles, conference proceedings, or publications in internationally renowned journals,
- ✓ Books,
- ✓ Theses (Master's or Doctoral),
- ✓ Websites.

Articles:

Regardless of the topic, the number of articles available on the web is vast. Therefore, to ensure the reliability of the information, any article whose source is unknown should be disregarded.

So, which journals offer reliable, high-quality articles?

The journal and the conference should be sponsored by a well-known publisher such as: IEEE, Elsevier, Springer, ACM, etc.

Note that the first three publishers are the primary references for all research areas addressed by electronics engineers.

Institute of Electrical and Electronics Engineers: IEEE

ELSEVIER Company

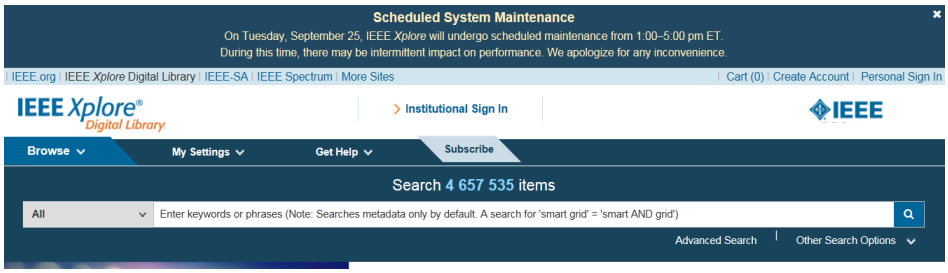
SPRINGER SCIENCE + BUSNESS MEDIA

Association for Computer Machinery: ACM

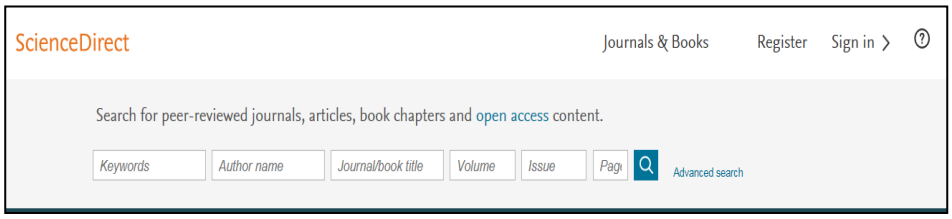
Institution of Engineering and Technology: IET

Considering the publishers we have just mentioned, we can see that each one has its own bookstore:

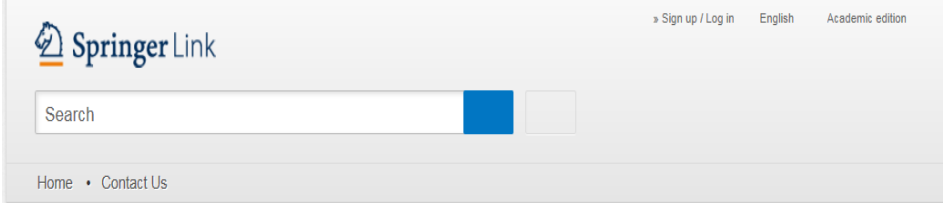
- IEEE : IEEE Xplore



- ELSEVIER: Science direct



- SPRINGER: Springer Link



Publication articles constitute the fundamental support for research, as they offer scientific advances on the topic in terms of methodologies and results.

Publication IEEE :
IEEE transactions on…

IEEE TRANSACTIONS ON PATTERN ANALYSIS AND MACHINE INTELLIGENCE, VOL. 32, NO. 9, SEPTEMBER 2010 1705

WLD: A Robust Local Image Descriptor

Jie Chen, *Member, IEEE*, Shiguang Shan, *Member, IEEE*, Chu He, Guoying Zhao, Matti Pietikäinen, *Senior Member, IEEE*, Xilin Chen, *Senior Member, IEEE*, and Wen Gao, *Fellow, IEEE*

Abstract—Inspired by Weber's Law, this paper proposes a simple, yet very powerful and robust local descriptor, called the Weber Local Descriptor (WLD). It is based on the fact that human perception of a pattern depends not only on the change of a stimulus (such as sound, lighting) but also on the original intensity of the stimulus. Specifically, WLD consists of two components: differential excitation and orientation. The differential excitation component is a function of the ratio between two terms: One is the relative intensity differences of a current pixel against its neighbors, the other is the intensity of the current pixel. The orientation component is the gradient orientation of the current pixel. For a given image, we use the two components to construct a concatenated WLD histogram. Experimental results on the Brodatz and KTH-TIPS2-a texture databases show that WLD impressively outperforms the other widely used descriptors (e.g., Gabor and SIFT). In addition, experimental results on human face detection also show a promising performance comparable to the best known results on the MIT+CMU frontal face test set, the AR face data set, and the CMU profile test set.

Index Terms—Pattern recognition, Weber law, local descriptor, texture, face detection.

1 Introduction

Recently, there has been much interest in object and view matching using local invariant features [27], classification of textured regions using microtextons [34], and in face detection using local features [47]. There are several studies to evaluate the performance of these methods, such as [30], [31], [33], [38]. These methods can be divided into two classes: One is a sparse descriptor which first detects the interest points in a given image and then samples a local patch and describes its invariant features [30], [31]; the other is a dense descriptor which extracts local features pixel by pixel over the input image [33], [38].

as the quantization parameters of the histograms [31]. Dalal and Triggs proposed a "histogram of oriented gradients" (HOG) [12]. Lazebnik et al. proposed a rotation invariant descriptor called the Rotation Invariant Feature Transform (RIFT) [24]. Bay et al. proposed an efficient implementation of SIFT by applying the integral image to compute image derivatives, and quantifying the gradient orientations in a small number of histogram bins [4]. Winder and Brown learned an optimal parameter setting on a large training set to maximize the matching performance [48]. Mikolajczyk and Matas developed the optimal linear projection to

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Comparative study of mixing behaviors using non-Newtonian fluid flows in passive micromixers

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ARTICLE INFO

Keywords:
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TLCCM Micromixer
non-Newtonian fluids
Power-law index
Mixing index
Mixing energy cost

ABSTRACT

High-performance micromixers are widely used in various industrial applications. Mixing in the laminar regime and at low Reynolds numbers is of major importance in some processes. Implementing the physical phenomenon of chaotic advection to improve the mixing efficiency is a well-established technique, therefore, the secondary flows resulting from this technique are very interesting and act at the microscopic level on homogenization. This study aims to compare different configurations of passive micromixers. The four examined micromixers are: Two-Layer Crossing Channels Micromixer (TLCCM), Semicircular Serpentine Micromixer (SCSM-90), Curved micromixer with Grooves (CG), and C-Shape micromixer. All micromixer geometries have the same hydraulic diameter and the equivalent unfolded length. The numerical simulations have been carried out at low Reynolds numbers using the CFD Fluent code to solve the 3D momentum equations, the continuity equation, and the species transport equation. The employed non-Newtonian shear-thinning fluids are the CMC solutions which are modeled by the power-law model with power-law index range from 0.72 to 1 and the generalized Reynolds number varies between 0.1 and 50. The mixing efficiency has been evaluated by calculating the mixing index (MI) based on the standard deviation of the mass fraction in different cross-sections. To examine the obtained results, the mass fraction distributions, the velocity profiles, and the mixing energy cost (MEC) have been presented. The results show that the TLCCM micromixer has a high mixing index which exceeds 0.96 for all the generalized Reynolds number values and the considered power-law index, it also has a lower mixing energy cost compared to other studied micromixers.

1. Introduction

Microfluidic is a new branch of science and technology which has made considerable progress in recent years, microfluidic systems treat the fluids flow field with reducing quantities, in devices having small dimensions ranging from hundreds of micrometers to a few millimeters in a miniaturized system [1–4].

In microfluidic, the fluids mixing is a very common operation, whether in life and domestic use or in the industrial fields where this operation is present in the majority of processes [5]. The rediscovery of micromixers allowed physicists to study fundamental phenomena, then chemists and biologists began to use microfluidics [6]. From the mid-90s, and since 2000, more than 2300 articles have been published on the topic of micromixers. Besides, these articles have been cited more than 40 000 times. Among these articles, about 20–25% relate to micromixing technology applications, while the remainder relates to the development of fundamentals or micromixers performance improvement. The main application fields are: chemical reactors (18%), biological analysis (17%), chemical synthesis (16%), concentrations (13%), polymerization (11%), extraction (9%), and emulsion (8%) [7–11]. The mixing can relate to scalars (concentration, temperature), or several fluids or products (powders, particles or molten polymers). In each situation, a specific mixing strategy must be developed, depending on the physical mechanisms involved in each industrial process. This diversity of situations is reflected by the large number of different available micromixers [12].

There are two main categories of micromixers, depending on the mixing strategy, which can be classified into: active and passive micromixers [13,14]. Generally, active micromixers need different external energy sources to accelerate the mixing process which aims to dis-

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ELSEVIER Publication

Pattern Analysis and Applications
https://doi.org/10.1007/s10044-018-0735-y

THEORETICAL ADVANCES

Hybrid one-class classifier ensemble based on fuzzy integral for open-lexicon handwritten Arabic word recognition

Bilal Hadjadji[1] · Youcef Chibani[1] · Hassiba Nemmour[1]

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Abstract
One-class classifier (OCC) is involved for solving different kinds of problems due to its ability to represent a class distribution regardless the remaining classes. Its main advantage for multi-class classification is offering an open system and therefore allows easily extending new classes without retraining OCCs. So far, hidden Markov models, support vector machines and neural networks are the most used classifiers for Arabic word recognition, which provides a system with closed lexicon. In this paper, the OCCs are explored in order to perform an Arabic word recognition system with an open lexicon. Generally, pattern recognition systems designed by a single system suffer from limitations such as the lack of uniqueness and non-universality. Thus, combining multiple systems becomes an attractive research topic for performance and robustness enhancement. Fixed rules are commonly used as combiners for the hybrid OCC ensembles. The present paper aims to propose a combination scheme of OCCs based on the use of fuzzy integral (FI) operators. Furthermore, an alternative framework is proposed to design a parameter-independent and open-lexicon handwritten Arabic word recognition system as well as a new density measure function. Experimental results conducted on Arabic handwritten dataset using different types of OCCs with large number of classes highlight the superiority of FI for hybrid OCC ensembles.

Keywords One-class classifiers · Hybrid OCC ensemble · Fuzzy integral · Density measures · Open-lexicon Arabic word recognition

1 Introduction

Handwritten Arabic word recognition is an active research field due to its interesting use in different applications such as automatic sorting of postal mail, automatic bank check processing, bills processing, passport validation and, recently, for historical document reading via text to speech applications, helping blinds to read and recognizing handwritten historical documents [1–5]. Unlike Latin languages, Arabic is written from right to left. Also, it has its own diacritical marking such as dumma (ٌ), hamza (ء) and the madda (–). Regarding character shapes, Arabic script has two main properties. On the one hand, several letters share the same shape and differ only in the number and position of dots, such as "djim: ج," "ha: ح" and "kha: خ." On the other hand, some letters change their shape according to their position at the beginning, the medial or the end in the word. For instance, the letter "Aïn" can be written through four shapes that are: "ع، ـعـ، ـع and ع،" where the two last shapes are related to end positions which change if the word is fully connected or not.

So far, the Arabic word recognition is considered as one of the most challenging tasks of pattern recognition for its specific writing as well as its variability. In this context, the analytical and holistic approaches are the two possible ways for recognizing an Arabic word [6]. The first one consists of segmenting a word image into subwords or isolated characters, which are recognized through character recognition. Generally, this approach is employed when a very large vocabulary is available since it is impossible to construct a

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SPRINGER Publication

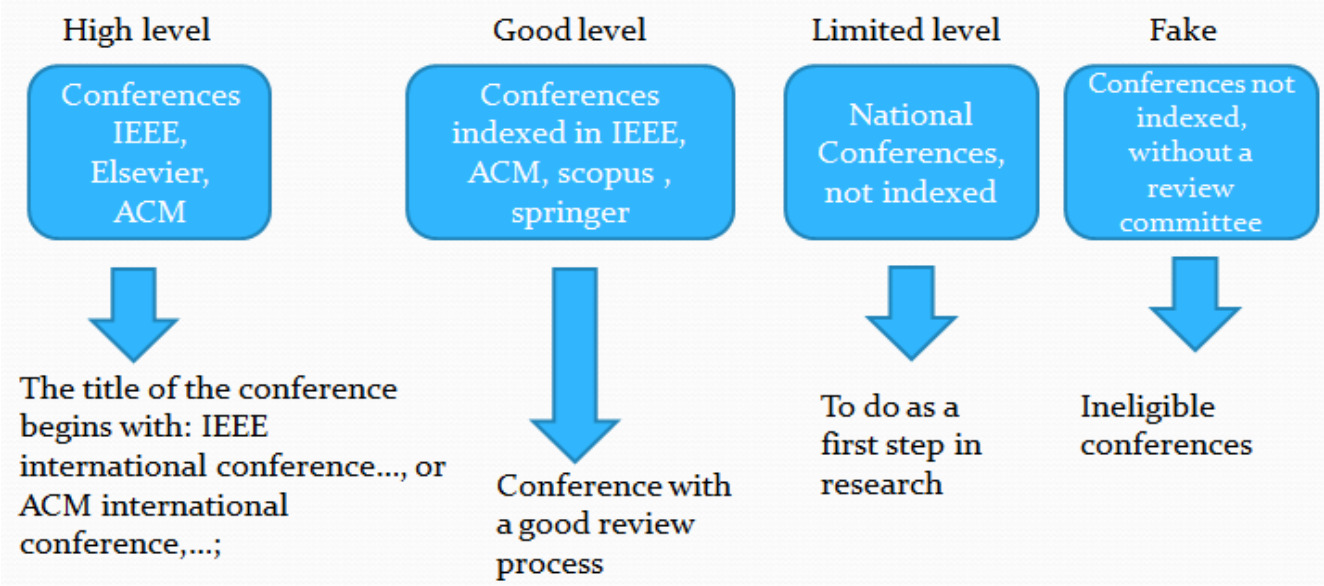
How to choose a journal?

Class A journals	Class B journals
These are the journals indexed by ISI Thomson in the Web of Science database. All these journals have an "Impact Factor" which reflects the ratio of published articles to cited articles.	These are the journals indexed by Scopus. They do not have an impact factor. Most publishers have Class A and Class B journals.

- ✓ A good journal should have an impact factor > 1
- ✓ Class A+: Top-ranked journal

Conferences:

The conferences are classified according to the level of the papers presented.



In addition to understanding the fundamental concepts of the topic, documentary research helps to grasp the aspect being studied. To complete a final year project or, more specifically, a dissertation, one must evaluate all the work already done on the topic. This allows for the establishment of what is called a Literature Review (Background and Literature Review, Background, related works, etc.). The Literature Review consists of listing the various works carried out on the topic, illustrating their advantages and, above all, their disadvantages, from which problems or questions still arise. The work of a final year project or a thesis must therefore address a problem or question that is still being asked in order to propose a solution.

How to construct a literature review?

For each article directly related to the thesis topic, you must:

1. Determine the article's contribution and impact:
   - The problem addressed
   - The proposed solution
   - The tests performed
   - The databases used
   - The results obtained

2. Write a short summary of the article's content. The summary should include:

- The objective, the contribution, and the results
- Note the strengths, weaknesses, and limitations

After collecting the documents, a reading must be done before beginning the final year project (PFE). This reading will provide the general concepts related to the topic and will also help contextualize the PFE project. The objective (the contribution in the case of a dissertation) will thus be clearly defined. Once this step is completed, the work proposed in the PFE can begin.

IV.3 Work Organization

It is useful to be well organized when collecting information. Some small tips can help the student organize so as not to waste time or lose information:

- Create summaries of consulted documentation: each time the student reads an article, book, or other work, it is useful to write a summary of the essential information found. Creating files for each source of documentation is very useful.
- Do not retain summaries that are not useful to the dissertation topic.
- Classify documents or summaries by theme, aspect of the problem, or method used.
- Underline or highlight important sentences or paragraphs in documents.

IV.4 Starting Questions

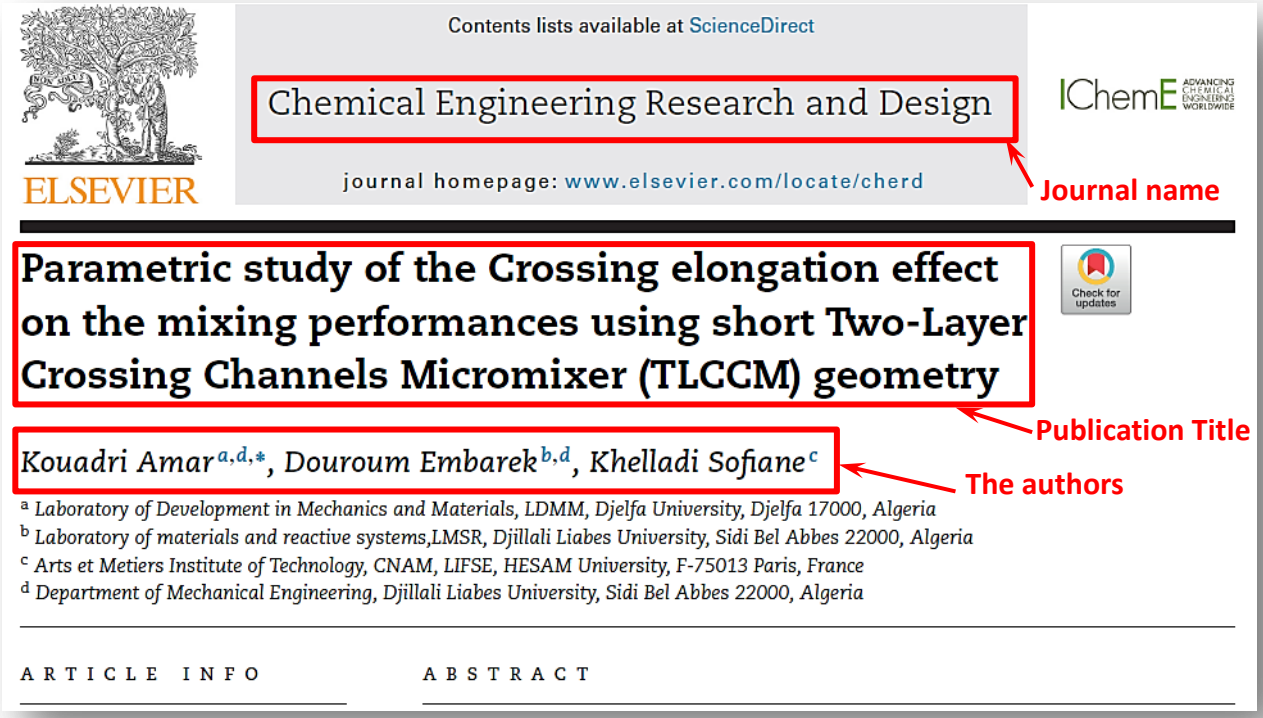
The questions to ask oneself during documentary research for each source are:

- Who are the authors of this work?
- When was this work carried out?
- What was done in the work?
- How was it done?
- What were the results found?
- Are these results important for my dissertation topic?

These questions will help write summaries more easily. The student can find answers in the abstracts presented at the beginning of each research article and write them in a table.

Exemple

The abstract of a scientific article entitled "*Parametric study of the crossing elongation effect on the mixing performances using short two-layer crossing channel micromixer (TLCCM) geometry*," whose authors are Kouadri Amar, Douroum Embarek, and Khelladi Sofiane, was published in the journal of Chemical Engineering Research and Design in 2020.



Abstract: The objective of this work is to optimize the geometry of the TLCCM micromixer using different geometric parameters defined by aspect ratios (l/W = 0.25, 0.5, 0.75, and 1), based on the crossover length, and then to perform a quantitative and qualitative comparison of hydrodynamic mixing efficiency using different characteristic graders.

The results of the comparison showed that the optimal micromixer has the highest hydrodynamic mixing performance with the lowest pressure loss and also exhibits the lowest mixing energy cost.

How to summarize this article during literature research?

Authors	Year	Work objectives	Method followed	Found results	Utility
A. Kouadri *E. Douroum K.* *Sofiane*	2020	Geometric optimization of the TLCM micromixer using different geometric parameters defined by aspect ratios, based on the elongation of the crossing.	Use the CFD-Fluent code to solve the problem. Examine the wall effect of the micromixer geometry on mixing performance.	The TLCCM micromixer (with l/W = 1) exhibits excellent mixing performance where the mixing index obtained exceeds 85.67% for Re = 0.2 and reaches 99.22% for Re = 50.	Yes

IV.5 Synthesis of Selected Documents

Once all the summaries of documentation sources have been written, a synthesis must be made. For this, all summaries can be gathered in the same table and classified in chronological order. This allows one to follow the evolution of work in the field and to know the methods from oldest to most recent. This table also helps find documents more easily without having to leaf through works trying to remember where information was found. This step will later help the student write their bibliography.

IV.6 Links Between Different Parts

To understand the links between different documents, draw up tables similar to the summary tables in which works can be classified by approach. Each table contains works that used the same approach to solve the problem, listed in chronological order.

IV.7 Final Plan for Documentary Research

All the previous tables are combined with the consulted documents to form a research library. The student will consult all these documents whenever needed. All information is classified, making retrieval easy. It is very important to always save documentation on different computer media.

Part I-Chapter V:

PRESENTING THE BIBLIOGRAPHY

Chapter Contents

CHAPTER V: PRESENTING THE BIBLIOGRAPHY

V.1 Introduction

The bibliography, or bibliographic references, is an ordered list of all documentation used in the dissertation. The bibliography is generally placed at the end of the dissertation, before the appendices. It can also be placed at the end of each chapter. The bibliography must be precise, clear, simple, and complete. It must allow the reader to find the referenced document.

V.2 Systems for Presenting a Bibliography

V.2.1 Harvard System (Alphabetical)

In the text, the author is cited in parentheses followed by a comma and then the year of publication. Cited works are detailed in full, in alphabetical order, in a bibliography section at the end. Example: "This numerical calculation method was developed by (Khelladi, et al. 2024)."

V.2.2 Vancouver System (Numerical)

References are numbered in Arabic numerals in the text in order of their appearance. When a reference is cited multiple times, it keeps the same number. In the bibliography section, references are listed in numerical order. Example: "This numerical calculation method was developed by [8]."

V.2.3 Mixed System

References are listed alphabetically in the bibliography section and called up by this numbering in the text. This system is more practical to read but harder to write.

V.3 Presentation of Documents

When information in the dissertation text is taken from a document or when an entire sentence is copied from a research document, this must be specified in the text immediately after the information or sentence in question. Otherwise, the text will be considered plagiarism and the author can be punished by law. The most important rule is that all documents cited in the text must be easily identifiable by the reader from the bibliographic references.

V.4 Citing Sources

Citations must be written according to the following categories:

- Publications: LAST NAME First name. Article title. Journal title, publication year, volume, issue, number, pagination.
- Conferences: Conference title (session no.; session year; location). Title. City: Publisher, year, number of pages.
- Books: Author's last name and initial of first name. Book title. Edition, country, year.
- Theses and dissertations: LAST NAME First name. Thesis title. Discipline. Location: University, year, number of pages.
- CD-ROMs: AUTHOR. Title [CD-ROM]. Place of publication: Publisher, year. (The [CD-ROM] indication is mandatory.)
- Websites: AUTHOR (or organization). Resource title. [If applicable, add the larger resource to which the cited document is linked.] [online]. Available at: <URL>. (Consultation date)

Part II :

DISSERTATION DESIGN

Part II-Chapter I:

DISSERTATION PLAN AND STAGES

Chapter Contents

PART II – DISSERTATION DESIGN

CHAPTER I: DISSERTATION PLAN AND STAGES

I.1 Introduction

Each dissertation must contain a certain number of sections or parts that the student must respect. Each of these sections appears in a well-defined order, and together they form a harmonious work. One common mistake made by students is to prioritize the number of pages over quality. Therefore, only the essentials should be written, and only useful information should be mentioned.

I.2 Abstract and Keywords

The abstract is very important in a dissertation as it summarizes all the presented work. Reading it allows one to decide whether or not to read the dissertation. Its role is to:

- ✓ Clarify the title,
- ✓ Show the student's contribution to the field,
- ✓ Help the reader decide whether or not to read the manuscript,
- ✓ Give the reader quick information.

The abstract consists of four parts:

- ✓ The problem or dissertation subject,
- ✓ How the problem is solved,
- ✓ The most important results,
- ✓ The utility of the work.

The abstract concludes with a list of keywords. These are the most important terms in the dissertation. Their purpose is to guide research in the field for those who consult the dissertation after its defense.

The abstract must be written in the present tense. It should be written in French and translated into Arabic and English.

Résumé

ملخص

تم التحقيق في خلط السوائل النيوتونية باستخدام جهاز مزج دقيق ذو طبقتين (TLCCM-X و TLCCM-KX) ، ونموذجين آخرين جد معروفين (C-2D و C-3D). يتم حل معادلات Navier-Stokes ومعادلات إنحفاظ الكتلة ومعادلة نقل الأنواع عدديًا باستخدام كود CFD Fluent 16.0. تتمتع أجهزة الخلط الدقيقة TLCCM بإمكانيات حقيقية في تحسين أداء الخلط الهيدروديناميكي والحراري لأن الخصائص الحركية

الكلمات المفتاحية: ميكرومكسر،التأفق الفوضوي،مؤشر الخلط،سائل غيرنيوتوني،رقم رينولدز منخفض.

Résumé

Le mélange de fluides Newtoniens à l'aide des micromélangeurs à deux couches de canaux de croisées (TLCCM-X et TLCCM-KX) et deux autres types bien connus (C-2D et C-3D) a été étudié. Les équations de Navier-Stokes, les équations de conservation de masse et l'équation de transport des espèces sont résolues numériquement à l'aide d'un code CFD Fluent 16.0. Les

Mots clés : micromélangeurs, mélange chaotique, degré de mélange, fluide Newtonien, faible nombre de Reynolds, TLCCM, CFD.

Abstract

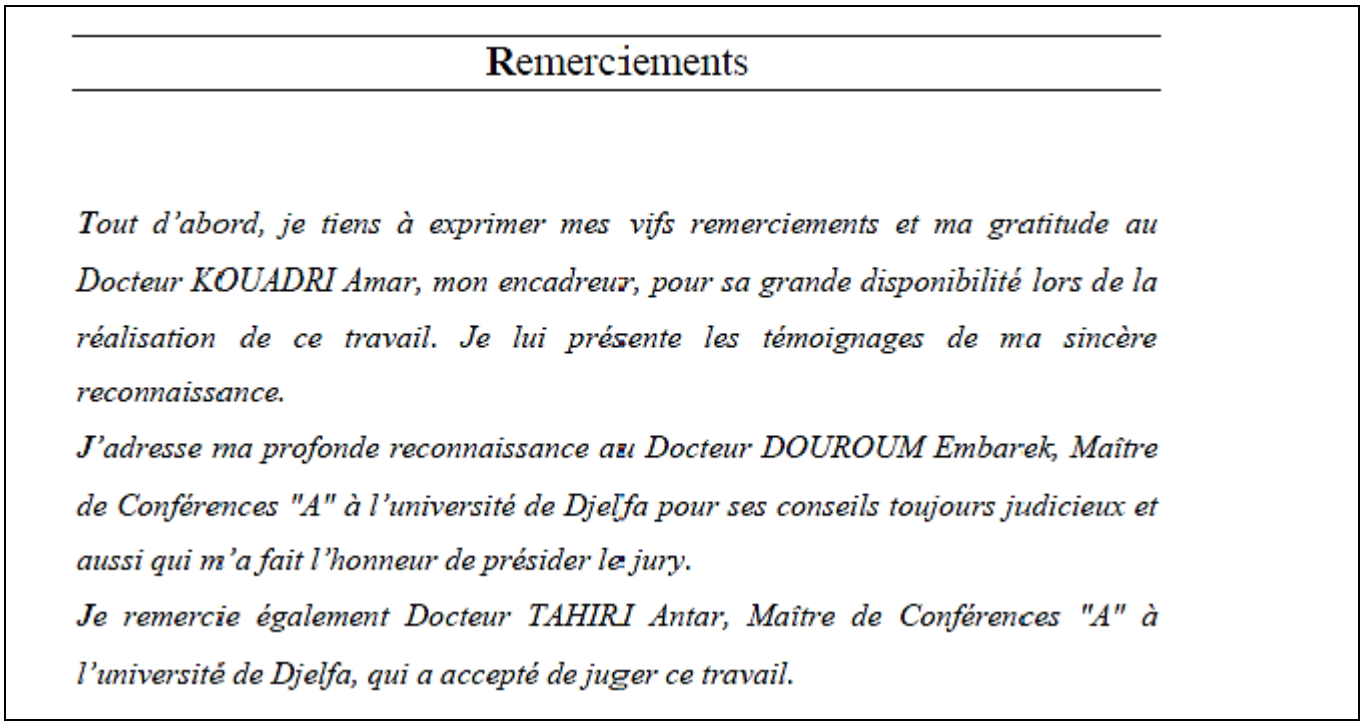
The mixing of Newtonian fluids using Two Layer Crossing Channel Micromixers (TLCCM-X and TLCCM-KX), and two other well-known models (C-2D and C-3D) has been investigated. Navier-Stokes equations, mass conservation equations and species transport equation are solved numerically using a CFD Fluent code 16.0. TLCCM micromixers had real potential in improving

Keywords: micromixers, chaotic mixing, mixing degree, Newtonian fluids, low Reynolds numbers, TLCCM, CFD.

Fig II.1. Illustrative examples of dissertation abstracts in three languages.

I.3 Acknowledgements and Dedications

This is an optional section. On one page, the student may mention the persons to whom they dedicate their work. This is a purely personal note. Acknowledgements are at the student's discretion for help received from certain persons such as professors, companies, etc.



Remerciements

Tout d'abord, je tiens à exprimer mes vifs remerciements et ma gratitude au Docteur KOUADRI Amar, mon encadreur, pour sa grande disponibilité lors de la réalisation de ce travail. Je lui présente les témoignages de ma sincère reconnaissance.

J'adresse ma profonde reconnaissance au Docteur DOUROUM Embarek, Maître de Conférences "A" à l'université de Djelfa pour ses conseils toujours judicieux et aussi qui m'a fait l'honneur de présider le jury.

Je remercie également Docteur TAHIRI Antar, Maître de Conférences "A" à l'université de Djelfa, qui a accepté de juger ce travail.

Fig II.2. Illustrative example of dissertation acknowledgements

I.4 Table of Contents

This is the list of all chapters, headings, and subheadings with the page numbers of their beginnings. It is advisable not to include all subheadings and sub-subheadings if they are too numerous.

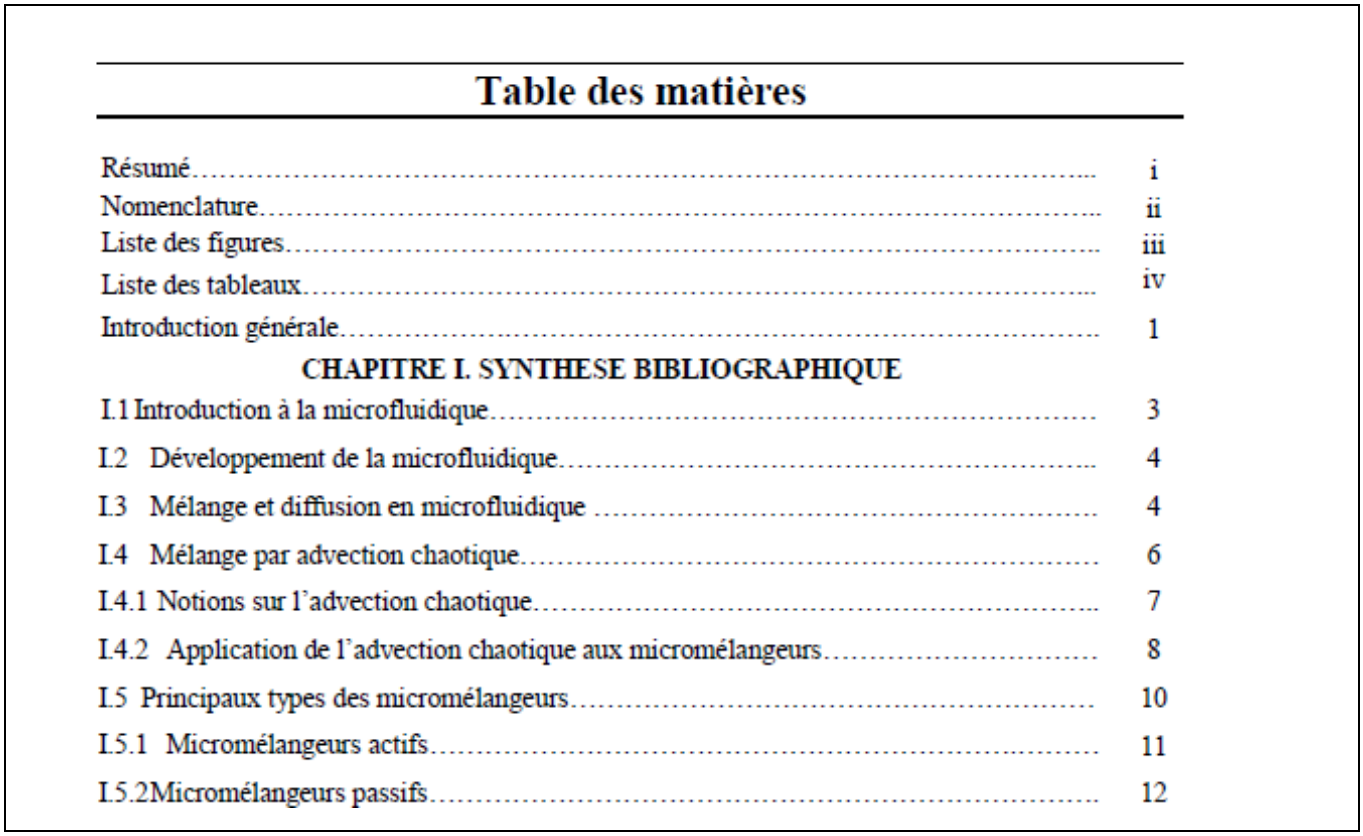


Table des matières

Fig II.3. Illustrative example of dissertation table of Contents

I.5 Nomenclature and Abbreviations

A list of quantities, subscripts, superscripts, and abbreviations is provided together with their meanings. Units may also be added.

Symboles grecques

∇	Opérateur nabla	-
ρ	Masse volumique	$[kg \cdot m^{-3}]$
σ	Déviation standard	-
σ_0	Déviation standard maximale	-

Indices et exposants

T	Opérateur transposé
0	Indice de référence

Fig II.4. Illustrative example of dissertation nomenclature and abbreviations

I.6 General Introduction

The general introduction enables the reader to engage with the topic of the dissertation. It should be clear, concise, and engaging, capturing the reader's attention, sometimes beginning with a striking opening statement. It typically includes the importance and relevance of the subject, its various aspects, the objectives of the dissertation, the methodology adopted, and an outline of the dissertation structure. The general introduction is usually written last

I.7 Literature Review

The literature review provides a critical summary of the most important work carried out in the field. Its purpose is to demonstrate that the student has conducted thorough research, has a solid understanding of the relevant theories, and is able to situate the dissertation within the context of existing studies. The selected works should be grounded in the theoretical framework of the subject, directly related to the research theme, and reflective of current developments in the field. They should also help position the dissertation within contemporary research and highlight the state of the art

I.8 Methodology

In this section, the methodology is presented in a clear and detailed manner. It should justify the choice of the adopted method by explaining its relevance and suitability for addressing the research problem. A comprehensive description of the experimental setup, test bench, or computational domain should be provided, along with the procedures and techniques followed during the study.

The section should also discuss alternative methods that were considered and explain the reasons for their rejection. In addition, it should outline the resources used, including materials, equipment, software, and data sources. Where appropriate, any assumptions, limitations, and constraints of the chosen approach should be acknowledged to ensure transparency and reproducibility of the work.

I.9 Results and Discussion

The student should first consult with the supervisor to determine which results are most relevant and appropriate to present. The results must be displayed clearly using well-designed graphs, histograms, tables, or other visual representations that enhance readability and understanding. Particular attention should be paid to clarity, proper labeling, and consistency in presentation.

The analysis and discussion of the results constitute the most important part of the thesis. Each graph or diagram should be examined individually and systematically. This involves first describing the general trends observed, then explaining the underlying phenomena and providing logical interpretations. Where appropriate, these explanations should be supported by references to previous studies or established theories. Finally, each analysis should conclude by highlighting key findings or positive aspects, emphasizing their significance in relation to the research objectives.

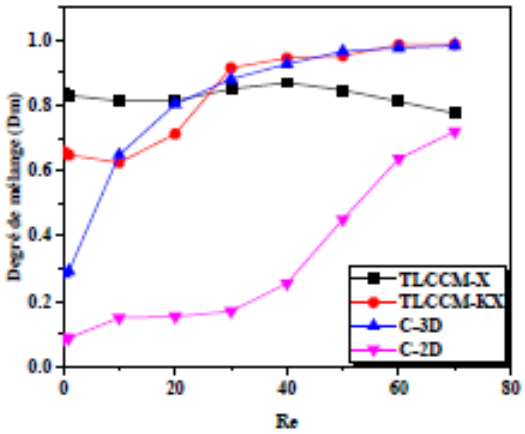


Figure III.5. Variation du degré de mélange aux plans de sortie des différents micromélangeurs sur toute la gamme du nombre de Reynolds.

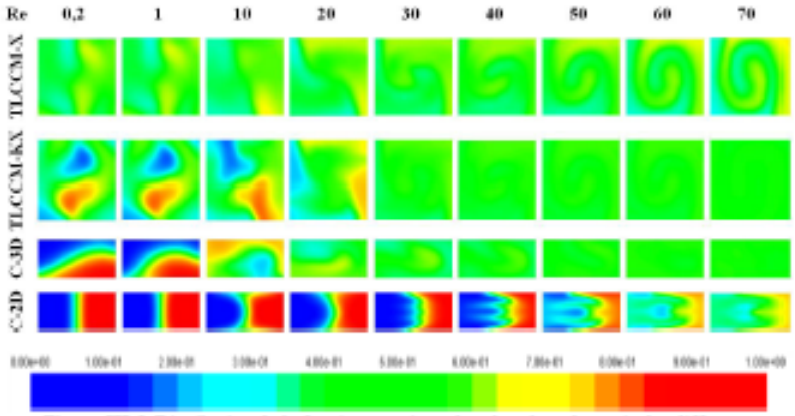


Figure.III.6. Distribution de la fraction massique dans les plans de sortie des différents micromélangeurs pour différents nombres de Reynolds.

III.4. Performances thermiques de mélange des micromélangeurs proposés

Afin de quantifier l'efficacité du mélange, l'effet du nombre de Reynolds sur le degré de mélange thermique pour chaque micromélangeur sont présentés dans les figures ci-dessous. La Figure III.7 montre l'évolution du degré de mélange thermique le long des différents micromélangeurs pour Re = 0,2 ; 10 ; 30 ; et 60.

41

Fig II.5. Example illustrating the interpretation of graphs and contour plots in a dissertation.

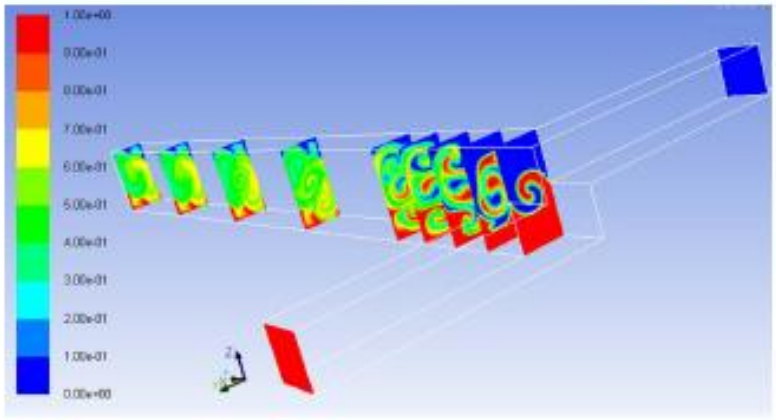


Fig. III.2. Fraction massique dans différents plans pour Re = 250.

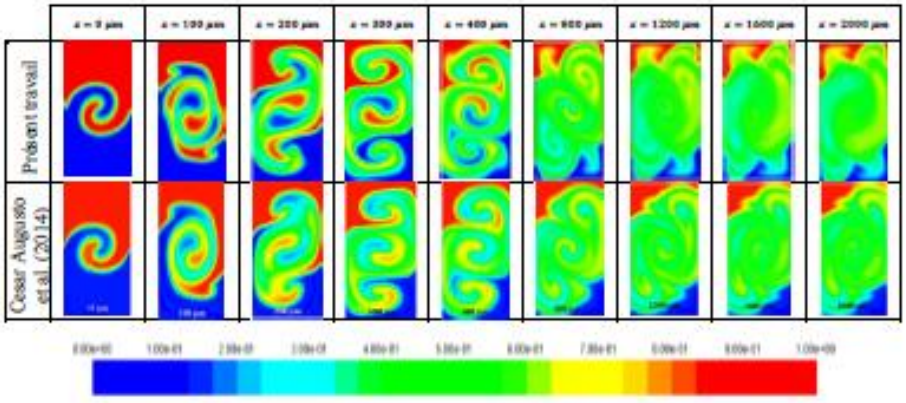


Tableau. III.1. Fraction massique dans différents plans du canal de mélange pour Re = 250.

III.3. Performances hydrodynamiques de mélange des micromélangeurs proposés

Le micromélangeur à deux couches de canaux croisés TLCCM-X a montré des performances de mélange élevées, ce qui nous motive de le comparer avec d'autres micromélangeurs chaotiques tridimensionnels (3D) et planaires (2D).

36

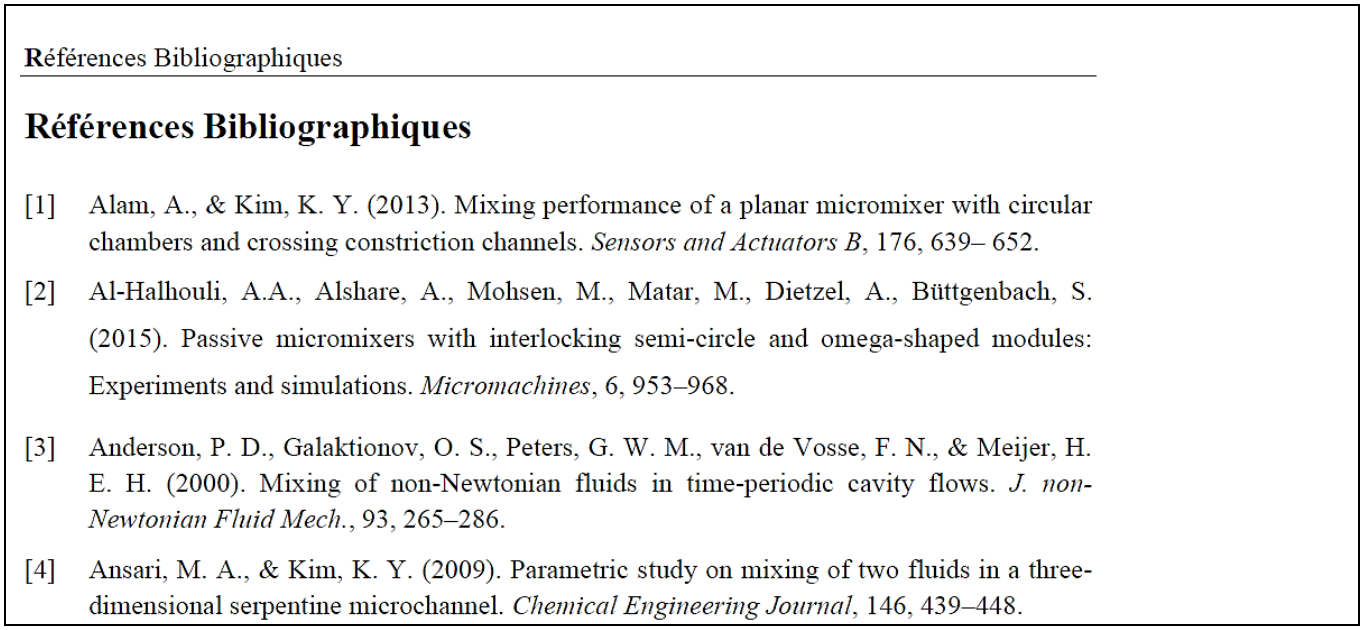
Fig II.6. Interpretation of contour in a dissertation.

I.10 Conclusions and Perspectives

The general conclusion is written at the end of the dissertation and serves to synthesize the entire work. It should briefly restate the research objectives and the methodology adopted, followed by a clear summary of the main results obtained. The conclusion should also highlight the efforts made, as well as the originality and contributions of the study. In addition, it may discuss the limitations encountered and suggest possible extensions or directions for future research, thereby opening perspectives for further investigation.

I.11 Bibliography

The bibliography must include all sources and documents consulted during the preparation of the thesis. It is presented at the end of the document and should be organized according to a consistent citation style. Each reference must be complete and accurate, allowing readers to easily locate the original sources. The bibliography reflects the depth and quality of the research undertaken and demonstrates proper acknowledgment of the work of other authors.



Références Bibliographiques

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[3] Anderson, P. D., Galaktionov, O. S., Peters, G. W. M., van de Vosse, F. N., & Meijer, H. E. H. (2000). Mixing of non-Newtonian fluids in time-periodic cavity flows. *J. non-Newtonian Fluid Mech.*, 93, 265–286.

[4] Ansari, M. A., & Kim, K. Y. (2009). Parametric study on mixing of two fluids in a three-dimensional serpentine microchannel. *Chemical Engineering Journal*, 146, 439–448.

Fig II.7. Presentation of the bibliography in a dissertation.

I.12 Appendices

Appendices are optional sections that include supplementary material useful for understanding the thesis but not essential to its main body. They are used to present documents that would otherwise interrupt the flow or make the text too heavy, such as extensive data tables, detailed calculations, official documents, legal texts, or additional technical information. Each appendix should be clearly labeled and referenced in the main text where appropriate, allowing readers to consult it easily if needed.

Part II-Chapter II:

WRITING TECHNIQUES AND STANDARDS

Chapter Contents

CHAPTER II: WRITING TECHNIQUES AND STANDARDS

II.1 Introduction

A high-quality dissertation is a well-written manuscript. The manuscript reflects the image of the student. Currently, few students give importance to writing their dissertations. They are content to 'copy and paste' from the internet. This gives a very poor image of them. Writing should be done in parallel with other stages to avoid being caught by deadlines. At the Mechanical Engineering Department, there is a writing model for final cycle projects that students must follow; otherwise, their dissertations cannot be accepted.

II.2 Writing, Scientific Language, Style, Grammar, and Spelling

A plan must be drawn up before starting writing. It is useful to start writing in parts throughout dissertation preparation. Pre-writing facilitates final writing. Start by deciding which parts should make up the dissertation and classify them. Then write the dissertation as well as possible:

- ✓ Make the objectives and usefulness of the work appear clearly from the first paragraphs,
- ✓ Write clearly and simply,
- ✓ Clearly give definitions of the dissertation's keywords,
- ✓ Never forget that the dissertation is addressed to readers who need to be attracted and persuaded,
- ✓ Do not write overly long sentences,
- ✓ Write in the active voice, not passive,
- ✓ Understand everything you write,
- ✓ Constantly re-read what you write to correct or make changes,
- ✓ Show the manuscript to the supervisor and qualified persons in the field for their opinion,
- ✓ Check grammar and spelling, or have them checked by competent persons.

The student can also contact a language teacher for help in correcting mistakes. Punctuation is very important; it can change the meaning of sentences. A dissertation full of errors gives a very poor image of the student.

II.3 Dissertation Formatting

Students must strictly follow the dissertation writing guidelines, as failure to do so may result in the rejection of their work

II.4 Saving, Securing, and Archiving Data

Saving, organizing, and securing all documents used in the preparation of the dissertation is an essential practice that helps prevent data loss and avoids last-minute difficulties. Documents should be properly classified and archived in a structured manner to ensure easy access and efficient management. It is recommended to store files on multiple storage media, such as a computer, USB flash drive, external hard drive, or DVD, in order to reduce the risk of data loss. Regular backups should be carried out frequently, without waiting for a large volume of work to accumulate, to ensure continuous protection of all research materials.

Part II-Chapter III:

WORKSHOP – DISSERTATION WRITING MODEL

Chapter Contents

CHAPTER III: WORKSHOP – DISSERTATION WRITING MODEL

III.1 Introduction

This chapter presents the harmonized model for writing a final-cycle dissertation, detailing all its requirements and structure. Students are expected to adhere strictly to this model throughout the preparation of their manuscripts. Any failure to comply with these guidelines may result in the rejection of the dissertation, which would consequently prevent the student from being authorized to defend their work

III.2 Dissertation Writing Model

Cover Page

The cover page must include all essential administrative and academic information in a clear and structured format. It should present the name of the country and the ministry in both Arabic and French or English, followed by the university, faculty, and department. It must also indicate the degree being pursued (for example, Master's in Mechanical Engineering, Option: Energetics), as well as the title of the project. In addition, the names of the student(s) and the supervisor must be specified. The cover page should also include the defense date, the composition of the jury with their respective titles and roles (President, First Examiner, Second Examiner, Supervisor), and finally the academic year. All elements should be clearly organized to ensure readability and conformity with institutional standards.

الجمهورية الجزائرية الديمقراطية الشعبية
République Algérienne Démocratique et Populaire
وزارة التعليم العالي والبحث العلمي
Ministère de l'enseignement supérieur et de la recherche scientifique

Université Ziane Achour de Djelfa
Faculté des Sciences et de la Technologie
Département de Génie Mécanique

جامعة زيان عاشور الجلفة
كلية العلوم والتكنولوجيا
قسم الهندسة الميكانيكية

N° d'ordre : MGM/...../2024

MEMOIRE

Présenté en vue de l'obtention

Du diplôme

MASTER ACADEMIQUE

Domaine : Sciences de la Technologie

Filière : Génie Mécanique

Option : Energétique

Thème

Titre du Projet de Fin de Cycle

Présenté par

Nom et prénom du candidat

Soutenue publiquement le ..../..../2024 devant le jury composé de:

NOM et Prénom du président	Grade et affiliation	Président
NOM et Prénom du 1er examinateur	Grade et affiliation	Examinateur
NOM et Prénom du 2ème examinateur	Grade et affiliation	Examinateur
NOM et Prénom du co-encadreur	Grade et affiliation	Co-Encadreur
NOM et Prénom de l'encadreur	Grade et affiliation	Encadreur

PROMOTION 2023/2024

A blank page must be left between the cover page and the rest of the dissertation.

ملخص

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الكلمات المفتاحية: ..... ، ..... ، ..... ، .....
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Abstract (English)

An English abstract of the work is desirable but not mandatory. It should briefly present the context of the study, the methodology adopted, and the main results obtained in the dissertation. The abstract should be concise, with a maximum length of approximately 15 lines, and it must be centered on the page. The title ‘Abstract’ should be written in Georgia 18 bold, while the abstract text should be formatted in Times New Roman 12.

Keywords in English must be provided at the end of the abstract. A maximum of ten keywords is allowed, separated by dashes. The heading ‘Keywords’ should be written in Georgia 12 bold, and the keywords themselves in Times New Roman 12.

Abstract (French)

A French abstract of the work must be presented. It should not exceed 15 lines and must be centered on the page. The page is not numbered. The "Résumé" title is in Georgia 18 bold; the text is in Times New Roman 12. Keywords are cited at the end and must not exceed 10, separated by a dash.

Acknowledgements and Dedication

These are optional pages, not numbered. The title is in Georgia 18 bold and the text in Times New Roman 12 in italic.

Remerciements

***T**out d'abord, je tiens à exprimer mes vifs remerciements et ma gratitude au **Nom de l'encadreur**, mon encadreur, pour sa grande disponibilité lors de la réalisation de ce travail. Je lui présente les témoignages de ma sincère reconnaissance.*

***J**'adresse ma profonde reconnaissance au **Nom du président de jury, son grade et son affiliation** pour ses conseils toujours judicieux et aussi qui m'a fait l'honneur de présider le jury.*

***J**e remercie également **Nom de l'examinateur, son grade et son affiliation**, qui a accepté de juger ce travail.*

***J**e tiens aussi à remercier ……..*

***Q**ue toutes les personnes ayant contribué, de près ou de loin, à la réalisation de ce travail, soient chaleureusement remerciées.*

***E**nfin et surtout, je voudrais remercier mes parents, ……..*

Table of Contents

The table of contents must be numbered in lowercase Roman numerals (i, ii, iii, iv…). Main titles and chapter titles are in Georgia 12; subtitles are in Times New Roman 12.

Table des matières

Nomenclature

The nomenclature includes the main symbols and abbreviations used in the dissertation, numbered in lowercase Roman numerals following the table of contents. Units must be specified. The title "Nomenclature" is in Georgia 18 bold; section titles such as "Latin Symbols" in Georgia 12; quantities and units in Times New Roman 12. Symbols and units must be in italic. The nomenclature includes: Latin symbols (e.g., a – speed of sound [m/s]), Greek symbols (e.g., λ – thermal conductivity [W/m.K]), subscripts, superscripts, and abbreviations.

Nomenclature

Symboles latins

b	Hauteur du canal diagonal	$[m]$
c_i	Fraction massique en un point i	-
H	Largeur du micromélangeur	$[\boldsymbol{m}]$
P	Pression	$[\boldsymbol{Pa}]$
Re	Nombre de Reynolds pour les fluides Newtoniens	-
u, v, w	Composantes cartésiennes de la vitesse	$[\boldsymbol{m \cdot s^{-1}}]$
x, y, z	Coordonnées cartésiennes	$[m]$

Symboles grecques

∇	Opérateur nabla	-
ρ	Masse volumique	$[\boldsymbol{kg \cdot m^{-3}}]$
$\boldsymbol{\sigma}$	Déviation standard	-
$\boldsymbol{\sigma_0}$	Déviation standard maximale	-

Indices et exposants

T Opérateur transposé

0 Indice de référence

Abréviations

CFD	Computational Fluid Dynamics
SIMPLEC	Semi Implicit Method for Pressure Linked Equations Consistent
TLCCM	Two Layer Crossing Channels Micromixer

List of Figures and List of Tables

The list of figures must contain all figures with their corresponding page numbers, numbered in lowercase Roman numerals after the nomenclature. The title is in Georgia 18 bold and the text in Times New Roman 12. The list of tables similarly follows the list of figures.

Liste des figures

Liste des Tableaux

CHAPITRE I

CHAPITRE II

General Introduction

The general introduction must be at least one page for bachelor's dissertations and more than one page for master's dissertation. It presents the context, objectives, and means of implementation, as well as the dissertation content. Arabic numeral page numbering begins here. The title is in Georgia 18 bold; the text is in Times New Roman 12.

CHAPITRE I
REDACTION D'UN PROJET DE FIN DE CYCLE

Chapter Structure

The title and number of each chapter must appear at the beginning in Georgia 22 bold, left-aligned. Chapter numbers must be in Roman numerals. It is recommended that each chapter begin with a table of contents. Within chapters:

- Titles (level 1) are in Georgia 14 bold, numbered X.Y (e.g., I.3 for the 3rd title of Chapter I).
- Subtitles (level 2) are in Georgia 13; text in Times New Roman 12.
- Sub-subtitles (level 3) are in Georgia 12; text in Times New Roman 12.

I.1 Introduction

It is recommended that each chapter begin with an introduction.

I.2 Titles and Subtitles

Titles are in 14-point bold Georgia font. They are numbered as follows: the first number is the chapter number, and the second is the subtitle.

Example: if it is the third title in Chapter I, then it will be numbered I.3. A space is left between the title and the text that follows it.

I.2.1 Subtitle 1

The subtitles are in Georgia 13-point font. The text is in Times New Roman 12-point font.

I.2.2 Subtitle 2

The subtitles are in Georgia 13-point font. The text is in Times New Roman 12-point font.

I.2.2.1 First subtitle 2

The level 2 subtitles are in Georgia 12-point font. The text is in Times New Roman 12-point font.

I.2.2.2 Second subtitle 2

I.3Figures

Figures must be in the language used to write the dissertation. Translation is required if the reference contains information in another language. The reference for each figure must be cited if it exists. Figures are numbered as: Chapter number. Figure number (e.g., Figure II. 4 for the 4th figure of

Chapter II). The title must be in Times New Roman 12, centered, with the word "Figure" and its number in bold, not separated by a colon. Axis labels and units must be clearly shown.

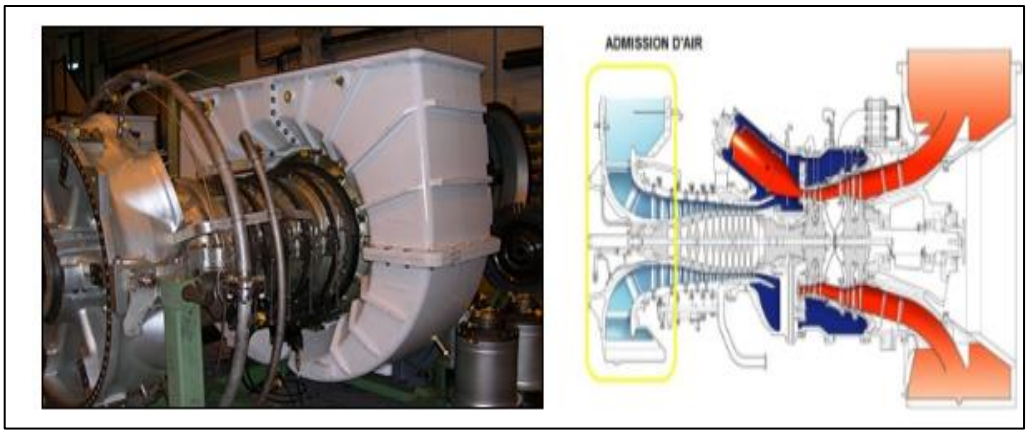

Figure II.4. Section admission d'une turbine SGT 400 [3]

I.4 Tables

Tables must be in the language used to write the dissertation. Tables are numbered as: Chapter number. Table number (e.g., Table II.3). The title must be in Times New Roman 12, centered, with the word "Table" and its number in bold, placed above the table.

Tableau II.3. Paramètres géométriques a^* et b^* en fonction de différents rapports d'aspect α^*.

$\boldsymbol{\alpha^*}$	**0**	**0,1**	**0,2**	**0,3**	**0,4**	**0,5**	**0,6**	**0,7**	**0,8**	**0,9**	**1,0**
$\boldsymbol{a^*}$	0,5	0,4132	0,3475	0,2991	0,2659	0,2439	0,2297	0,2208	0,2155	0,2129	0,2121
$\boldsymbol{b^*}$	1,0	0,9098	0,8444	0 ,7954	0,7571	0,7278	0,7065	0,6921	0,6831	0,6785	0,6771

I.5 Equations

Equations must be written with an equation editor (Word's built-in or Math Type). Characters must be consistent with the dissertation text. Equations are numbered like figures and tables, with the number at the end of the line in parentheses (e.g., $PV = nRT$ (IV. 2)). A space is left before and after each equation.

$$Re_g = \left(\frac{4\frac{b}{a}}{\frac{b}{a}+1}\right)^n \frac{\rho \bar{u}^{2-n} b^{n-1}}{m} \qquad (\text{II. } 25)$$

I.6 General Formatting Rules

- All dissertation text must use 1.5 line spacing. Margins are 2.5 cm on all sides.
- Headers are at the top of pages, in Times New Roman 10 or 11, underlined.
- Page numbers are at the bottom right, in Times New Roman 12 bold.
- Avoid colons after titles.
- Avoid articles at the start of titles (e.g., write "General Principles" not "The General Principles").
- Avoid overloading figures with too many colors or information.
- Check all text, equations, and formulas for errors.
- Copy-pasting without citing a reference is prohibited and sanctioned.

General Conclusion

In the general conclusion, the student should briefly review the entire content of the dissertation, retrace the steps followed, summarize the results obtained, highlight their practical significance, and outline future perspectives. The conclusion should be at least one page for a bachelor's degree and more than one page for a master's degree. The title should be in Georgia, 18-point, bold; the text should be in Times New Roman, 12-point.

Bibliographic References

References are numbered in brackets in order of appearance. The title is in Georgia 18 bold; text in Times New Roman 12. Format:

- Book: [number] Author last name, initial. Book title (italic). Edition, country, year. Example: [4] Gibaut A, Henry M. *Mécanique du point*. Dunod, 2nd ed., France, 2007.
- Article: [number] Authors. Article title (italic). Journal, volume, pages, year. Example: [4] Albin I, Duprès S, Harmen T. *Etude thermique d'un moteur*. RIMT, vol. 15, pp. 157-175, 2015.
- Website: [number] http://www.example.com

Annexes

In some reports, appendices are necessary to provide certain data. The appendices are numbered as follows:

Annexe 1

Annexe 2

Part II-Chapter IV:

ORAL PRESENTATION AND DEFENSE

Chapter Contents

CHAPTER IV: ORAL PRESENTATION AND DEFENSE

IV.1 Introduction

The defense is mandatory at the end of the master's program. It must be carefully prepared, as it represents an important moment academically, personally, and professionally. The oral defense is not a mere formality; the student's final grade depends on it.

Jury members, having already read the manuscript, may have formed an initial positive or negative opinion of the candidate. This opinion can evolve during the defense. The pedagogical objective is to assess the student's ability to present their work clearly and effectively, as well as their ability to respond to questions from the jury members.

IV.2 Preparing the Defense

IV.2.1 Re-reading the Dissertation

The dissertation should be carefully re-read by the candidate, who should identify key ideas as well as any omissions. It is also important to review basic definitions that may be addressed during the defense.

Typical questions to expect include: What aspect of the problem seemed most difficult? Can you elaborate on…? What is the practical significance of your work? How could this work be developed in the future? What are the most important conclusions you have drawn?

IV.2.2 Identifying Errors in the Dissertation

If errors are discovered, they can be corrected, printed, and given as a copy to jury members before the defense.

IV.2.3 Knowing the References Used

Have the most important references memorized, such as those used for validation or those containing the model or working method adopted.

IV.2.4 Preparing Slides Carefully

Preparing slides for the defense requires clarity, structure, and attention to detail. Slides should highlight the key points of the dissertation rather than reproduce entire paragraphs, using concise bullet points, clear headings, and relevant visuals such as figures or charts to support understanding. The design must remain simple and professional, with consistent fonts, appropriate font sizes, and good contrast to ensure readability. Each slide should correspond to a specific part of the presentation and follow a logical progression, helping both the presenter and the audience stay on track.

Careful preparation of slides not only enhances the quality of the presentation but also helps the candidate communicate ideas more confidently and effectively.

IV.2.5 Doing a Pre-Defense with the Supervisor

The pre-defense should be conducted with the supervisor, in the presence of teachers or fellow students, to simulate the conditions of the actual defense. This rehearsal helps ensure that the presentation is not too long and allows for evaluation of the quality and clarity of the slides.

IV.3 Preparing the Visual Aid or Slides

It is customary to prepare presentation slides using PowerPoint. As a general guideline, allow approximately one minute per slide. The jury president usually allocates 15 to 20 minutes for the presentation.

The oral presentation typically includes:

- A brief introduction in bullet points (no full text)
- A reminder of the thesis objective
- A summary of selected previous work
- A presentation of the methodology or research progress
- The main results
- A conclusion in bullet points
- Perspectives or future work in bullet points

Slides should be clear, concise, and easy to read. They must not be overloaded with information. The following recommendations can help ensure effective slides:

- Avoid busy or distracting backgrounds
- Avoid excessive or flashy animations
- Ensure strong contrast between background and text
- Use clear, legible fonts; bold text can improve readability
- Avoid writing full sentences to read aloud; use bullet points and explain verbally
- Do not strictly follow the thesis chapter structure
- Avoid using the word “chapter” to label sections of the presentation
- Present explanations orally rather than writing them on the slides

- Use short captions or bullet points alongside figures when necessary
- Avoid copying large portions of text from the thesis
- Ensure that figures are clear and readable
- Begin with a cover slide and include slide numbers
- Always remember that slides are designed for the audience, not for the presenter

IV.4 Before the Defense

The student should verify they have a printed version of their dissertation to consult if needed. Check in advance the computer equipment needed: cabling, copy the presentation on a USB drive or CD to bring on the day. Also bring a laptop and check compatibility with the projection system.

IV.5 The Day of the Defense

The day of the defense is always a memorable day in a student's life. Good preparation can avoid great stress. Arriving early allows setup of equipment and avoids additional stress. During the oral presentation, the student should:

- Be presentably dressed before the jury,
- Turn off their phone,
- Be pleasant, calm, and courteous,
- Wait for the jury president's authorization before speaking,
- Speak with confidence without speaking too loudly,
- Be audible to the audience,
- Avoid long introductions with endless thanks at the start,
- Look at all jury members,
- Do not read from written notes,
- Stand rather than sit (except in exceptional cases),
- Listen to jury questions and comments before answering; do not interrupt.

Part II-Chapter V:

PLAGIARISM

Chapter Contents

CHAPTER V: PLAGIARISM

V.1 Introduction

Plagiarism is the theft of intellectual property, which may include an idea, a sentence, a paragraph, a figure, or a diagram. It involves using another author's work without properly citing the source. Even if a few or most words are changed in someone else's sentence, it can still be considered plagiarism if the original idea is not acknowledged. Students who copy and paste content into their theses without proper referencing are therefore regarded as plagiarists. In Algeria, plagiarism is subject to strict legal penalties. Additionally, plagiarism detection software is widely used around the world to identify such practices.

V.2 Consequences of Plagiarism

The risks for a student who plagiarizes are:

- Immediate or short-term: if the supervisor or jury members discover it, they can severely sanction the student and cancel the defense and the dissertation.
- Long-term: after the defense, the dissertation is deposited in the department library and can be consulted by thousands of people. If plagiarism is discovered, the student risks annulment of their degree, even years after obtaining it.

Moreover, no one would like to see their results, manuscript, figures, or other work distributed without their consent. All documents bearing a copyright must be used with proper reference.

V.3 Paraphrases

Paraphrasing involves restating an author's ideas using different words and sentence structures. Although the wording changes, the original idea remains the same and still belongs to the original author. Therefore, even when paraphrasing, it is essential to properly cite the source to give credit to the author.

V.4 Algerian Legislation on Plagiarism

Order No. 933 of July 28, 2016 establishes rules for the prevention and fight against plagiarism. The Ministry of Higher Education and Scientific Research has introduced plagiarism detection software to examine theses, dissertations, and other scientific work produced in Algerian universities. In addition, the Ethics and Professional Conduct Council of the university profession has been established to investigate cases of plagiarism. Sanctions may be severe and can include the annulment of academic degrees.

V.5 How to Avoid Plagiarism

The student must follow very simple rules to avoid plagiarism:

- Avoid using copy-paste.
- Indicate the reference for all ideas, sentences, paragraphs, diagrams, figures, or photographs you did not create. The reference must be clearly indicated in the text and in the bibliography section.
- Do not forget to mention the reference when borrowing results from a study by an organization.
- Put in quotation marks every sentence or paragraph from another author, with the reference in both the text and the bibliography.
- Do not translate text from one language to another without citing the source.
- When taking notes, put in quotation marks or highlight elements copied from another author, to avoid involuntary plagiarism.

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BIBLIOGRAPHIC REFERENCES

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