|  |  |
| --- | --- |
| Project Title: | Title |
| Team Members: | Yasemin Kilit Aklar |
| Supervisor(s): |  |

Abstract

The aim of this report is to present your project results and methodology, which you employed or developed for your project. In the Abstract section, define briefly the project field, objectives, methodology, achievements and results. Use 100-150 words. This title page should be 1 page. This template shows you what your report should look like in terms of content and format. Do not change the format. The headings can be changed. If you do not have any content for given headings, you can delete this section. The required content of each section is provided.

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# Introduction and Motivation

Briefly explain the field, where your project is located.

Mention the motivation of your project. Explain the relevance of your project to other subjects, environment, economy and society.

You can give also pictures or tables or references to other sources.

In general, use high quality, descriptive tables and figures. Label them properly as shown in Table 1 and Fig.1,2,3.

# Literature Survey

The literature survey covers your survey on the topics relevant to your project. It is composed of information from books, papers, reports, thesis, web pages, etc. You can organize your survey under subtitles as below. Most importantly, you should discuss the findings in relevance to your project. Paraphrase the knodledge, you would like to take from other resources and give reference to them, even after paraphrasing. You can use the following different formats while referencing.

* **Format 1:** The state of the art wind turbine development relies heavily on realistic simulations of aerodynamics and structure [1],[2]. The optimization methods are increasingly employed. Semiempirical formulations are helpful for fast optimization tasks [2]
* **Format 2:** The state of the art wind turbine development relies heavly on realistic simulations of aerodynamics and structure (Manwell, McGovan & Rogers, 2010; Al-Abadi *et al. 2015*). Al-Abadi *et al.(2015)* suggested that semiempirical formulations are helpful for fast optimization tasks.

## 2.1 Aerodynamic performance

These subsections should help you to organize your survey.

## 2.2 Structure

## 2.3 Optimization

# Definition of the Project

In this section, define your project as clearly and briefly as possible. Use the following subsections, objectives, boundary and operating conditions and constraints for the definition of your problem. Depending on the project, the nature of the objectives, conditions and constraints might vary. They can be even not quantitative. However, maximum effort should be spend to define those conditions quantitatively.

Utilize tables and figures as much as possible.

## 3.1 Objectives

An example objective is as follows:

The objective of the project is to design a wind turbine blade with maximum aerodynamic efficiency while matching to the torque and rotational speed characteristic of the generator [2].

## 3.2 Boundary Conditions and Operating Conditions

The boundary conditions and operating conditions of the above mentioned design objective are provided in Table 1.

|  |  |
| --- | --- |
| **Operating conditions** |  |
| Wind speed | 5-15 m/s |
| Temperature range | -20-50 $°$C |
| **Boundary conditions** |  |
| Maximum rotational speed | 30 rpm |
| Maximum turbine diameter | 100 m |

Table 1 Operating and boundary conditions

## 3.3 Constraints

Discuss the physical, technical, social, environmental and economic constraints, if any exists.

# Methodology

This section is devoted to show the methodology which you have developed, adopted or utilized to reach to the objectives of your project. You have to describe briefly those methods. The results will be discussed later in Conceptual Design (and/or Results) section. You can provide an algorithm of the method. In Fig.1, design and optimization algorithm for wind turbines is provided, as an example [2]. You can organize this section under analysis method and design, if you find it is necessary.



Fig. 1 Analysis flow diagram for aerodynamic optimization of wind turbines [2]

## 4.1 Analysis method

In this section describe the methods you have used in your project. They can be analytical, experimental and/ or numerical. Describe clearly, what kind of information you are getting from each method and how they are connected.

## 4.2 Design method

Explain the kind of analytical, experimental or numerical considerations you use for your project. Explain the decision procedure in your project. If you use an optimization algorithm mention it here.

# Work packages and Time Plan

Provide work packages and time plan (Gant chart), which were constructed at the beginning of your project. Explain the content of each WP and discuss the present state of the project. Show the role of each team member in each WP.

# Conceptual Design (and /or Results)

This is ***the most important*** part of the report. The title can be “Conceptual design”, for those who is designing a system, equipment or process. In the projects, where new materials or surfaces with new functionalities are developed, they can chose the title as “Results”. Here, you have to

* Describe the properties and functionality of the conceptual design(s) or new materials or new processes
* Provide information how did you reach to this design
* Provide detailed quantitative data (figures, drawings, list of performance characteristics, etc.)
* Discuss the advantages and disadvantages of your design based on quantitative data



Fig. 2 Set-up for measuring mechanical power



Fig. 3 Comparison of the calculated and the measured power coefficients [2]

# Cost analysis

Provide a cost analysis, if necessary.

# Discussion and Conclusion

Provide a self judgment of the final results of your project. State any risks or potentials.

## Physical, technical, social, environmental and economic impact of your project

## 8.1.a Describe and evaluate physical impact

## 8.1.b Describe and evaluate technical impact

## 8.1.c Describe and evaluate scenarios for social impact

## 8.1.d Describe and evaluate scenarios for environmental impact

8.1.e Describe and evaluate scenarios for economic impact

# Future Work

Discuss the future work, which will be conducted during ME 402 course. If you want to make changes to the work packages and time plan, do it here while giving reasons for that.

If this is the final report of ME 402, discuss the use of your project in the future. Give suggestions for further improvements.

Acknowledgements

Acknowledge institutes or people who provided any kind of support for this project work. Do not acknowledge the supervisors and the university.

References

According to the given formats in the literature survey make your literature list as shown below:

**Format 1 (1st reference should take number 1 ,i.e. ordered as given in the text):**

[1] Manwell, J.F., McGowan, J.G., Rogers, A.L., Wind Energy Explained: Theory, Design and Application, 2nd Edition, Wiley, 2010.

[2] Al-Abadi, A., Ertunç, Ö., Weber, H., Delgado, A., “A design and optimization method for matching the torque of the wind turbines”, Journal of Renewable and Sustainable Energy 7 (2), 023129, 2015.

**Format 2: (alphabetically ordered)**

Al-Abadi, A., Ertunç, Ö., Weber, H., Delgado, A., “A design and optimization method for matching the torque of the wind turbines”, Journal of Renewable and Sustainable Energy 7 (2), 023129, 2015.

Manwell, J.F., McGowan, J.G., Rogers, A.L., Wind Energy Explained: Theory, Design and Application, 2nd Edition, Wiley, 2010.

Appendices

If repetitive information or pictures have to be delivered, utilize the appendix for this purpose. Do not make your report unreadable with such information.