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BARCELONATECH

Escola Superior d'Enginyeries Industrial,
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Estudi computacional del comportament mecànic de biocompostos per a aplicacions en aeroestructures

Document:

Budget

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BACHELOR FINAL THESIS



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Chapter 1

Budget

This document contains the relation of economic expenses related to the Bachelor Final Thesis, classified by its source and nature, overall being the budget of the project.

The type of expenses considered are of three kinds: human resources, software costs and hardware costs (including estimated energy costs).

1.1 Human resources

In this section, the wage of the authors of the thesis is calculated. In this case, the author is one person, an undergraduate in engineering. The cost of the labour is assimilated to the typical retribution agreed for an undergraduate ESEIAAT (Universitat Politècnica de Catalunya) student on a business internship, that being 8€ per hour.

The time spent on the project is found to be 450 hours in total. A relation of different tasks and the time assigned to finish them are included in the table below.

Activity	Cost per hour (€/h)	Time (h)	Cost (€)
MSC Nastran, preprocessor and postprocessor familiarization	8	90	720
MSC Nastran internal models for composites familiarization	8	20	160
Bureau Veritas procedures familiarization	8	10	80
Research on lamination theory and failure models	8	45	360
Development of auxiliary Python code	8	100	800
Geometry modelling and boundary condition definition on studied cases	8	30	240
Research on manufacturing processes and environmental impact	8	60	480
Result analysis	8	15	120
Writing the report and other miscellaneous tasks	8	80	640
TOTAL		450	3600

Table 1.1: Budget relation of costs associated to human resources.

1.2 Software costs

In this section, the costs related to the computer programs used to develop this thesis are estimated.

An effort to keep costs down has made the cost in this section zero, even regarding the finite element software, which can be obtained for free when demonstrating to be an undergraduate student. MSC Nastran Student Edition and MSC Apex Student Edition have limitations in the number of nodes available for computation but otherwise are free of cost for a period of time longer than required to do the project.

Concept	Cost (€)
MSC Nastran Student Edition	0
MSC Apex Student Edition	0
Python and Numpy package	0
TexStudio	0
Visual Studio Code	0
TOTAL	0

Table 1.2: Budget relation of costs associated to the software.

1.3 Hardware costs

In this section the costs related to the operation of the computer, as hardware are estimated.

The computer used to perform all the tasks involved in the project had a value of 1000 € at the time of acquisition. It is expected to work for 7 years. The amortization cost is therefore 11.9 € per month. The work was conducted in 6 months when the computer had to be available to continue work.

The electric bill will be computed considering 450 hours of labour with an average price of 0.22 €/kWh of electricity and a laptop's mean power consumption of 70 W. That equates to a cost of 0.0154 per hour.

Concept	Cost per unit time	Time	Cost (€)
Laptop amortization	11.9 €/month	6 months	71.4
Electricity bill	0.0154 €/h	450 h	6.93
TOTAL			78.33

Table 1.3: Budget relation of costs associated to the hardware.

1.4 Summary

The total estimated cost of the project is estimated below.

Concept	Cost (€)
Human Resources	3600
Software	0
Hardware	78.33
TOTAL	3678.33

Table 1.4: Budget total costs classified by broad concept.