Engineering Thesis Example

A chapter-by-chapter sample for mechanical engineering students

This guide shows what each part of an engineering thesis looks like, using a short sample on a simple mechanical topic. The numbers are for illustration only. Use it to understand structure and depth – your own thesis must contain your own work, results and words.

Sample thesis title

Comparison of Plain and Perforated Rectangular Plate Fins for Natural Convection Cooling of an Electronic Enclosure

Why / Tip: The title names the object (plate fins), the comparison (plain vs perforated), the physics (natural convection) and the application (electronic enclosure).

Thesis structure at a glance

Part	Contents
Preliminary pages	Title page, certificate, declaration, acknowledgement, abstract, contents, lists of figures and tables, nomenclature
Main chapters	1 Introduction, 2 Literature Review, 3 Methodology, 4 Results and Discussion, 5 Conclusion and Future Scope
End matter	References, appendices, list of publications (if any)

Sample abstract

Electronic enclosures without fans depend on natural convection from finned surfaces to remove heat. This work compares a plain rectangular plate fin array with a perforated fin array of the same base size, made of aluminium alloy, under natural convection. A 3D model of both fin arrays was created and steady-state thermal analysis was carried out for heat inputs of 10 W, 20 W and 30 W. A mesh-independence study was done and the base-temperature results of the plain fin were validated against a published correlation within 5%. The perforated fins showed a lower base temperature than the plain fins at all heat inputs while using less material. The study concludes that perforations improve heat dissipation per unit mass and recommends perforated fins for passively cooled enclosures.

Why / Tip: About 200 words answering: what is the problem, what was done, how, what was found (with a number or trend) and what it means. No references or figures in the abstract.

Chapter 1 – Introduction

Sections: 1.1 Background, 1.2 Heat transfer from extended surfaces, 1.3 Problem statement, 1.4 Objectives, 1.5 Scope, 1.6 Organisation of the thesis.

Sample objectives:

1. To create 3D models of plain and perforated rectangular plate fin arrays of the same base size.
2. To carry out steady-state thermal analysis of both fin arrays at three heat inputs.
3. To validate the plain-fin results with a standard natural-convection correlation.
4. To compare the base temperature, heat-transfer rate and mass of both designs.

Why / Tip: Every objective starts with "To" plus an action verb, and each one must have a matching result in Chapter 4.

Chapter 2 – Literature Review

Summarise 20–40 relevant papers and end with the research gap. A summary table helps:

Author (year)	Study	Method	Key finding
Author A (20XX)	Fin arrays, different spacings	Experimental	An optimum spacing exists
Author B (20XX)	Fins with circular perforations	Numerical	Higher heat transfer per unit mass
Author C (20XX)	Perforation shape	Numerical + experimental	Shape and size affect performance

Sample research gap: "Most studies examine perforated fins under forced convection or for single fins. Few compare plain and perforated fin arrays of equal base size for passively cooled electronic enclosures. This work addresses that gap."

Chapter 3 – Methodology

Sections: 3.1 Geometry, 3.2 Material properties, 3.3 Meshing, 3.4 Boundary conditions, 3.5 Mesh-independence study, 3.6 Validation.

Parameter	Value (example)
Base plate size	100 mm × 100 mm × 5 mm
Number of fins	9
Fin height / thickness	40 mm / 2 mm
Perforation	Circular, 6 mm diameter
Material	Aluminium alloy (k ≈ 200 W/m·K)
Ambient temperature	30 °C
Heat input at base	10 W, 20 W, 30 W

Why / Tip: Write the method so clearly that another student could repeat it. Add a flow chart: problem → literature → geometry → mesh → boundary conditions → solve → validate → compare.

Chapter 4 – Results and Discussion

Present mesh-independence first, then validation, then the main comparison. Explain every figure and table in words.

Heat input (W)	Plain fin base temp. (°C)	Perforated fin base temp. (°C)	Difference
10	48.2	46.1	–2.1 °C
20	66.5	62.4	–4.1 °C
30	84.9	78.8	–6.1 °C

Illustrative values only, to show the format.

Sample discussion: "The perforated fin array shows a lower base temperature at all heat inputs, and the difference grows with heat input. The perforations let cooler air pass through the fins and break the thermal boundary layer, which raises the local heat-transfer coefficient, while the design uses less material."

Why / Tip: Do not only describe the graph – explain the reason behind every trend using theory. This is where most marks are won or lost.

Chapter 5 – Conclusion and Future Scope

- The perforated fin array gave a lower base temperature than the plain array at all three heat inputs.
- The improvement increased with heat input.
- Perforated fins reduced material use, giving better heat dissipation per unit mass.

Future scope: other perforation shapes, other fin materials, forced convection, and experimental confirmation.

References and appendices

Use one style throughout – IEEE (numbered) or APA (author, year). Put long calculations, extra figures and code in the appendices.

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- Shodhganga (INFLIBNET) – Indian PhD theses
- Your university library or institutional repository
- Open-access university repositories abroad
- Open Access Theses and Dissertations (OATD) index and Google Scholar

Read them to learn structure and depth, then write in your own words and check your similarity score before submission.

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