

## Scientific Paper Outlines

Including Scientific Theses and Dissertations

Although scientific/engineering theses/dissertations/papers are written according to the technical interests of the individual writer, they typically follow the same type of formatted structure. Such a structure may be generalized into the following section (or chapter) divisions as outlined below:

### I. Introduction (brief background)

- The introduction typically contains a very brief background entailing a few references to the field of interest, noting one or more achievements made to the field in general. Next, the introduction leads into the as-yet undiscovered portion of research that the paper is intended to address. This may be written in terms of a *problem statement*: an issue in the field that the paper is meant to overcome, mitigate, or otherwise address. Lastly, the introduction converges into a statement which describes the objective of the intended work.

### II. Literature review (what you know; what you found out)

- The literature review is essentially a detailed identification of the overall paper's relevance to the author's scientific discipline. More specifically, this chapter gives the reader an idea of the appropriate placement of the author's research topic (and contributions) within the overall knowledge of the discipline itself.

### III. Theoretical/experimental setup (what you planned; how you did it)

- A. Objective (what you wanted to do)
- B. Focus (your main emphasis)
- C. Methodology (the way you did it)

- The theoretical/experimental setup chapter is intended to provide the reader with an overall idea of the approach taken by the researcher to solve the problem described in the introduction and literature review. For example, if the work is experimental in nature, this chapter will give a detailed description of the apparatus used. If, however, the work is theoretical in nature, the chapter will give a description of the underlying theoretical models to be applied. In either case, this chapter will contain several diagrams and/or flowcharts designed to reveal the structured nature of the work reported.

### IV. Results (what you discovered)

### V. Discussion (what the results mean to you)

- The results and discussion section(s)/chapter(s) detail the findings reported in the paper. Although these two portions of the work may be written together as a single section (or chapter), they may also be written separately. In either case, the results' portion should describe what the author obtained from the setup chapter while the discussion portion should describe the significance of the results obtained.

### VI. Conclusions (summary of results and discussion)

### VII. Recommendations (how to improve the results, what to do next)

- As with the results and discussion section(s)/chapter(s), the conclusions and recommendations section(s)/chapter(s) may also be written either together or separately. When written separately, the conclusion portion should summarize the overall results of the research undertaken while the recommendation portion should describe either how the results could be improved and/or what step(s) should be taken in the future.

### **Appendices** (supportive data)

- Finally, any supportive material pertaining to the author's research may be included in appendices located at the end of the thesis/dissertation. The appendices may consist of examples, derivations, raw data, sample calculations, etc.