The University of Sydney

School of Civil Engineering

CIVL2201 Structural Mechanics

Laboratory Sessions – Information, Marking Criteria and Report Writing

This information sheet provides general instructions on how to prepare a laboratory report in Structural Mechanics. Similar general instructions may apply to the various courses offered within the School of Civil Engineering, but more specific may apply in each course

Aims

The aims of the laboratory sessions are to:

- Reinforce the theory of lectures and tutorials with practical examples,
- Familiarise students with laboratory & testing procedures,
- Enhance the important generic engineering skill of critical report writing.

Content of each lab session

There are two lab sessions, *Basic material properties*, and *Bending of Channel Section*. Specific instructions for each session are given on separate information sheets.

Note that **an essential criterion in this course is the full attendance at the nominated sessions and the submission of a satisfactory report on each topic.** Failure to fulfil these criteria will result in a fail mark being awarded in the course, regardless of performance in other areas.

General notes about submissions and engineering calculations

The main general aims of all the submissions are:

1. To reinforce and complement the theory covered in lectures through practical examples.
2. To ensure students work continuously throughout the semester and receive feedback on their progress.
3. To enhance the important generic skill of setting out solutions/calculations for archival purposes.

Students will discover the importance of aim 3 as they progress through their professional careers, whether or not it is related to engineering. ***Drawings and calculations are major forms of communications between engineers.***

A professional engineer performs written calculations for two reasons:

1. To calculate the answer to problems (obviously!),
2. To keep a permanent record of satisfactory design.

The importance of keeping accurate design calculations is increasing in the engineering profession. Disputes over fees, delays in construction, or minor and major failures, mean that engineers are often required to provide evidence of their calculations and decisions.

The following checklist could be used as a guide before submitting an assignment.

- Is the submission reasonably neat, organised and legible?
- Is there an appropriate diagram of reasonable size, showing all relevant forces, moments, dimensions etc?
- Is the answer set out in a clear and logical manner such that a fellow engineer could understand?
- Is there a brief explanation of the key steps (even just a phrase) or are there just numbers?
- Are any assumptions noted?
- Have the questions specifically asked in the problem been answered, and are the answers clearly identifiable?
- Are the correct units used?
- Is the number of significant figures appropriate?
- Have I checked (or double checked?) my answers?
- Have I put my name and student number on the assignment?

A well written assignment is one which a fellow engineering student like yourself, but not from this university, would be able to understand. Always ask yourself "Would another student understand my submission?"

Laboratory reports assessment

The anticipated workload for writing the laboratory reports is approximately 4-6 hours for the "Materials" report, and approximately 8-10 hours for the "Bending" report.

The materials lab report is worth 5 %, and the bending lab report is worth 10 % of the total assessment. This information sheet provides guidance for students on how to write a suitable report. Reports will be assessed according to the following criteria encompassing interpretation, calculations and presentation:

Interpretation

Excellent	• Comments show complete understanding of experiment and significance of the data
Good	• All questions answered demonstrating a grasp of the ideas
Satisfactory	• Rudimentary answers to the questions
Poor	• Questions incorrectly answered or not answered

Calculations

Excellent	• All calculations correct
Good	• Some minor calculation errors
Satisfactory	• Some errors in graphs; some errors in calculations
Poor	• Careless mistakes, many errors, some required calculations missing

Presentation

Excellent	• Well laid out with cover page, figure explanations, written in clear and concise English, graphs presented correctly with axes labelled and with units
Good	• Well presented report, but some small deficiencies in the presentation
Satisfactory	• Poor layout of report, some errors in spelling and grammar
Poor	• Untidy and careless presentation

A guide to writing a good report

Below are some general instructions on how to present a technical report on an experiment.

General

A well written laboratory report is one which a fellow engineering student like yourself, but not from this university, would be able to understand. From a report, the reader should be able to replicate the experiment, clearly understand the results and any calculations, and appreciate the conclusions

- The report should contain a cover sheet with the title of the experiment, the name(s) and student number(s) of the author(s), the date and time of the experiment, the group number (if applicable), and an abstract (or summary).
- Reports should be neatly written. Typewritten reports are not required unless the student wishes to do so. However poor presentation (including lack of neatness) detracts from the quality of the report.
- All reports should be written in clear, concise English. Remember the purpose of a laboratory report is to communicate ideas. Short sentences should be used wherever possible, as they are clearer to understand.
- The report should be written in the passive voice. Do not use the words I, he, she, we, they, my, our etc. Keep the report impersonal at all times - eg use "The dimensions of the specimen were measured" rather than "We measured the dimensions of the specimen"
- Students should not use words they do not know, or are unsure of their meaning. Commonly misused words include; effect/affect, quiet/quite, and gauge/guage – if in doubt use a dictionary. If the report is prepared using a word processor, use the spell checker, but remember that spell checkers are not always correct, and that the report is for use in Australia, not the United States.

Cover/Title Page
The cover or title page should contain all appropriate bibliographic data, such as title, authors and date. There should also be a very brief abstract which mentions the aim and main conclusions/recommendations of the report. Increasingly many people will only read the cover/abstract of a report, hence it is importance to convey concisely what has been done, why, and the conclusions. A reader will decide if he/she wants to read to remainder of the report based on the content of an abstract. An abstract should only be a paragraph long (say 250 words). Some reports will also contain a list of 5 or 6 keywords, which are used in database searches.

Introduction
The report should contain a brief introduction that outlines the main aims of the experiment.

The introduction may also contain any background information, including a review of previous literature. This may sometime be in a separate section entitled "Literature Review".

Experiment Description
The methodology should be described in such detail that the reader could replicate the experiments, but high level of details should be avoided and this section should not be a set of dot point instructions. The report should be written in the passive voice. Do not use the words I, he, she, we, they, my, our etc. Keep the report impersonal at all times - eg use "The dimensions of the specimen were measured" rather than "We measured the dimensions of the specimen". The use of diagrams is very useful.

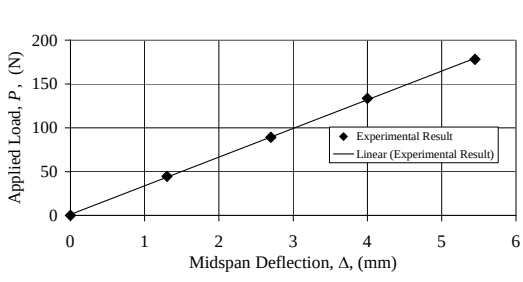
In most cases for university lab reports, there will be a handout, describing the methodology of the experiment. In such cases the handout may be inserted as an appendix of the report.

Results & Observations
In this section, the results from the experiment, and any subsequent calculations, should be presented along with any graphical representation of the results. Tables are a most suitable way of presenting information, but remember to include units with the column/row titles and to use an appropriate number of significant figures. Appendices may be appropriate for large amounts of experimental data or raw data. Appendices should also be used for calculations.

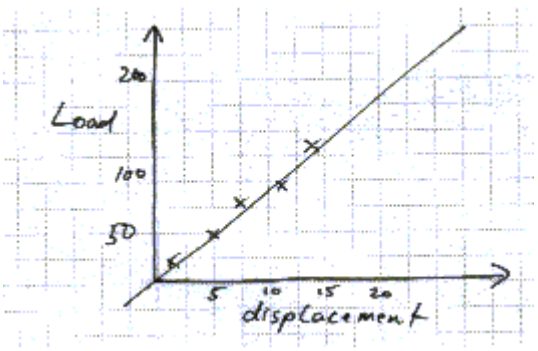
Justification calculations for only one set of results is required, do not waste time repeating the same calculation, it is not only boring to write, but also to read!

Care should be taken over the accuracy of any calculated figures and the use of significant figures. Special care should be taken in this respect if using a spreadsheet to assist in calculations.
Any graph(s) will generally compare the experimental results with either theoretical results, or other published data. When graphing please consider the following:

- graphs should be generated by a spreadsheet (eg Excel) or plotted on graph paper,
- the graph should be of suitable size – in general the width of the graph should be about the width of an A4 sheet,
- the data spread should be taken into account, all the points should not be crammed into one corner of the graph and the remainder of the figure left blank,
- axes should be labelled, the units clearly marked, and tick marks should be numbered,
- the independent variable should be on the *x*-axis (abscissa), and the dependent variable on the *y*-axis (ordinate),
- if asked to graph 'Load versus displacement', then the *y*-axis should be load and displacement the *x*-axis,
- data points should be represented with a distinct symbol: circle, square etc. not simply a dot,
- any line drawn through the data points should be labelled (eg "line of best fit", "linear regression"), and should not be extrapolated beyond the known limits of the experiment,
- if appropriate error bars should be included on the experimental points.



Well presented graph (should be bigger than this)



Poorly presented graph

Comments
This section should contain a description of any unusual factors encountered during the experiment and any sources of experimental error. Based on the sources of experimental error identified, a full error analysis should be presented (if required). 'Human error' is not a valid error, as no attempt has been made to quantify the magnitude of the error. The "comments section" is often included within the results.

Discussion
This section should be used to discuss the results obtained. A comparison between the experimental and theoretical, or published, results should be presented with reference to the error analysis. Reasons for any differences between theory and experimental should be postulated. Any recommendations for refinement of the experimental apparatus, or techniques should be presented here. This is the most important section of the entire report.

The experimental handout may contain a list of questions that require answering. The answers and any relevant discussion pertaining to those questions, should be included in this section. The questions may act as a guide to help students determine what should be included in the discussion. Nevertheless, the format of the discussion section is different to an assignment in which lists of questions may be answered.

Conclusions
The body of the report finishes with a small section summarising the conclusions of the experiment. Only state what can be directly concluded from the experiment no matter how small.

References
Give a full reference including title, author(s), publisher, date etc. everything that would be required for anyone reading the report to find a copy of the publication.

Appendices
Lengthy calculations, additional graphs, raw data etc, which are not of vital importance to the report, should be included as appendices. This will ensure that the report remains concise and uncluttered.

Quality assurance

Any submission should be rechecked carefully by the author, and preferably by a third party to check for any errors. A report with careless mistakes, spelling errors etc appears most unprofessional, and will be marked down as explained in the assessment schedule.

As you become professional engineers you will come to fully appreciate this final note. Start practicing it now.

Safety in the laboratory

- Please take care.
- Please obey the instructions of any staff and any safety notices.
- Enclosed shoes (no barefeet or thongs) are to be worn.
- Please do not touch any equipment not connected with the experiment you are performing. The laboratories are used to conduct commercial and research tests and interference with these tests could have serious consequences.
- Some of the items in the laboratories maybe dirty, dusty and greasy. It is suggested that students may choose to wear clothing appropriate for such a location.

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