FACULTY OF ENGINEERING

Structural Engineering Project Handbook 2009/10

Contents

Introduction

During the final year of the Degree in engineering a major individual project must be completed. The purpose of the project is to cultivate independent thought, initiative and systematic study by the student without dependence on textbooks and lecturers. Project work is open-ended learning as opposed to lectures and structured laboratory classes. Each student will be assigned to a project tutor.

In carrying out the project, the student will have an opportunity of exercising engineering judgment and skills, analysing problems and overcoming the difficulties encountered in the project working within the limitations imposed by cost considerations, available equipment, and time constraints.

Any apparatus, programmes, designs, models or specimens resulting from the project must be demonstrated by the student at a number of assessments, which take the form of oral presentations. The completed work must be presented in the form of a hardbound project report.

The project marks amount to 300 i.e. approx. 25% of the total relevant marks allocated in the final year. The importance and emphasis given to final year project work is reflected in this mark allocation.

Starting the Project

Final year projects should be based on technical reading e.g. research papers, course work, laboratory work or a technical problem encountered in previous work experience. In choosing a project, it is expected that the following points will be considered:

a) The chosen topic should be of personal interest to the student.

b) It should be of suitable academic level, incorporating some theoretical work, design work and the implementation of a solution.

c) It should be possible to complete the project within the allotted time.

d) Where a project involves the construction of a piece of equipment the project should not involve the purchase of expensive or highly specialised equipment or material. Excessive space requirements, use of very large equipment, or purchase of expensive equipment will be a constraint to any project submission and will affect the decision to proceed with a project proposal. Even at proposal stage, it is necessary to submit a realistic outline on costing, which should indicate capital equipment requirements. Where possible equipment already in existence should be used.

e) Supervision and technical advice should be readily available in the chosen topic.

Setting out a Project Proposal

A proposal for the final year project is required. This should consist of a brief written submission comprising the following sections:

A brief descriptive text (300 words) explaining the project content,

A brief outline of:

a) Theory and analysis,

b) Equipment required if any, costs and availability of resources,

c) Procedures envisaged,

d) Tests, experimental work (if any)

e) Expected results, conclusion.

NOTE: The above proposal must be discussed with a Project Tutor or other member of staff for preliminary approval as to its suitability for a final year project.

Choosing a project

A brief outline of the main project requirements

The students are required to undertake a piece of experimental style research i.e. an investigation of a "bounded" problem. Experiments are usually carried out in the college laboratories. Experimental work outside the college may be permitted where the college laboratories are unable to provide the required equipment, in which case arrangements must be made for a college tutor to be present at the time of testing. In exceptional cases, a "desktop" project may be approved.

After receiving approval the student should proceed as follows:

- Carry out a critical review of existing theory and literature (previous research).
- Determine what is to be tested and what limits to apply to the scope of the experiment.
- Decide what is to be measured and how these measurements will be made.
- Select a suitable scale or size of sample allowing for time and cost of tests.
- Design the experiments.
- Conduct the experiments and collect data.
- Use appropriate techniques to analyse the data.
- Draw conclusions from the analysis in the light of existing knowledge and information gained from literature research.
- Note further research, which would test the hypothesis more thoroughly.

Sources of ideas

- Proceedings of learned institutions, in particular the following publications:

  - Journal of the Institution of Structural Engineers – The Structural Engineer
  - Proceedings of the Institution of Civil Engineers - Structures and Buildings
  - Proceedings of the Institution of Civil Engineers – Geotechnical Engineering

- Progressing a previous student project

- Ideas from colleagues, work experience, text books or material and proprietary product manuals

Facilities

Laboratories/Project Fabrication.

The following laboratories are available to final year students for their project:

Room 171.	Concrete Testing Laboratory & Loading rig.
Room 191	Materials Testing Laboratory
Room 193	Soils Laboratory
Room 495	Stress Analysis Laboratories
E-block	Project Room, Loading Rig, Fabrication Area and Testing Lab.

Software available in Dept. of Civil/Structural Engineering

General

- The main computing facilities available to the department are in rooms 380, 390 and 392.
- Most of the P.C.s operate on a Novell network. (Room 392 also operates a UNIX system).
- Each staff member and student is allocated file storage space on one of the servers.
- Software applications are loaded on individual PCs' rather than on a central server.
- The software loaded varies between from PC to PC in any one room - the following is a list of available programs that may be of use to 4th Year students.

Application	Version	Description	Staff Contact
Microsoft Office	Office 2003	(Word, Excel, Access, PowerPoint, Outlook)	Eddie Fallon John O' Donnell
CAD PACKAGES			
AutoCAD	R14	Drafting Package	John O' Donnell
AutoCAD Mechanical	14.5	Mechanical Eng. Drafting	John O' Donnell
Visio Technical	5.0	Technical Drawing	John O' Donnell
Rhinoceros	1.1	3D modelling package	-
Solid Edge	9.0	3d modelling package	-
PROGRAMMING PACKAGES			
Visual Basic	5.0		John O' Donnell
Visual Basic for Applications	5.0	Enables VB programs to be created and run from within other applications.	Eddie Fallon John O' Donnell
Visual C++			John O' Donnell
STRUCTURAL ANALYSIS PACKAGES			
Ansys	5.6	3D Finite Element Analysis	Barry Duignan, and Gareth Keane
SPACEGASS (available on the network in room 480) Student Version can be downloaded from following link: http://www.spacegass.com/index.asp?resend=/sgstudent.asp&referer LINPRO, QSE		Structural Analysis	John O' Donnell Colin Caprani

Project Research for Structural Engineering Students

Information sessions

A more detailed introduction to the resources available and to the general techniques of information searching is organised early in final year.

Electronic information resources

Students may access a comprehensive suite of electronic information resources available across the DIT campus network providing engineering information. Resources include major engineering and construction databases for comprehensive literature searching.

Ei Compendex

International Civil Engineering Abstracts

ICONDA

Other resources provide documents full text to screen for researchers.

British Standards Online (available through Library Website – click on "Databases" link) .

Info4education – construction literature, building trade literature etc.

Electronic journals.

Internet resources provide access to resource finding tools and gateway sites such as EEVL. The Edinburgh Engineering Virtual Library presents quality-assessed sites, resource finders, Internet guides, guides to literature searching and is an essential source for engineering research. http://www.eevl.ac.uk/

Remote access to our Electronic Resources

You may configure the browser on your home Internet PC to access the full suite of electronic resources. Details can be found on the Student Intranet or you can ask in the library for the information.

You may create an individual Athens account (must be done within the DIT campus). Athens is a service providing managed access to electronic resources for the higher education sector. Once created, your individual set of passwords will provide access to a range of databases, currently including Ei Compendex, British Standards, the Construction Information Service and Emerald Full text, from their site http://www.athens.ac.uk/ to any Internet connected PC on the planet. Arrange to do this with Peter Cahalane in the library before leaving for the summer.

Ask at the library desk.

Inter library loans, document supply and access to other libraries

Procedures for Claiming Project Expenses

Limits for Project Expenses (€100 max total for year per student for vouched expenses for materials) are set by Engineering Schools & Departments and come out of School/Department Budgets.

Where possible, Lecturers/Tutors should purchase materials needed for projects through the normal requisitioning procedures.

When purchasing equipment, students should keep all receipts and ensure that any invoices issued to them have been marked "paid".

At the end of the project, the Student can reclaim the expenses, within the limit set by the School/Department. Each Student should claim for all their expenses in the one claim.

Claiming amounts less than €63.00: Students can claim amounts less than €63.00 from Accounts Office Petty Cash. To do this the Student brings the receipts to Accounts Office and a Lecturer/Tutor must accompany the Student, as only members of Staff can sign for Petty Cash. The Student should also have his/her current Student Card with him/her.

Claiming amounts greater than €63.00: Students can claim amounts greater than €63.00 from Accounts Office Cheque Request System. To do this the Student brings their receipts [signed by their Head of Department] to Accounts Office. The Student should also have his/her current Student Card with him/her.

A request for a cheque for the amount is sent to DIT Central Office and a cheque in the Student's name is issued and is sent to the Student's home address. This process usually takes a minimum of 7-10 working days.

Staff

Tutors

FT124/4:

Ross Galbraith (ext. 3817), Dr. John O'Donnell (2913), Ed Mullarkey (3816), Gabriel Corcoran (3810), Henry Mullen (3765), Dr. Colin Caprani, John Turner

B742S/4:

G. Corcoran (3810). Project Studio: Room 193 on Tuesdays 7.00 p.m. to 10.p.m.

Technical support staff

Ronan Hogan, David Thompson – Main Project Lab (E-block)

Conor Keaney – Concrete and Soils - Rooms 193/171 – Phone: 3624

Seamus Greene- Material properties - Rooms 191/495 - Phone: 3623

Anna Reid – Chemistry - Room 492 - Phone: 3693

Key Dates

The **Project Proposa**l should be handed into the Department of Civil/Structural Engineering (Room 240) on or before Friday **5th June 2009**. The tutors will review proposals and written guidance/preliminary approval will be forwarded to all students prior to the **20th June 2009.**

If any student wishes to discuss or seek outline approval for a project, prior to the **5th June**, the Project Tutors will be available for advice and consultation, as required..

You are required to submit to the Department a **Preliminary Report** on your project in accordance with the requirements set out herein by **5pm on Wed 18th Nov. 2009**.

The Department expects all testing to be carried out on the College premises - and to be completed by **Friday 26th March 2010**. Permission may be given by the Head of Department to vary either or both of these requirements in exceptional circumstances.

The **Final Thesis** must be submitted to the Department by **5:00 p.m. on Tuesday 1st June 2010**.

No project can go ahead without the approval of the Department.

Notes:

- All dates are provisional and the Department reserves the right to alter the above timetable. Students will be notified in advance of any changes.

- The procurement of materials for any /all projects remains the responsibility of the student. The Department cannot guarantee the arrival of materials at a particular time or even at all. Students are advised to procure all materials that are of a critical nature to the completion of a project.

Written and Oral Presentations

Preliminary Report

The purpose of this report is to gain approval to proceed with your chosen project. It should include a brief description of progress made and information gathered to date together with a list of materials, instrumentation and equipment necessary to complete the project.

Suggested layout of Preliminary Report

1) Abstract
   Approximately a half page outlining the project.
2) Introduction
   A general outline of the topic with reference to any background information, history, previous work, and general background to theory.
3) Objective and how to achieve it
   a. Set out the particular line of research to be carried out, stating what tests, theory etc. are required to achieve it.
   b. It will be helpful to answer the following questions:
      - What is the problem?
      - How do you propose to quantify it?
      - What structural behaviour do you expect?
      - What deflections or rotations?
      - What are the directions of force paths?
      - How will you model support conditions, hinges etc.?
      - What material behaviour do you expect?
      - How will you measure this?
      - For materials tests, how many tests are required?
      - What tests are required to achieve the desired results in the project?
      - How will you illustrate your results? - Tables, graphs etc.?

- What minimum number of results will you require for these?

c. The actual details of testing (diagram of test set-up etc.) may be outlined in Item 5 below.

4) Progress to date
   a. Brief outline of relevant information from literature survey.
   b. People contacted - information received from them.
   c. Availability of materials and equipment.

5) Proposed course of action
   a. Further information required.
   b. Materials and equipment required - names and addresses of sources, approximate quantities, estimated costs, and anticipated delivery dates.
   c. Details of tests to be carried out - diagrams of testing arrangements showing loading method, measurement of loads, deflections, strains etc. indicating maximum anticipated load. You must indicate clearly your proposals for the stability and safety of your test methods.
   d. Programme for project - in bar chart form - showing time scale for different activities.

6) Proposed Cost
   a. List of materials and equipment to be purchased - with approximate costs - and proposed total cost of project (*not* including photographs, typing, copying and binding).

7) References
   a. List of literature surveyed to date. This must include author's names, full title, journal or book name, volume no., copy no., date, page nos., and publisher (for books). The references must be cross-referenced by number to the body of the Preliminary Report.

NOTE:

a. Approximately five to ten pages would be the norm for the Report.
b. The Report is to be *typed*.
c. *One copy* is to be submitted - punched and bound in a plastic *lab-type folder* with transparent front cover.
   The first page is to be the title sheet with the title in the centre and the student's *name in the top right hand corner.*
d. Reports are to be submitted to the Secretary, Department of Civil and Structural Engineering, (Room 239) by **Wed 18th Nov 2009**

Preliminary Report Interview

Students will be interviewed on their Preliminary Reports on the afternoons of **Wed 25th Nov. 2009 and Wed 2rd Dec. 2009**. The interview will take approximately 15 minutes and will include a short 5-minute oral presentation by the student and a 10-minute question session by the interview panel.

Final Thesis

The Final Thesis is to be submitted in a ring-bound soft cover format **by 5:00 p.m. on Tuesday** 1st **June 2010**.

If the written thesis is not of an acceptable standard as regards both layout and content, then the student will NOT be interviewed as part of the final

assessment in the summer, and will have to re-present the revised written thesis in the autumn.

The Final Thesis should comply with the following requirements:

Title

The title page should comprise

- The title (maximum eight words)
- The full name of the author
- The date
- The address (DIT Bolton Street)

Text

The text should be in clear English, in the third person and avoid colloquialisms.

Spelling should follow the first spelling in the latest edition of the Concise Oxford English Dictionary. Capital letters should only be used for proper nouns. Abbreviations should conform to the latest edition of BS 350 Part 1 and symbols should be in accordance with the latest edition of the relevant industry guidelines. A notation defining all symbols used should be provided.

Mathematical equations should be clear and easily understood. Each equation should be numbered and appear on a separate line in the text. Only relevant equations should be shown in the main body of the text - any development of an equation should appear in an appendix.

SI units should be used throughout.

Tables

Information, which is additional yet essential to the understanding of the text – and which cannot be better presented graphically – should be presented as tables. Tables should be simple with brief column headlines (including all units) and as few rows and columns as possible. The tables should be numbered consecutively and referred to in the text (e.g. Table 1).

Illustrations

Line drawings, sketches and photographs should be included wherever possible to enhance the understanding of the text. Each illustration should be clearly captioned, referred to in the text and numbered consecutively (e.g. Fig. 1).

References

Sources of information and originators of work or ideas referred to in the text must be properly acknowledged. References should be indicated in the text with consecutive superscript numbers after the authors name (e.g. Wearne[1]) or at the ends of the sentences. The numbered references should then be listed after text on separate pages and in numerical order.

Bibliography

Background reading should be listed as bibliography. Bibliography should be listed after references.

Books Author's surname, initials, title of book, publisher, place of publication, year, and e.g.

WEARNES S., Principles of engineering organisation (2nd edn), Thomas Telford, London, 1993.

Periodicals Author's surname, initials, title of paper or article, title of periodical, year, volume, month or part, first-last page number, e.g.

GIBBONS C., Experimental behaviour of partially restrained steel columns. Proc. ICE Struct and Bdgs, 1993 Vol. 99, No.1, 29-42.

Conference proceedings Author's surname, initials, title of paper, title of conference proceedings, place of conference, year, first-last page number, e.g.

BISHOP A. W., Factors controlling the shear strength of partially saturated soils. Proc. Res. Conf. Shear Strength of Soils, Colorado, 1960, 503-532.

Appendices

Detailed test procedures and results, development of equations, supplementary or additional information should be presented in appendices on separate pages after the bibliography.

Suggested layout of Final Thesis

- Title Page
- Abstract
- Acknowledgements
- Contents List
- List of Figures
- List of Tables
- List of Abbreviations
- Glossary of Terms
- Introduction
- Theory
- Critical Literature Review
- Design of Experiment
- Testing and Data Collection
- Presentation of Results
  - Data Analysis
  - Production of Results
  - Discussion of Results
- Conclusions
- Recommendations for Further Research
- References
- Bibliography
- Appendices

Final Thesis Interview

Students will be interviewed on their Final Thesis on **Mon 7th June 2009 and Tues 8th June 2010**. The interview will take approximately 30 minutes and will include a 15-minute oral presentation by the student and a 15-minute question session by the

interview panel. Students are to use **storyboards only** to illustrate the main points of their Thesis as an aid to their oral presentation. A brief handout of the main points may be distributed to the panel at the interview.

FT124/4 Project Presentation

Time

15 mins. Max. presentation + 10 mins. questions. Total 25 minutes.

Layout:

Storyboards only

On drawing sheets (in felt tip pen) - or enlarged type - pinned to boards.

Format:

(a) Title.

(b) Reason e.g. practical problem encountered during summer work -if relevant.

(c) Aims - set out as points 1, 2, 3 etc.

(d) Testing - photos and/or diagrams, sample pieces.

(e) Theoretical Analysis - just state method (title) or formula -don't go through detailed analysis.

(f) Results of Tests - photos, some samples, graphs (a few –not all - preferably showing a comparison) or table showing a comparison.

(g) Discussion of results and conclusions -do your results agree with what you set out to do -if not, why not? Reasons for cracks, failures -if something did not work out say why not -you must show the ability to reason things out.

Presentation:

(a) Make out your main points.

(b) Time your presentation - practice.

(c) Don't dwell on background information or details -a history of steel or concrete or timber is not required.

(d) Remember:

(i) What did you set out to do?

(ii) How did you accomplish it?

(iii) What are your results?

(iv) What conclusions do you come to?

Project Supervision

Project Diary

Students must keep a project diary in the form of an A4 hard backed notebook recording sketches, ideas, information sources, contacts, rough calculations, etc.

Tutors

Students are assigned an individual tutor who will provide a first point of contact with the department.

Tutors are assigned after the presentation of the preliminary report.

All project staff are available to all students for consultation.

Assessment

Total mark awarded for the project is 300.

50 marks are awarded for the Preliminary Report and Preliminary Report Interview as follows:

5 marks for written preliminary report.

5 marks for oral presentation.

10 marks for execution/management of the project.

30 marks for theoretical analysis/critical literature review.

250 marks are awarded for the Final Interview and Final Thesis Interview as follows:

30 marks for written presentation.

30 marks for oral presentation.

50 marks for execution of the project.

140 marks for theoretical analysis, analysis of results and conclusions.

Health and Safety Issues

Students are expected to exercise due care and diligence in manufacturing and testing of test pieces, and must take all necessary steps to safeguard the health and safety of themselves, their fellow students, staff, and any other person involved.

In particular they must exercise due care and diligence in:

- Use of power tools
- Moving and lifting heavy loads
- Constructing test pieces
- Storage of test pieces
- Setting up testing equipment and test pieces
- Applying loads
- Ensuring that any failure of test pieces is carried out in a controlled manner
- Removal of test equipment and failed test pieces

Each student's attention is drawn to the following:

- Power tools may not be used unsupervised
- Lifting equipment may not be used unsupervised
- The test set-up must be approved by the student's Tutor or the laboratory technician
- Testing must be supervised
- Only those involved directly in testing are allowed in the laboratory during a test.
- Testing to failure is only allowed subject to the Tutor's approval
- Each student is to provide for his/her own use a safety helmet, safety boots and reflective waistcoat, to be used where necessary or as directed by the Tutor/laboratory technician
- Safety visors/goggles are to be used where necessary during manufacture, setting up and testing or as directed by the Tutor/laboratory technician
- Students are to stand well clear of the test rig during testing and must cease Demec stud readings, or other close observations, when the load is in the failure range.

Where it is deemed necessary, the Head of Department will arrange demonstrations in the proper use of equipment. All students must obey Health and Safety notices displayed in the Laboratories. Laboratory access is restricted to registered students of the college.

List of Theses 2008 - 2009

Cantilever Stone Stairs
Inclined Links in dapped beam
Stiffeners

Splitting in Composite Beams

RC Cladding
Dowels in Glulam
Dampers in Tall Buildings
Dapped Beams

Use of Glass Fibre and Epoxy Resin in Timber Members Subjected to Bending

Self-compacting Concrete

Two-pinned Arches
Dynamic Behaviour of Steel Frames

Shakedown limits/collapse loads for portal frames

Predicting Temperature rise in Concrete Walls

Steel beam to RC wall connection

Aluminium plate girders

Slab punching shear resistance

Non-destructive Testing
Size Effect on shear
Shear Studs in Narrow RC Beams
CFRP strenthend Beams

Torsional strength of frp reinf. RC beams

Ultra Shallow Floor Beams

Reinforced Concrete Haunched Beams

GGBS
Thin FRP Formwork
Stabilisation of mine waste
Shear Connectors
Early Strength Gain in CEM III
Bonded Anchors
Shear in Composite Beams
Shear Connectors

Summary of Important Dates

Friday 5 June 2009	**Submission of Project Proposal**
Wednesday 21 October 2009	**Final Approval of Project Proposal**
Monday 2 November 2009	**Submission of Preliminary Report**
Wednesday 4 November 2009	**Preliminary Report Interviews**
Wednesday 11 November 2009	**Preliminary Report Interviews**
Friday 26 March 2010	**Completion of Testing**
Monday 12 April 2010	**Submission of Final Thesis**
All week, 3-7 May 2010	**Final Thesis Interviews**

Note: All dates are provisional and subject to final confirmation.

Useful Reference:

Fellows S., Liu Anita, Research Methods for Construction, Blackwell Science Ltd, Oxford, 1997.