COLLEGE OF ENGINEERING A ND THE BUILT ENVIRONMENT

SCHOOL OF CIVIL AND BUILDING SERVICES ENGINEERING

BE in Structural Engineering

Final Year

Project Handbook

2011/12

Contents

Introduction

During the final year of the Honours 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.

In all work, DIT's Policy on Plagiarism must be adhered to. It is available here:

www.dit.ie/media/documents/campuslife/**plagiarism**.doc

All formal submissions must include a signed statement indicating that the submitted work is solely the work of the stated author, except where indicated by academic reference.

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.

Choosing a project

A brief outline of the main project requirements

The students are required to undertake a piece of research i.e. an investigation of a "bounded" problem. Physical 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. A "desktop" project may also be approved in exceptional circumstances.

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
    - American Society of Civil Engineers Journals – www.asce.org.

- Progressing a previous student project

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

- Ideas from tutors – projects that tutors are currently working on, or would like to, have carried out.

Setting out a Project Proposal

A proposal for the final year project is required. A Project Approval Form will be made available for this purpose. This will consist of a brief written submission comprising the following information:

A brief descriptive text (250 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. The Project Approval Form must be signed by a tutor to register the approval of the project, before the time and date stated in the Project Calendar.

Typical Steps Towards a Successful Project Proposal

1. As a first step you need to select a topic, produce a written description thereof and seek approval from a tutor that this is a feasible topic.

2. The next step is to develop this topic into a full proposal and to produce details thereof in a Preliminary Report. To get approval to proceed with the proposal, you need to demonstrate (via your preliminary report and Preliminary Interview) that any proposed test-pieces can be safely manufactured and tested and that their structural behaviour can be both experimentally monitored and mathematically modelled. Therefore, your proposal needs to be quite specific, and should state clearly the specific problem which you are endeavouring to solve.

3. Carry out a literature survey (including textbooks, published papers, codes of practice and previous student theses) to ascertain existing state-of-the-art knowledge on the topic and summarize this in your report, together with your opinion of each source.

4. Determine acceptable mathematical structural model(s) for any proposed test-pieces to cover all possible modes of behaviour and failure. Ensure that mathematical models chosen can be derived from first principles.

5. Identify and list clearly all of the parameters which are involved.

6. Choose those parameters whose effect you wish to study (two parameters is sufficient and a total of four to five test-pieces may be sufficient).

7. Select exact dimensions and properties for any proposed test-pieces such that they can be tested safely by the College equipment (discuss with tutors and relevant laboratory staff). Decide exactly the manner and orientation whereby each test-piece will be placed in the loading rig. Total theoretical failure load (with all partial safety factors equal to 1.0) should not exceed about 150 kN.

8. Produce hand-calculations to justify the predicted failure load of each of any test-pieces.

9. Decide on the locations where you will measure structural deformations (e.g. by means of displacement transducers, strain gauges, etc.) and state your reasons for these locations.

10. Describe the proposed method and location of manufacture of your test-pieces.

11. Produce sketches showing each test-piece in the loading rig, including loading and support details (including lateral support), protection shields, locations of displacement transducers and strain gauges.

12. List material tests (with reasons) which you propose to carry out (discuss with tutors and laboratory staff).

13. Carry out a cost analysis for the project (including strain gauges).

14. Produce a time-allocation chart, i.e. Activity versus Time.

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, Room 608	Project Room, Loading Rig, Fabrication Area and Testing Lab.

Software available in the School

General

The main computing facilities available to the department are in rooms 380, 390 and 392.

Please see the table on the following page for program details.

Application	**Description**	**Staff Contact**
Microsoft Office	(Word, Excel, Access, PowerPoint, Outlook)	John O' Donnell
CAD PACKAGES		
AutoCAD	Drafting Package	John O' Donnell
AutoCAD Mechanical	Mechanical Eng. Drafting	John O' Donnell
Visio Technical	Technical Drawing	John O' Donnell
Rhinoceros	3D modelling package	-
Solid Edge	3d modelling package	-
PROGRAMMING PACKAGES		
Visual Basic		John O' Donnell Bernard Enright
Visual Basic for Applications	Enables VB programs to be created and run from within other applications.	John O' Donnell Bernard Enright
Visual C++		John O' Donnell Bernard Enright
STRUCTURAL ANALYSIS PACKAGES		
Ansys	3D Finite Element Analysis	Barry Duignan Gareth Keane
SPACEGASS Student Version at: http://www.spacegass.com/exes/w74hs29k/student/	Analysis & Design	John O' Donnell
LinPro www.line.co.ba	2D Static and Dynamic Analysis	Colin Caprani
LUSAS	3D Finite Element Analysis for Civil/Structural Engineering	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 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 Petty Cash Limit: Students can claim amounts less than the Petty Cash Limit 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 Petty Cash Limit: Students can claim amounts greater than the Petty Cash Limit 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

Name	Telephone	Email
Colin Caprani	402-2993	colin.caprani@dit.ie
Gabriel Corcoran	402-3810	gabriel.corcoran@dit.ie
Ross Galbraith	402-3817	ross.galbraith@dit.ie
Edward Mullarkey	402-3816	edward.mullarkey@dit.ie
Henry Mullen	402-3765	henry.mullen@dit.ie
John O'Donnell	402-2913	john.odonnell@dit.ie
John Turner	402-3654	john.turner@dit.ie

Technical support staff

David Thompson – Main Project Lab (E-block) – Phone 2995

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

TBC – Material properties - Rooms 191/495 - Phone: 3623

Anna Reid – Chemistry - Room 492 - Phone: 3693

Computing Support

Simon Farrell – Rm 379 – 3943

Michael O'Flaherty – Rm 379 – 3943

School Administration

Caroline O'Dowd – Rm 240 – 3635

Anne Cullen – Rm 241 – 4039

Project Calendar

Notes

1. No project can proceed without the approval of the School.

2. All **dates and times are provisional** and the School reserves the right to alter the timetable. However, students will be notified in advance of any changes.

3. 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 critical to the completion of their project.

Milestones

- A **Project Proposal** is to be submitted to the Department of Civil/Structural Engineering (Room 240). The tutors will review proposals and written guidance/preliminary approval will be forwarded to all students. If any student wishes to discuss or seek outline approval for a project, prior to the Project Proposal deadline the Project Tutors will be available for advice and consultation, as required.

- **Project Approval** must be given formal approval. A Project Approval Form is available for this purpose.

- **Tutor Group Meetings** (1.5 hours duration) will be held approximately every four weeks. Each student in a tutor's group will present on their progress for 15 minutes. These are informal events.

- A **Preliminary Report** on your project in accordance with the requirements set out herein is required.

- **Testing Completion Date**: the Department expects all testing to be carried out on the College premises - and to be completed by the assigned date. Permission may be given by the Head of Department to vary either or both of these requirements in exceptional circumstances.

- The **Project Dissertation** must be submitted to the Department by the assigned date, for examination.

- The **Final Project Interviews** will be held on the assigned dates.

Calendar of Activities

Note: The Project Class runs every Wednesday of term from 14:00-17:00 unless noted otherwise.

Year	Month	Week Starting	Week No.	Specific Date	Time	Activity
2011	June	30/05/11	N/A			
		19/09/11	Sem 1 - 1			
		26/09/11	Sem 1 - 2	28-Sep	14:00-17:00	Safety Induction & Research Methods
	October	03/10/11	Sem 1 - 3	05-Oct	14:00 - 15:30	Tutor Group Meeting
		10/10/11	Sem 1 - 4			
		17/10/11	Sem 1 - 5	19-Oct	17:00	**Final Date for Project Approval**
		24/10/11	Sem 1 - 6			
		31/01/11	Sem 1 - 7	02-Nov	14:00 - 15:30	Tutor Group Meeting
	November	07/11/11	Sem 1 - 8			
		14/11/11	Sem 1 - 9	16-Nov	14:00	**Preliminary Report Submission**
		21/11/11	Sem 1 - 10	23-Nov	14:00-17:00	Preliminary Interviews
		28/11/11	Sem 1 - 11	30-Nov	14:00-17:00	Preliminary Interviews
	December	05/12/11	Sem 1 - 12	07-Dec	14:00 - 15:30	Tutor Group Meeting
		11/12/11	Sem 1 - 13			
2012		09/01/12	Sem 1 - 14			Exams
		16/01/12	Sem 1 - 15			Exams
		23/01/12				
		30/01/12	Sem 2 - 1	02-Feb	14:00 - 15:30	Tutor Group Meeting
	February	06/02/12	Sem 2 - 2			
		13/02/12	Sem 2 - 3			
		20/02/12	Sem 2 - 4	23-Feb	14:00 - 15:30	Tutor Group Meeting
		27/02/12	Sem 2 - 5			
	March	05/03/12	Sem 2 - 6			
		12/03/12	Sem 2 - 7	16-Mar	17:00	**Testing Completion Date**
		19/03/12	Sem 2 - 8			
		26/03/12	Sem 2 - 9	28-Mar	14:00 - 15:30	Tutor Group Meeting
	April	02/04/12				Easter
		09/04/12				
				16-Apr	10:30	**Project Dissertation Submission**
		16/04/12	Sem 2 - 10			
		23/04/12	Sem 2 - 11			
		30/04/12	Sem 2 - 12			
	May	07/05/12	Sem 2 - 13	09-May	14:00-18:00	Final Project Interviews
				10-May	09:00-17:00	Final Project Interviews
		14/05/12	Sem 2 - 14			Exams
		21/05/12	Sem 2 - 15			Exams
		28/05/12				

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 must 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 School Administrator by the time and date given on the calendar.

Preliminary Report Interview

Students will be interviewed on their Preliminary Reports on the dates given in the calendar. The interview will take approximately 15 minutes and will include a short 5-minute PowerPoint presentation by the student and a 10-minute question session by the interview panel.

Dissertation

The dissertation is to be submitted in a ring-bound soft cover format on or before the time and date given in the calendar.

If the written document 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.

A dissertation template will be supplied to you. You must comply with the dissertation template's layout and styles.

You may be required to submit an electronic version of your final project document in PDF format.

Final Project Interview

Students will be interviewed on their projects on the dates given in the calendar. 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.

Alice Prendergast (402-3912, alice.prendergast@dit.ie) will be available during the year to provide assistance in preparation for the interviews and to assist with presentation techniques and dry-run practice.

Time

15 mins. Max. presentation + 15 mins. questions. Total 30 minutes.

Format: Powerpoint presentation – load your files before the interview session starts

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 and Assessment

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

The 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 Project Interview and Dissertation as follows:

- 30 marks for written presentation.
- 30 marks for oral presentation.
- 50 marks for management of the project.
- 140 marks for theoretical analysis, analysis of results, and conclusions.

The penalties to be imposed for late submissions will be in accordance with the General Assessment Regulations.

Health and Safety

Early in Semester 1 a **Safety Induction** is given (along with a research methods talk by library staff). In order to work in the laboratory, each student is required to have:

- certified attendance at the Safety Induction;
- signed a declaration that they have read, and are familiar with, the Health & Safety standards that apply, and will abide by them.

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.

All students must obey Health and Safety notices displayed in the Laboratories. Laboratory access is restricted to registered students of the college.

List of Projects 2009 - 2010

- The Use of Geopolymer Concrete to Mitigate Alkali-Silica Reaction
- An Investigation of Deflection in Reinforced Concrete with CFRP Rods
- Structural Behaviour of Built-Up Timber Box Columns
- Negative Skin Friction in Pile Foundations
- Implications of Digital Image Processing for Vibration Monitoring
- Comparative Study of Immediate Settlement in Boulder Clay Under Shallow Foundations
- The Dynamics of Framed Structures
- The Calibration of Ultra-High Performance Fibre Reinforced Concrete for Irish Materials
- External Reinforcement of Horizontal Timber Beams Using Steel Cables
- Examining the Bond of FRP to Concrete
- Structural Performance of Composite Timber I-Beams
- Damage Detection Using Distributed Accelerometers
- Moment Resisting Performance of Glulam Beam-to-Column Finger Joints
- How Prying Forces Vary Depending on the Bolt Configuration and Endplate Thickness
- Racking Resistance of Wall Panels In-Filled with Hemp Lime Mix
- The Effect of Bolt Slippage on Reduced Beam Section
- Shear Capacity in Timber I-Beams with Web Holes
- Apex Connections in Cold-Formed Steel Roof Trusses
- Channel Section with Longitudinal Stiffeners
- Investigation into Wood Beam to Beam Steel Sleeve Connections
- The Capacity of A Cellular Steel Roller I-Beam as a Function of the Web-Post Width
- Behaviour of Concrete-Filled Aluminium CHS Columns
- A Study of the Effects of Variable Repeated Loading
- Flexural Behaviour of Void-Filled Square Hollow Section Beams
- Concrete Columns Reinforced with Prefabricated Cage System
- Beam to Column Moment Connections in Cold-Formed Steel
- Moment/Shear Ratio Effects on Bolted End Plate Splice Connections in RHS Beams
- The Structural Properties of Dublin Boulder Clay
- Strengthening of RC Beams by External Prestressing
- Analysis of the Block Shear Capacity of Stiffened Coped Beams
- Mechanically Fastened Fibre Reinforced Polymer Strengthening for RC Beams
- Web Crippling in Cold-formed Stainless Steel I-sections
- Improvement to Bond Strength of Rebar Using Steel Fibres
- Pre-stressing of Fibre Reinforcement in Glulam Beams
- Air Entrained CEM 2 Concrete
- Torsion of RC Beams with Opes
- Comparing Cable Anchors and Rock Bolt Anchors Under Tensile Loading
- The Design and Performance of Helical Piles and Anchors in Soil
- Flexural Behaviour of RC Beams with Debonded Longitudinal Tensile Reinforcement
- The Suitability of Horizontal Tie Connections in Precast Hollowcore Slabs
- Compressive Strength of Eccentrically Loaded Masonry
- Influence Surfaces Applied to Bridge Traffic Load Effect

List of Projects 2010 - 2011

- Reliability of Bolted Timber Connections with Varying Moisture Content
- Repairing of Timber Beams with Varying Lengths of Bonded Reinforcement
- Fastener Flexibility in Strengthened Timber Framed Walls
- Strengthening and Repair of RC Beams with Fibre Reinforced Concrete
- The Composite Relationship between Masonry and Prestressed Concrete Lintels
- The Structural Behaviour of Precast Concrete Sandwich Panels
- Flexure Capacity of Reinforced Concrete Beams with Corroded Steel Reinforcement
- Reinforcing Curved Glulam Beams Perpendicular to the Grain
- Welded-Flange Bolted-Web Steel Moment Connection
- Strength Development and Shrinkage of Alkali-Activated Slag Cement
- Tuned Liquid Column Damper to Suppress Vibrations of Tall Buildings
- The Effect of Load Sharing on Deflection in Double Glazed Units
- Capacity of a Steel Column with Crookedness
- Flexural Behaviour of Rectangular Concrete-Filled Box Sections Using HSC
- Reliability Analysis of Corroded Steel Box Girder Bridges
- Embedment Strength of Recycled Plastic Lumber
- Glued Composite Timber-Concrete Beams
- Effectiveness of the Helical Pitch on the Ductility of an HSC Beam
- Structural Analysis of a Winding Concrete Stairs
- Behaviour of Eccentrically Loaded Concrete Filled Steel Tubular Columns
- The Effects of Underground Tunnelling on Surface Structures
- Hemp and Sorelcement as a Construction Material
- The Extension of Precast Concrete Beams Using Steel Fibres
- Behaviour of Single Plate Shear Connections
- The Effects of Corrosion on the Bond Strength of Reinforced Concrete
- Damage Detection in Beams Using Distributed Accelerometers
- Punching Shear Strength of Interior Slab-Column Connections with CFRP
- Rheological Properties of Self Compacting Concrete using Coarse Recycled Concrete Aggregate
- Ceramic Waste as an Aggregate Replacement in Structural Concrete
- Racking Resistance in Timber Wall Panels with Openings
- Fatigue of Steel Orthotropic Bridge Decks
- Reduced Beam Section as Seismic Moment Connections
- Spiral Post-Tensioned Concrete Members
- Transverse Circular Openings in Reinforced Concrete Beams
- Damping of Tall Structures Using Skybridges
- Composite Beam Construction Using Cold-Formed Steel Sections
- Analysis of CFRP Wrapping on Eccentrically Loaded Columns
- Accelerating the Curing and Carbonation of Hempcrete using Carbon Dioxide
- The Effect of a Temperature Load on a Reinforced Concrete Wall
- FRP Strengthening of a Pre-Loaded RC Beam
- Flexural strengthening of box-beams using GFRP

Reference

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